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A Cultural Resources Reconnaissance at Lake Red Rock, Iowa

U.S. Army Corps of Engineers
Rock Island District

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This report reviews the archeological literature, presents the results of field checks of prehistoric sites, synthesizes available data for Lake Red Rock - Iowa, describes geomorphological characteristics, and discusses preliminary predictive models for archeological site locations and prehistoric settlement systems. Information on ceramic and lithic technologies is summarized, and maps are provided which illustrate geomorphological and vegetation features of the Lake Red Rock area. A preliminary culture history is also provided.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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A CULTURAL RESOURCES RECONNAISSANCE AT LAKE RED ROCK, IOWA

PREPARED FOR:

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61201

BY:

COMMONWEALTH ASSOCIATES INC.
209 EAST WASHINGTON AVENUE
JACKSON, MICHIGAN 49201

UNDER THE SUPERVISION OF:

DONNA C. ROPER, Ph.D.
PRINCIPAL INVESTIGATOR

REPORT R-2596

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CHAPTER 1

INTRODUCTION

Lake Red Rock, located southeast of the city of Des Moines on the Des Moines River (Figure 1-1), was filled in 1969, several years before the major pieces of current cultural resource management legislation were enacted. Archeological investigations began shortly after the reservoir was authorized (Wheeler 1949) and continued intermittently until it was completed (McKusick and Ries 1962; Gradwohl 1973). Around 200 archeological sites are presently known in the reservoir, but a synthesis of the data, identification of research gaps, and identification of pertinent research concerns have yet to be accomplished.

The purposes of the present report are to present an initial synthesis of the archeological resources of the lake, using several types of evidence to identify the present data base and gaps in the data base, and to place the archeological resources in their context through the development of a model of Holocene landscape evolution. This synthesis may then form a basis for planning future investigations, managing endangered resources, and making evaluations of the significance of resources. The rationale for producing such a synthesis for this purpose holds that if Federal cultural resource management legislation is to achieve its goal of preservation of archeological data, then it is important that those data be recovered in a manner consistent with the current professional archeological standards. In a pure sense, however, data do not exist in the absence of questions which they may help answer. Those questions in turn are derived from an explicit research design which specifies relevant research problems and methods for their solution. Problem areas must be as specifically phrased as possible to achieve maximum fit between research objectives and data recovery.

Research problem areas cannot be specified without a review of the present data base. The data base in this case includes the literature of not only Lake Red Rock per se, but also its immediate vicinity, Iowa, and the Prairie Peninsula in general. It also includes the already recorded sites in the reservoir and a review of their status and potential.

The basic objectives of the present project were to:

1. Review the literature of Iowa and central Iowa archeology in general and Lake Red Rock archeology in specific;

2. Conduct an in-the-field examination of known sites in the reservoir to verify site locations, supplement existing data, and assess current condition;

3. Synthesize the available data to identify pertinent research domains and specific questions which may serve as a foundation for continued investigations in Lake Red Rock and vicinity;

4. Conduct geomorphic investigations leading to a model of Holocene landscape evaluation in the central Des Moines River valley, and

5. Generate a predictive model (which must be considered general and preliminary) for the lake area.

This work was accomplished by Commonwealth Associates Inc. under Contract DACW25-83-C-0064 with the U.S. Army Engineer District, Rock Island. Background research began in late July and early August 1983. Fieldwork by archeologists and geoarcheologists was conducted from September 7 to 18, 1983. Reduction of data and report preparation was conducted during fall 1983.

All investigations were conducted under the direction of Donna C. Roper, Ph.D. Dr. Roper and Deborah K. Rhead conducted the archeological fieldwork. Introductory material, artifact descriptions, and archeological synthesis were then written by Dr. Roper, with the assistance of Ms. Rhead, who also wrote site descriptions.

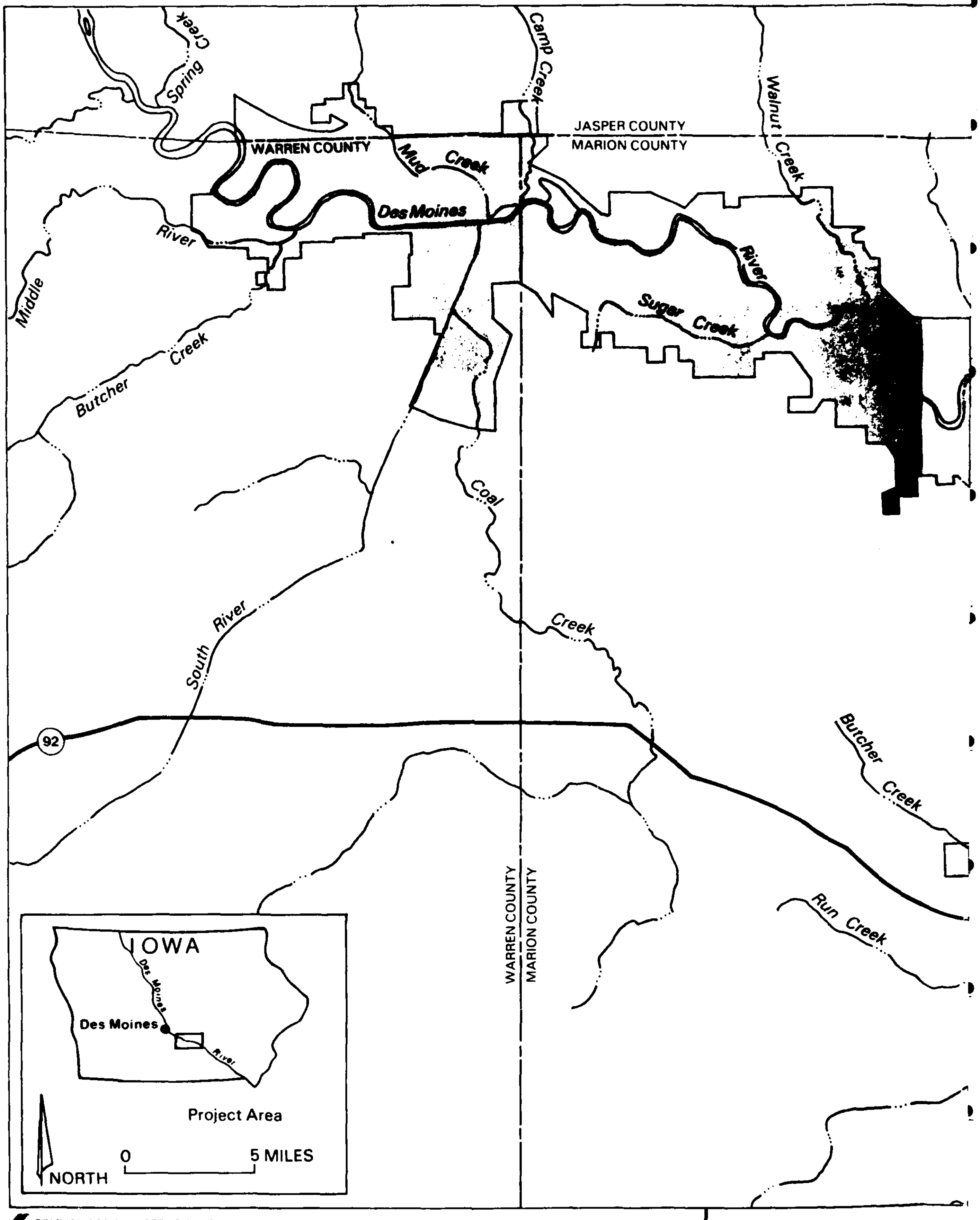
Geoarcheological investigations were conducted by Joseph Schuldenrein, Ph.D., assisted by H. Edwin Jackson. Dr. Schuldenrein and Mr. Jackson conducted all geoarcheological fieldwork. Dr. Schuldenrein then prepared all parts of this report dealing with geoarcheology and the Holocene landscape. He was assisted in preparation of the landform map by James Towler and John H. Guidinger. Mr. Guidinger also prepared the vegetation description.

The historical background was prepared by consultant Barbara B. Long and reviewed by John R. Kern, Ph.D. of the Commonwealth staff. Historic sites were examined in the field by Dr. Roper and Ms. Rhead, who also described these resources. Jenalee Muse analyzed the artifacts collected from the historic sites.

The field phase of this project had as its goal the examination of as many sites as possible within the limitations of time and financial resources. Logistics placed practical limits on the number of sites that could actually be visited. Priorities are described in Chapter 5.

The fieldwork schedule was adjusted from that originally intended because Lake Red Rock held near-record amounts of water in August 1983. By actually conducting the fieldwork shortly after the waters had receded, it was possible to examine fairly fresh exposures on the shorelines and probably also to get a better view of the surface of sites than would have been possible had the waters not been as high as they had been. It was necessary to contend with massive piles of driftwood, however.

The changed schedule did produce a problem with access to some lands. Various areas around the lake are designated as wildlife refuge areas by the Iowa Conservation Commission and are closed to all access from September 15 to December 15. Field personnel learned this fact on the afternoon of September 14 - in time to complete inspection of sites within the wildlife refuge



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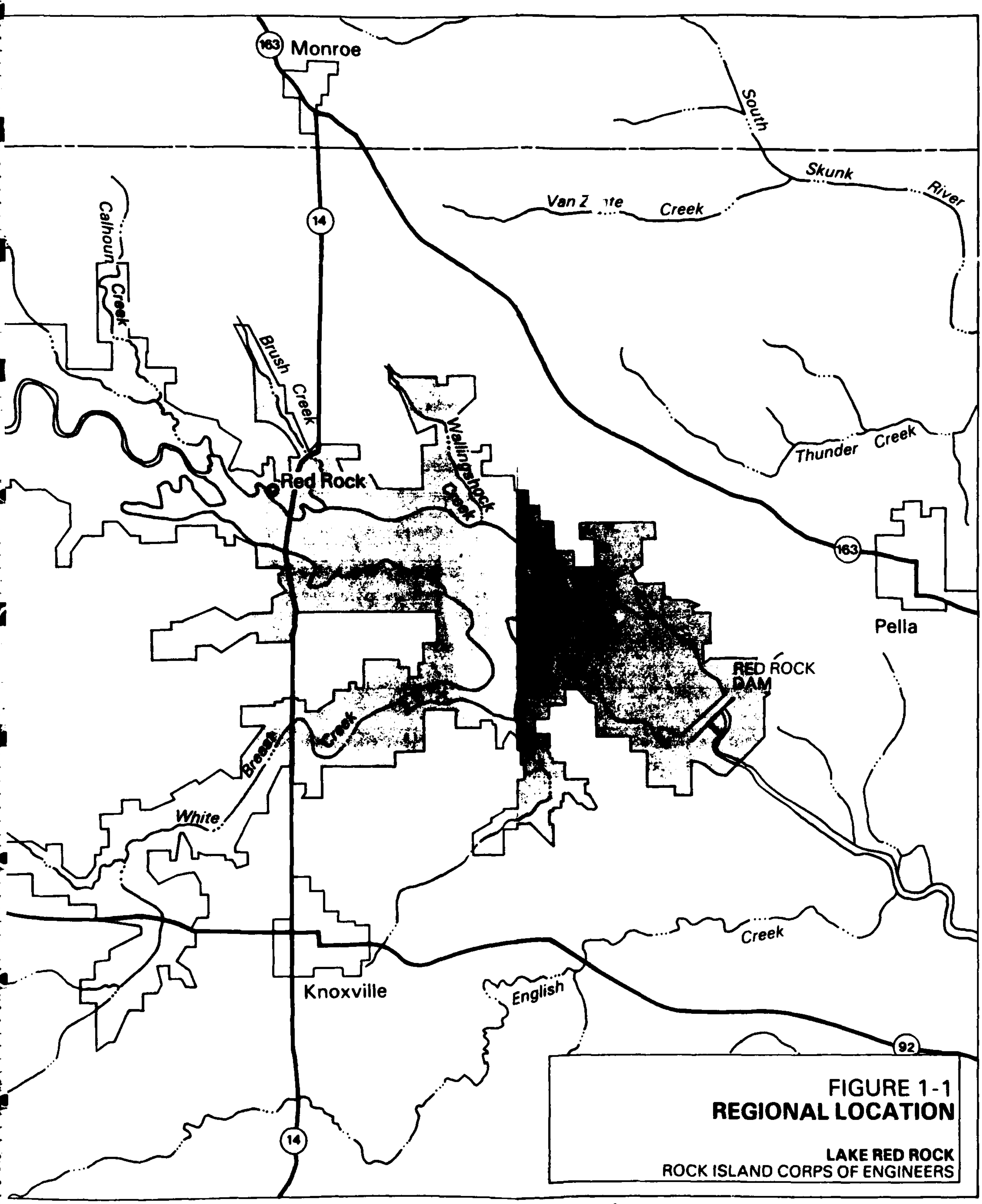

FIGURE 1-1
REGIONAL LOCATION

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

near Swan, but not in time to complete inspection of some sites in a refuge on the north side of the lake. These latter included some important Oneota sites.

Finally, the logistics of access to other areas was difficult, particularly in some of the Iowa Conservation Commission lands upstream from the conservation pool. Road access to these areas is difficult, particularly after a prolonged period of high water when the floodplain is still very wet. Use of a boat would seem a practical way to access some of these lands, but the shallowness of the water at the head of the conservation pool places severe restraints on boat access. Of course it is always possible to walk to these areas, but this reduces the amount of time that can be allocated to other areas. As always, priorities must be established.

CHAPTER 2

PREVIOUS INVESTIGATIONS

THE PROGRESS OF ARCHEOLOGY AT LAKE RED ROCK

Archeological investigations in the Lake Red Rock area have never been particularly comprehensive, but they do have a respectable antiquity. Some of the more outstanding sites, including particularly mounds and Oneota village sites, have been known for many years. The present investigators were unable to examine a copy of the relevant volume of the Proceedings of the Davenport Academy of Sciences, but Gradwohl (1974:92) assures us that antiquities in Marion, Warren, and Polk counties were described by Starr (1894, 1895) nearly a century ago.

The explorations of Charles Reuben Keyes touched many parts of Iowa and it is therefore not unexpected that his reports and syntheses reflect a familiarity with sites in what is now the Lake Red Rock area. One of his earliest syntheses of Iowa prehistory mentions in the discussion of Oneota "a village site on a broad ridge overlooking the Des Moines River in the northeast corner of Warren County" (Keyes 1927:222). Gradwohl (1974:92) has identified this as probably 13WA3 or 13WA4.

Keyes' information served as the basis for additional references to archeological sites in the Red Rock area. Among these was Mildred Mott's (1938:289) reference to Oneota sites "on the Des Moines River in Warren and Marion counties" and her inclusion of the Bowers Farm site (13WA3-4) as one of 12 sites used to develop a trait list for Oneota in Iowa (Mott 1938:299-301).

The first survey actually conducted in specific response to the plans to construct Lake Red Rock (then called Red Rock Reservoir) was the December 1948 reconnaissance for the Smithsonian Institution by Richard P. Wheeler. How long Wheeler spent in the field or how extensive were his surveys is not specified. He does report (1949:1), however, that the reconnaissance included field inspection, consultation with Keyes, then directing the Archeological Survey of Iowa, with Corps of Engineers personnel, and with local informants. A total of 15 sites in Marion (8 sites), Warren (5 sites), and Polk (2 sites) counties are described. These include mounds, temporary habitation sites, and village sites and Wheeler (1949:5) explicitly identifies both generalized Woodland and Oneota manifestations in the area. The survey was initially reported in a limited River Basin Surveys report (Wheeler 1949) but was later summarized in a more widely available article (Wheeler 1959). Additionally, Wheeler's collections from the six Oneota sites were examined by Henning (1961:31-32) in the course of preparing his study of Oneota ceramics in Iowa.

Wheeler's (1949:8) conclusions recommended that intensive surveys, testing, and excavation be conducted. Accordingly, the National Park Service entered into a contract in 1961 with the State Archeologist through the State University of Iowa (now the University of Iowa) to conduct "a research project of appraising the archeological values in Red Rock Reservoir area, Iowa" (McKusick and Ries 1962:1). The procedures used in conducting the project were not described although it is clear (McKusick and Ries 1962:1) that they included

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collector interviews and seemed to include at least verification of locations, if not in-the-field surveys. The report describes 57 sites, including the 15 previously described by Wheeler. No testing was conducted but such was recommended for several sites.

The National Park Service then entered into a cooperative agreement with Iowa State University for archeological salvage. This program was conducted intensively in 1964, 1965, and 1966 (Gradwohl and Osborn 1974b:2). It included survey, surface collection, test excavation, and excavation that in current cultural resource management parlance would be called mitigation. Gradwohl (1974:93) reports that the work included recording of 42 new sites, surface collection at 57 sites, testing at 10 sites, and extensive excavation at 9 sites. Iowa State University continued intermittent work in the Red Rock Reservoir during the years 1967 to 1973. This work included some additional salvage and recording. The latter, however, was limited to three sites on the eroded shoreline (Gradwohl and Osborn 1974b:3, 10).

Reporting of the Iowa State University work took a number of forms. Gradwohl presented annual reports of the investigations at the Plains Conference. The abstracts of these presentations were published in subsequent issues of the Plains Anthropologist (Gant and Gradwohl 1966; Gradwohl 1965, 1967a). These abstracts normally specify the types of activities conducted during the year, list the sites excavated, and provide brief synopses of pertinent data for each site. The general Plains Conference presentations were supplemented at several meetings by additional presentations by Gradwohl or one of his students. These papers treated specific sites or topics (Cole and Gradwohl 1969; Gradwohl 1966, 1967b; Reynolds 1967, 1969).

More formal reports of the Iowa State University work were also prepared. The work conducted under the 1964-1966 cooperative salvage program was reported to the National Park Service in 1973 (Gradwohl 1973) and, with the work Iowa State University was also conducting at Saylorville Reservoir, formed an important part of the data base for a "preliminary summary" of the archeology of the central Des Moines River valley (Gradwohl 1974). That article remains the only widely available synthesis for that part of Iowa. The sites investigated from 1964 through 1973 also provided the data base for a succinct report of the status of known sites in the reservoir (Gradwohl and Osborn 1974b). They also provided data for a number of student papers and Master's degree theses produced in the 1960s and 1970s (Barton 1967; Osborn 1976; Reynolds 1970; Thies 1979).

It hardly requires mention in this context that the conduct of archeology in the United States changed profoundly on May 24, 1974 when PL93-291 was signed. Lake Red Rock had been full for five years at the time this bill became effective, but its provisions applied to both operations and new construction. The first project to which it applied was development in the South Unit of Elk Rock State Park. The State Historic Preservation Program Officer and the Corps of Engineers agreed on a three-part archeological program in this area: 1) quick survey of immediate construction areas; 2) avoidance of construction at known sites where cultural resources were likely to exist, and 3) archeological monitoring of all construction activities during 1976. The Corps of Engineers then entered into two purchase orders (DACW25-76-M-1089 and DACW25-76-M-1025) with Iowa State University for the investigations within the park. The results of the initial survey were submitted later in the year (Gradwohl and Osborn 1976). Seven sites (six new and one originally described by McKusick and Ries (1962:10)) were recorded and described with recommendations. Monitoring continued during park construction and resulted in the recording of an additional 37 sites (Osborn and Gradwohl 1976). No testing was conducted as a part of the Elk Rock State Park program, although it was recommended at the conclusion of the work (Osborn and Gradwohl 1976:7).

Two other small projects were conducted in-house by the Corps of Engineers. One of these was for the Howell Station Campground (Smith 1978a), the other for the Tailwater Bank Stabilization Project (Smith 1978b). Neither survey recorded any cultural resources.

Additional sites have been recorded within the boundaries of Corps of Engineers land. These records are from a variety of sources, including local avocational archeologists and a sampling survey conducted for the Central Iowa Regional Association of Local Governments (CIRALG; Gourley 1983). This latter study considered the archeological resources of an eight-county area of central Iowa. The eight counties included those affected by Lake Red Rock.

Additional archeological data are available for other portions of the central Des Moines River drainage. The specific archeological resources described in these reports are not within Corps of Engineers boundaries; however, study of these references helps place Lake Red Rock in perspective and to generate research domains and specific questions that are germane to the lake itself. Three groups of references may be isolated: major studies conducted downstream from Red Rock Dam, minor studies in the general Red Rock area, and studies upstream from Lake Red Rock.

Major recent studies conducted downstream from Red Rock Dam are largely confined to the cultural resources reconnaissance for the Des Moines River bank erosion study (Van Dyke and Overstreet 1977) conducted for the Rock Island District. This study provided an overview and site compilation for the entire Des Moines River valley from Red Rock Dam to the mouth of the river at Keokuk. However, other investigations have been conducted at sites along the lower reaches of the Des Moines River which help place the Red Rock area in perspective.

Cultural resource studies have been conducted in the Red Rock area to assess impacts other than those produced by the lake and its associated constructions. These include studies at the Knoxville Municipal Airport (McKay 1980), Pella Wastewater Treatment Facility (Thompson 1978), Knoxville Facility (Kean 1979), and various coal mines in Marion County (Benn 1978a; Buecher 1978; Fokken 1978; Frey 1976; Whitworth 1978). One of these latter surveys recorded 23 prehistoric and historic sites (Benn 1978a:2-5). While these sites are not on Corps of Engineers property, they nevertheless lie in the Des Moines River drainage and provide comparative data from a landscape type not well represented in lake areas (i.e., uplands and minor drainage headwaters).

The lands upstream from Lake Red Rock have been intensively examined for archeological resources. The major work has been that conducted by Iowa State University and other institutions at Saylorville Lake. Saylorville filled in the mid-1970s by which time cultural resource procedures were different than they had been when Red Rock was constructed. Rather intensive surveys were undertaken in Saylorville prior to impoundment (Gradwohl and Osborn 1973, 1974a) and have also served as a basis for Gradwohl's (1974) summary of the archeology of the central Des Moines valley. Additional investigations have been conducted immediately downstream from Saylorville Dam (and thus, immediately upstream from the headwaters of Lake Red Rock) for the Des Moines River Greenbelt Corridor (Weichman, Osborn, and Mills 1975), the Spence-Johnson Tract (Gradwohl and Osborn 1977), and the Downstream Saylorville Corridor (Benn and Bettis 1981; Benn and Harris 1983). The Downstream Corridor work is particularly valuable for the Red Rock investigations since it not only provides comparative archeological data but also provides the only study conducted to date of the alluvial sequence of the central Des Moines River valley.

Only two additional references to the archeology of Lake Red Rock or its immediate vicinity can be cited. One of these is a brief appraisal of the archeological resources of the reservoir (Henning n.d.). The reference is undated but, judging from the citation of a 1961 reference by the same author and the lack of reference to the 1962 work, was probably produced in 1961 or early 1962. It does not describe specific sites, but rather considers important themes in regional prehistory (as stated at the time) and evaluates the potential of the Red Rock area to provide data bearing on these themes.

The second additional reference is of far less importance. It is a typescript (Anonymous n.d.) on file with the State Historical Department in Des Moines describing some of the resources of the Whitebreast Creek watershed. While it is concerned with primarily historical sites in Clarke and Lucas counties, it, like the strip mine studies, provides some comparative data for types of situations not encountered in the reservoir itself.

STATUS OF RECORDED RESOURCES

The work accomplished to date in Lake Red Rock has produced the records of 202 prehistoric and historical archeological sites. General information including approximate elevation, general vintage (prehistoric, historical, unknown), and type or cultural affiliation has already been compiled and summarized for the Rock Island District (Ryder 1983:3-10) and will not be repeated here. However, Table 2-1 does provide a compilation of the status of all sites to the extent the status can be determined from the available reports of investigations. Information on position within the reservoir, management jurisdiction (Corps of Engineers, Iowa Conservation Commission), whether the site has been tested or excavated, and report references is presented to supplement the previous compilation. These data are then summarized in Table 2-2.

It is appropriate to relate at this point that the quality of the information available for the various sites differs. Site records and topographic maps with sites plotted were obtained from the Office of State Archeologist in Iowa City. A review of the site sheets in relation to the literature shows that not all records are up-to-date. Specifically, ownership, present condition, and relevant references are often outdated, particularly for the older site records. Testing and excavation information is also not complete on most of these forms.

TABLE 2-1

STATUS OF KNOWN SITES IN LAKE RED ROCK

	POSITION			MANAGEMENT						
Site Number	Conservation Pool	Flood Pool	Above Flood Pool	COE	Iowa Park	Wildlife Refuge	Other	Test	Excavation	References
13MA1	-	-	X	X	-	-	-	-	-	Wheeler 1949:5-6, 9; McKusick and Ries 1962:5
13MA2	-	-	X	-	X	-	-	-	-	Wheeler 1949:6,9; McKusick and Ries 1962:5
13MA3	-	-	X	-	-	-	-	-	-	Wheeler 1949:9; McKusick and Ries 1962:5
13MA4	-	-	X	X	X	-	-	-	-	Wheeler 1949:9; McKusick and Ries 1962:5
13MA5	-	X	-	-	-	X	-	-	-	Wheeler 1949:9; McKusick and Ries 1962:5
13MA6	-	X	-	-	-	X	-	-	-	Wheeler 1949:9; McKusick and Ries 1962:5
13MA7	-	X	-	X	-	-	-	-	-	Wheeler 1949:9; McKusick and Ries 1962:6
13MA8	-	-	X	-	-	X	-	-	-	Wheeler 1949:9; McKusick and Ries 1962:6
13MA9	-	X	-	X	-	-	-	-	-	
13MA10	-	X	-	X	-	-	-	-	-	McKusick and Ries 1962:6,16; Gradwohl 1974:95
13MA11	-	X	-	X	-	-	-	-	-	McKusick and Ries 1962:6,16; Gradwohl 1974:94
13MA12	-	-	X	X	-	-	-	-	-	McKusick and Ries 1962:6,16
13MA13	-	X	-	X	-	-	-	-	-	McKusick and Ries 1962:6
13MA14	-	X	-	X	-	-	-	-	-	McKusick and Ries 1962:6
13MA15	-	-	X	X	-	-	-	-	-	McKusick and Ries 1962:7
13MA16	-	-	X	X	-	-	-	-	-	McKusick and Ries 1962:7
13MA17	-	-	X	X	-	-	-	-	-	McKusick and Ries 1962:7
13MA18	-	-	X	X	-	-	-	-	-	McKusick and Ries 1962:7
13MA19	-	-	X	-	-	X	-	-	-	McKusick and Ries 1962:7; Gradwohl 1974:95

TABLE 2-1 (Con't)

STATUS OF KNOWN SITES IN LAKE RED ROCK

	POSITION			MANAGEMENT						
Site Number	Conservation Pool	Flood Pool	Above Flood Pool	COE	Iowa Park	Wildlife Refuge	Other	Test	Excavation	References
13MA20	-	-	X	-	-	X	-	-	X	Gradwohl 1967a, 1974:94; McKusick and Ries 1962:7
13MA21	-	-	X	-	-	X	-	-	-	Gradwohl 1974:95; McKusick and Ries 1962:8
13MA22	-	-	X	-	-	X	-	-	-	McKusick and Ries 1962:8
13MA23	-	X	-	-	-	X	-	-	-	McKusick and Ries 1962:8
13MA24	-	-	X	X	-	-	-	-	-	McKusick and Ries 1962:8; Gradwohl 1974:95
13MA25	-	-	X	X	-	-	-	-	-	McKusick and Ries 1962:8
13MA26	-	X	-	-	-	X	-	-	-	McKusick and Ries 1962:8
13MA27	-	-	X	-	-	X	-	X	X	McKusick and Ries 1962:8; Gant and Gradwohl 1966; Gradwohl 1974:95
13MA28	-	-	X	-	-	X	-	-	-	Gant and Gradwohl 1966; McKusick and Ries 1962:8
13MA29	-	X	-	-	-	X	-	-	-	McKusick and Ries 1962:9
13MA30	-	-	X	-	-	X	-	-	X	Gradwohl 1965:50, 1974:95; McKusick and Ries 1962:9
13MA31	-	-	X	-	-	X	-	-	-	McKusick and Ries 1962:9, 16
13MA32	-	X	-	-	-	X	-	-	-	McKusick and Ries 1962:9, 16
13MA33	-	-	X	X	-	-	-	-	-	McKusick and Ries 1962:9, 16
13MA34	-	-	X	X	-	-	-	-	-	McKusick and Ries 1962:9, 16
13MA35	-	-	X	X	-	-	-	-	-	McKusick and Ries 1962:10
13MA36	-	-	X	-	X	-	-	X	-	Gradwohl and Osborn 1976:29; Osborn and Gradwohl 1976:3; McKusick and Ries 1962:10
13MA37	-	-	X	-	-	X	-	-	-	Gradwohl and Osborn 1976:29; Osborn and Gradwohl 1976:3; McKusick and Ries 1962:10

TABLE 2-1 (Con't)

STATUS OF KNOWN SITES IN LAKE RED ROCK

	POSITION			MANAGEMENT						
Site Number	Conservation Pool	Flood Pool	Above Flood Pool	COE	Iowa Park	Wildlife Refuge	Other	Test	Excavation	References
13MA38	-	-	X	-	-	X	-	-	-	Gradwohl and Osborn 1976:29; Osborn and Gradwohl 1976:3; McKusick and Ries 1962:10
13MA40	-	X	-	-	-	-	X	-	-	
13MA41	-	-	X	-	-	X	-	-	X	Gradwohl 1965:50, 1974:94
13MA42	-	X	-	-	-	X	-	-	-	
13MA43	-	-	X	-	-	X	-	-	-	
13MA44	-	X	X	-	-	X	-	-	-	
13MA45	-	-	X	X	-	-	-	X	-	Gradwohl 1974:95
13MA46	-	X	-	-	-	X	-	-	-	
13MA47	X	-	-	X	-	-	-	-	X	Gant and Gradwohl 1966
13MA51	-	-	X	-	-	-	X	-	-	
13MA52	-	-	X	-	-	-	X	-	-	
13MA55	-	X	-	X	-	-	-	-	-	
13MA80	-	X	-	-	X	-	-	-	-	
13MA81	-	X	-	-	X	-	-	-	-	
13MA83	-	-	X	-	-	-	X	-	-	
13MA84	-	X	-	-	-	X	-	-	-	
13MA85	-	X	-	-	-	X	-	-	-	
13MA86	-	-	X	-	-	X	-	-	-	
13MA87	-	-	X	-	-	-	X	-	-	
13MA88	-	-	X	-	-	-	X	-	-	
13MA102	-	-	X	X	-	-	-	-	-	
13MA103	X	-	-	X	-	-	-	-	X	Reynolds 1967:208, 1969; Gradwohl 1974:100

TABLE 2-1 (Con't)

STATUS OF KNOWN SITES IN LAKE RED ROCK

	POSITION			MANAGEMENT						
Site Number	Conservation Pool	Flood Pool	Above Flood Pool	COE	Iowa Park	Wildlife Refuge	Other	Test	Excavation	References
13MA104	-	-	X	X	-	-	-	-	X	Reynolds 1967:208; Gradwohl 1974:100
13MA105	-	-	X	X	-	-	-	-	X	Reynolds 1967:208; Gradwohl 1974:100
13MA106	X	-	-	X	-	-	-	-	X	Reynolds 1967:208, 1970; Gradwohl 1974:100
13MA107	-	-	X	X	-	-	-	-	X	Reynolds 1967:208
13MA108	-	-	X	X	-	-	-	-	-	
13MA110	-	-	X	X	-	-	-	-	-	
13MA111	-	-	X	X	-	-	-	-	-	
13MA112	-	-	X	-	-	X	-	-	-	
13MA114	-	-	X	X	-	-	-	-	-	
13MA115	-	X	-	X	-	-	-	-	-	
13MA116	-	-	X	X	-	-	-	-	-	
13MA117	-	-	X	X	-	-	-	-	X	Gradwohl 1974:94
13MA118	-	-	X	-	-	X	-	-	-	
13MA119	-	X	-	X	-	-	-	-	-	
13MA120	-	-	X	-	X	-	-	-	-	
13MA122	-	X	-	X	-	-	-	-	-	Osborn and Gradwohl 1976:3
13MA123	-	X	-	X	-	-	-	-	-	Osborn and Gradwohl 1976:3
13MA127	-	X	-	X	-	-	-	-	-	Osborn and Gradwohl 1976:3
13MA128	-	X	-	X	-	-	-	-	-	Osborn and Gradwohl 1976:3
13MA129	-	X	-	-	X	-	-	-	-	Gradwohl and Osborn 1976:31; Osborn and Gradwohl 1976:3
13MA130	-	X	-	-	X	-	-	-	-	Osborn and Gradwohl 1976:3
13MA131	-	X	-	-	X	-	-	-	-	Osborn and Gradwohl 1976:4

TABLE 2-1 (Con't)

STATUS OF KNOWN SITES IN LAKE RED ROCK

Site Number	POSITION Conservation Pool	Flood Pool	Above Flood Pool	MANAGEMENT COE	Iowa Park	Wildlife Refuge	Other	Test	Excavation	References
13MA132	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:4
13MA133	-	X	-	-	X	-	-	-	-	Osborn and Gradwohl 1976:4
13MA134	-	X	-	-	X	-	-	-	-	Osborn and Gradwohl 1976:4
13MA135	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:4
13MA136	-	X	-	-	X	-	-	-	-	Osborn and Gradwohl 1976:4
13MA137	-	-	X	-	X	-	-	X	-	Gradwohl and Osborn 1976:32; Osborn and Gradwohl 1976:3
13MA138	-	-	X	-	X	-	-	X	-	Gradwohl and Osborn 1976:33; Osborn and Gradwohl 1976:3
13MA139	-	-	X	-	X	-	-	X	-	Gradwohl and Osborn 1976:36; Osborn and Gradwohl 1976:3
13MA140	-	-	X	-	X	-	-	X	-	Gradwohl and Osborn 1976:39; Osborn and Gradwohl 1976:3
13MA141	-	-	X	-	X	-	-	X	-	Gradwohl and Osborn 1976:40; Osborn and Gradwohl 1976:3
13MA142	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:4
13MA143	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:4
13MA144	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:4
13MA145	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:4
13MA146	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:5
13MA147	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:5
13MA148	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:5
13MA149	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:5
13MA150	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:5
13MA151	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:5
13MA152	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:5

TABLE 2-1 (Con't)

STATUS OF KNOWN SITES IN LAKE RED ROCK

	POSITION			MANAGEMENT						
Site Number	Conservation Pool	Flood Pool	Above Flood Pool	COE	Iowa Park	Wildlife Refuge	Other	Test	Excavation	References
13MA153	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:5
13MA154	-	X	-	-	X	-	-	-	-	Osborn and Gradwohl 1976:5
13MA155	-	X	-	-	X	-	-	-	-	Osborn and Gradwohl 1976:5
13MA156	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:6
13MA157	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:6
13MA158	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:6
13MA159	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:6
13MA160	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:6
13MA161	-	-	X	-	X	-	-	-	-	Osborn and Gradwohl 1976:6
13MA162	-	X	-	X	-	-	-	-	-	Osborn and Gradwohl 1976:6
13MA163	-	X	-	X	-	-	-	-	-	Osborn and Gradwohl 1976:6
13MA164	-	X	-	X	-	-	-	-	-	Osborn and Gradwohl 1976:6
13MA165	-	X	-	X	-	-	-	-	-	Osborn and Gradwohl 1976:7
13MA166	-	X	-	-	X	-	-	-	-	Osborn and Gradwohl 1976:7
13MA167	-	X	-	X	-	-	-	-	-	Osborn and Gradwohl 1976:7
13MA202	-	-	X	-	-	X	-	-	-	Osborn and Gradwohl 1976:7
13MA203	-	X	-	X	-	-	-	-	-	
13MA204	-	X	-	X	-	-	-	-	-	
13MA205	-	X	-	X	-	-	-	-	-	
13MA206	-	X	-	-	-	X	-	-	-	
13MA207	-	X	-	-	-	X	-	-	-	
13MA208	-	X	-	-	-	X	-	-	-	
13MA209	-	X	-	-	-	X	-	-	-	
13MA210	-	X	-	-	-	X	-	-	-	

TABLE 2-1 (Con't)

STATUS OF KNOWN SITES IN LAKE RED ROCK

Site Number	POSITION Conservation Pool	Flood Pool	Above Flood Pool	MANAGEMENT COE	Iowa Park	Wildlife Refuge	Other	Test	Excavation	References
13MA211	-	-	X	-	-	X	-	-	-	
13MA212	-	X	-	-	-	X	-	-	-	
13MA213	-	X	-	-	-	X	-	-	-	
13MA215	-	-	X	-	-	X	-	-	-	
13MA216	-	X	-	-	-	X	-	-	-	
13MA217	-	X	-	-	-	X	-	-	-	
13PK1	-	X	-	-	-	-	X	-	X	Gant and Gradwohl 1966; Wheeler 1949:6, 10; Gradwohl 1967a, 1974:95; McKusick and Ries 1962:10
13PK4	-	-	X	-	-	-	X	-	-	
13PK6	-	-	X	-	-	-	X	-	-	McKusick and Ries 1962:11
13PK7	-	X	-	-	-	-	X	-	-	McKusick and Ries 1962:11
13PK8	-	-	X	-	-	-	X	-	-	
13PK9	-	-	X	-	-	-	X	-	-	McKusick and Ries 1962:11; Gradwohl 1974:95
13PK10	-	X	-	-	-	-	X	-	-	McKusick and Ries 1962:11, 16; Gradwohl 1974:95
13PK11	-	-	X	-	-	-	X	-	-	McKusick and Ries 1962:12
13PK12	-	-	X	-	-	-	X	-	-	McKusick and Ries 1962:12
13PK13	-	-	X	-	-	-	X	-	-	McKusick and Ries 1962:12
13PK14	-	-	X	-	-	-	X	-	-	McKusick and Ries 1962:12
13PK15	-	-	X	-	-	-	X	-	-	McKusick and Ries 1962:12
13PK33	-	-	X	-	-	-	X	-	X	Gradwohl 1966, 1974:94
13PK33A	-	-	X	-	-	-	X	-	-	
13PK43	-	-	X	-	-	-	X	-	-	

TABLE 2-1 (Con't)

STATUS OF KNOWN SITES IN LAKE RED ROCK

Site Number	POSITION Conservation Pool	Flood Pool	Above Flood Pool	MANAGEMENT COE	Iowa Park	Wildlife Refuge	Other	Test	Excavation	References
13PK44	-	-	X	-	-	-	X	-	-	
13PK45	-	-	X	-	-	-	X	-	-	
13PK46	-	-	X	-	-	-	X	-	-	
13PK48	-	-	X	-	-	-	X	-	-	
13PK52	-	-	X	-	-	-	X	-	-	
13PK101	-	-	X	-	-	-	X	-	-	
13PK101A	-	-	X	-	-	-	X	-	-	
13PK102	-	-	X	-	-	-	X	-	-	
13PK103	-	-	X	-	-	-	X	-	X	
13PK103*	-	-	X	-	-	-	X	-	-	
13PK104	-	X	-	-	-	-	X	-	X	
13PK105	-	X	-	-	-	-	X	-	X	
13PK106	-	X	-	-	-	-	X	-	X	
13PK290	-	-	X	-	-	-	X	-	-	
13PK291	-	-	X	-	-	-	X	-	-	
13PK292	-	-	X	-	-	-	X	-	-	
13PK293	-	-	X	-	-	-	X	-	-	
13PK294	-	-	X	-	-	-	X	-	-	
13PK303	-	-	X	-	-	-	X	-	-	
13PK304	-	-	X	-	-	-	X	-	-	
13PK438	-	-	X	-	-	-	X	-	-	
13PK439	-	-	X	-	-	-	X	-	-	
13PK440	-	-	X	-	-	-	X	-	-	
13WA1	-	X	-	-	-	-	X	-	-	Wheeler 1949:6, 10; McKusick and Ries 1962:4, 16

TABLE 2-1 (Con't)

STATUS OF KNOWN SITES IN LAKE RED ROCK

Site Number	POSITION Conservation Pool	Flood Pool	Above Flood Pool	MANAGEMENT COE	Iowa Park	Wildlife Refuge	Other	Test	Excavation	References
13WA2	-	X	-	-	-	-	X	-	X	Osborn 1976, 1982; Gradwohl 1974:95; Wheeler 1949:6, 10; Gradwohl 1967a; McKusick and Ries 1962:4, 16
13WA3	-	-	X	-	-	-	X	-	-	Keyes 1927:222; Mott 1938:299-301; Wheeler 1949:10; McKusick and Ries 1962:4; Gradwohl 1974:94,95;
13WA4	-	-	X	-	-	-	X	-	-	Wheeler 1949:7, 10; Mc-Kusick and Ries 1962:4; Gradwohl 1974:94, 95
13WA5	-	-	X	-	-	-	X	-	-	Wheeler 1949:7, 10; McKusick and Ries 1962:4
13WA6	-	-	X	-	-	X	-	-	-	McKusick and Ries 1962:4
13WA7	-	-	X	-	-	-	X	-	-	McKusick and Ries 1962:5
13WA8	-	-	X	-	-	-	X	-	-	McKusick and Ries 1962:5
13WA11	-	-	X	-	-	X	-	-	-	
13WA101	-	X	-	-	-	-	X	-	-	Gradwohl 1974:95
13WA102	-	X	-	-	-	-	X	-	-	Gradwohl 1974:95
13WA103	-	X	-	-	-	X	-	-	-	
13WA104	-	X	-	-	-	X	-	-	-	
13WA105	-	X	-	-	-	-	X	-	X	Gradwohl 1974:95; Cole and Gradwohl 1969
13WA106	-	-	X	-	-	-	X	-	-	Gradwohl 1974:95
13WA107	-	X	-	-	-	X	-	-	-	
13WA108	-	-	X	-	-	-	X	-	-	Gradwohl 1974:95
13WA110	-	X	-	-	-	-	X	-	-	

TABLE 2-2

STATUS SUMMARY OF LAKE RED ROCK SITES

	Recorded Only	Tested	Excavated	Total
Conservation Pool	-	-	3	3
Flood Control Pool	62	-	5	67
Above Flood Control Pool	101	7	11	119
TOTALS	163	7	19	189

Further, the Office of State Archeologist does not consider all plotted locations to be reliable. One of the objectives of the present project was to update site data and verify locations of the previous sites.

ORIENTATIONS OF PREVIOUS INVESTIGATIONS

Much of the archeology conducted at Lake Red Rock has had basic culture-history and description as its major goal. Consequently, many of the sites already recorded are mounds or large habitation sites and the results of investigations are descriptive in nature. The result is that diagnostic artifacts and general assemblages are reasonably well defined. Of course, it has been shown that Oneota manifestations in the Red Rock area have been recognized since at least the time of Keyes, and Woodland remains have long been recognized as well. Nevertheless, the result of the work has been a better understanding of the taxonomy of the cultural manifestations of central Iowa. The major synthesis is that formulated by Gradwohl (1974) and summarized in Figure 2-1 which is taken directly from Gradwohl's paper.

The chronology is somewhat less secure. A relative sequence is obtainable via cross-dating, but the absolute chronology is highly uncertain. A total of 32 radiocarbon assays have been run on archeological samples from nine sites in the central Des Moines River valley, including samples from sites in Lake Red Rock, Saylorville Lake, and the Downstream Saylorville Corridor (Table 2-3). All samples are from Woodland, Great Oasis, or Oneota sites.

The work accomplished to date thus has resulted in the accumulation of about 200 records of individual sites, the description of the basic cultural sequence, and a general chronology. Little analysis of subsistence or settlement patterns, cultural interactions, or cultural dynamics has been considered. A basic objective of this project will be to evaluate the extant data base and its potential to address these topics.

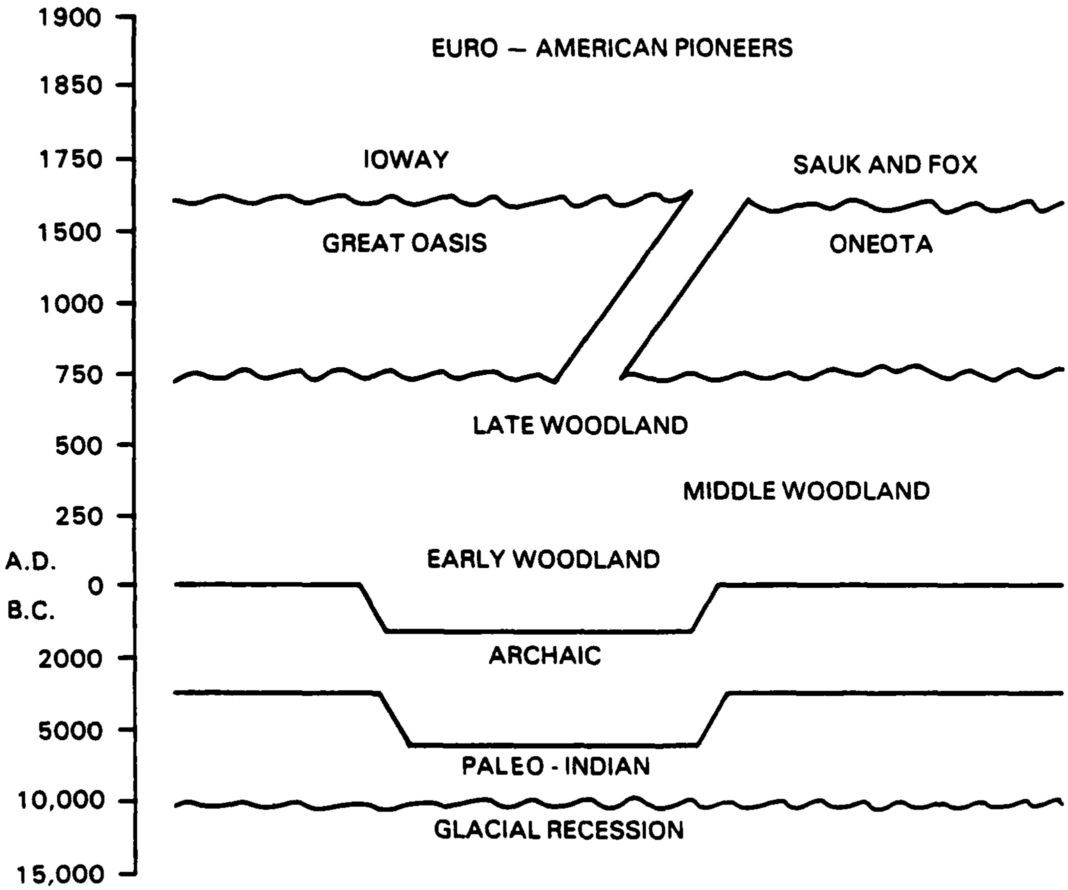
TABLE 2-3

ARCHEOLOGICAL RADIOCARBON DATES FOR THE CENTRAL DES MOINES RIVER VALLEY

Site Number	Site Name	Location*	Sample Number	Material	Age B.P.	References
WOODLAND						
13BN121	Sparks	SL	WIS-517	Charcoal	1600±55	Bender, Bryson, and Baerreis 1973, 1975; Gradwohl 1974:94; Tiffany 1981:58
			WIS-630	Charcoal	1670±55	
13MA41	Milo's Silo	RR	GaK-670	Charcoal	1380±100	Kigoshi 1967; Gradwohl 1974:94; Tiffany 1981:58
			GaK-671	Charcoal	1650±80	
13BN123	River Bend	SL	WIS-906	Charcoal	940±60	Bender, Bryson, and Baerreis 1978; Tiffany 1981:59
13PK149	Darr-Es-Shalom	SL	WIS-879	Charcoal	840±50	Bender, Bryson, and Baerreis 1978; Tiffany 1981:59
			WIS-899	Charcoal	1575±60	
			WIS-902	Charcoal	1605±55	
			WIS-904	Charcoal	1605±60	
			WIS-905	Charcoal	2820±65	
			WIS-880	Charcoal	3045±65	
			WIS-901	Charcoal	3095±65	
13PK407	Christenson	DS	Beta-2633	Charcoal	1130±80	Benn and Harris 1983:20
GREAT OASIS						
13BN110	Meehan-Schell	SL	WIS-501	Charcoal	870±60	Bender, Bryson, and Baerreis 1973; Mead 1981; Tiffany 1981:62; Gradwohl 1974:97
			WIS-502	Charcoal	975±55	
			WIS-498	Charcoal	950±55	
ONEOTA						
13MA30	Mohler Farm	RR	SI-358	Charcoal	450±200	Mielke and Long 1969; Bender, Bryson, and Baerreis 1976; Gradwohl 1974:96; Kigoshi 1967; Tiffany 1981:63
			WIS-734	Charcoal	930±50	
			WIS-763	Charcoal	740±45	
			SI-359	Charcoal	270±180	
			GaK-697	Wood	< 200	
			GaK-698	Charcoal	990±80	
			GaK-699	Charcoal	1260±90	
13PK1	Howard Goodhue	RR	SI-357	Charcoal	300±200	Mielke and Long 1969; Bender, Bryson, and Baerreis 1976; Gradwohl 1974:96; Kigoshi 1967; Tiffany 1981:63
			WIS-733	Charcoal	760±60	
			GaK-879	Charcoal	550	
13WA2	Clarkson	RR	WIS-738	Charcoal	650±55	Bender, Bryson, and Baerreis 1976; Osborn 1982:76; Tiffany 1981:64
			WIS-756	Charcoal	660±60	
			WIS-731	Charcoal	705±50	
			WIS-732	Charcoal	765±55	
13PK407	Christenson	DS	Beta-5231	Charcoal	700±140	Benn and Harris 1983:20
			Beta-4925	Charcoal	235±95	

*Location:

SL = Saylorville Lake
DS = Downstream Saylorville Corridor
RR = Red Rock Lake



after Gradwohl 1974:101

FIGURE 2-1
CULTURE SEQUENCE OF THE CENTRAL DES MOINES RIVER VALLEY

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

CHAPTER 3

THE HOLOCENE LANDSCAPE

The environmental settings of the Des Moines River valley archeological distributions are known from a series of disjunct surveys and testing programs conducted largely over the past 20 years. Principal research has been undertaken along the valley northwest of Lake Red Rock - in the Downstream Corridor and Saylorville Reservoir (Ashworth and McKusick 1964; Benn and Bettis 1981; Brown 1966; Gradwohl 1974; Gradwohl and Osborn 1974b, 1976) - and, to a lesser degree, down valley of the dam to the Mississippi River confluence (Van Dyke and Overstreet 1979). Perhaps the most systematic work has been the recent Saylorville Downstream Corridor project (Benn and Bettis 1981) which attempted to assess archeological significance, site predictability, and management strategies for cultural resources by grouping site placements in discrete geomorphic settings. A contribution of that research was the isolation of a key trend explaining observed site patterning the length of the Des Moines River valley: known distributions reflect discrete sedimentary processes that selectively expose, bury, and redistribute archeological site materials in response to changing geomorphic dynamism. This is not to underplay the significance of cultural filters that account for primary settlement location, but it does underscore the need for approaching locational and predictive modeling studies from integrated geoarcheological perspectives.

The Red Rock study adopted such a perspective in attempting to both streamline the investigative strategy for site location (in the field) and to address the broader archeological implications of site-landform correlations. Along the latter lines - clearly more theoretical - it should be possible to determine what types of occupations were associated with particular resource zones and whether mobility or sedentary procurement strategies could be implicated by settlement across given landscapes as exemplified by their principal landforms. These human ecological questions are explored in Chapter 8, once the cultural and geomorphologic scenarios for the Des Moines valley emerge. The purpose of the present chapter is to document the present and past settings of the project area in the context of the regional physical geography.

Figure 3-1 illustrates the location of the Red Rock Reservoir with respect to the standard recognized landform regions in Iowa (Prior 1976; Ruhe 1969). The southern Drift Plain drains the lower reaches of the Des Moines River, and the project area straddles the lowest elevations of that region (700 to 900 feet AMSL). As Figure 3-1 shows, the northwestern project limits abut the terminus of the Des Moines Lobe (at the Bemis Moraine) and the incised valley represents the largest scale erosional feature traversing both landform regions. The drainage was the principal outlet merging lower order meltwater channels that funneled glacial debris down valley as outwash. Periodic flushing of the valley has resulted in non-uniform valley scouring and downstream sedimentation patterns; the geomorphic relations obtaining are therefore complex and demand highly localized and regional reconstructions. As discussion below suggests, variable hydrographic and lithologic constraints preclude de facto correlations between landform configurations at Red Rock Reservoir, in the Drift Plain Province, and those of the Des Moines Lobe where the Downstream Corridor investigations (Benn and Bettis 1981) were performed. The difficulty in extrapolating site-landform and archeo-stratigraphic observations across the two regions is apparent.

It is therefore necessary to document the present environmental scenario of the Des Moines valley sector of the Drift Plain as carefully as possible and then to reconstruct the regional Holocene paleogeography. Only then is it possible to incorporate the locational archeological data and ultimately expand the frame of reference to accommodate broader, drainage-wide prehistoric distributions.

CONTEMPORARY VALLEY ENVIRONMENTS OF THE SOUTHERN DRIFT PLAIN

The Red Rock Reservoir and project area refers to the river lands and rimming loess mantled uplands of the Des Moines valley between river miles 183.9 and 142.7. Of the 41.2 river miles, 12.8 miles are submerged below the Lake Red Rock normal pool elevation at 725 feet (AMSL). The upper 38.8 miles define channel and flow lines of the present Des Moines River, though the thalweg and dimensions of the buried channel are known from the pre-1967 topographic maps and aerial flyovers of the project area. The fluctuating level of Lake Red Rock has altered the hydrography and drainage regimen of the river system to some degree, but well-maintained records of the former channel patterns have been consulted to reconstruct the most recent fluvial history prior to inundation. Clearly, the disposition of floodplain landforms is critical to any assessment of the changing prehistoric distributions and these have been mapped out with the aerial photographs, and are discussed in a subsequent section (see Figure 8-2 in Chapter 8).

The regional physiography of the project area may be summarized as consisting of steeply rolling hills interspersed with areas of generally level upland divides and graded alluvial lowlands and valleys. Upland tablelands are progressively more extensive and level away from the valley, to the south and northeast, while more abrupt topographic breaks are associated with the secondary drainages feeding into the Des Moines River. As Figure 3-1 shows, the principal tributaries are the Raccoon and Middle Rivers flowing northeastward in their lowest reaches. The lower order feeders emptying into the reservoir from the south such as Teter and Whitebreast Creeks and the South River also trend in the same direction and reflect strong structural and topographic controls for the drainage net (Figure 1-1). Northern streams drain south-southeast and chief ones are Prairie, Calhoun and Brush Creeks. Glacial landforms that once dotted the landscape have been obliterated by erosive forces that have leveled any prominent topographic features and left planar interfluve surfaces subject to slope wearing. Hillside erosion is accelerated on poorly vegetated flanks where loess accumulations are stripped and often expose more cohesive interglacial paleosols distinguished by reddish-brown profiles along drift tracts. It is along such hillsides that seeps or springs develop at the lateral juncture of impervious clay-rich paleosols and the land surface (Prior 1976; Cagle and Heinitz 1978). Several spring localities crop out in the Lake Red Rock study area, most prominently to the south and east of the Des Moines valley proper where thinner loess mantles exist (Ruhe 1969).

The terrain of the southern Drift Plain is underlain by undifferentiated glacial tills of the Kansan glacial stage, which overlies earlier Nebraskan-

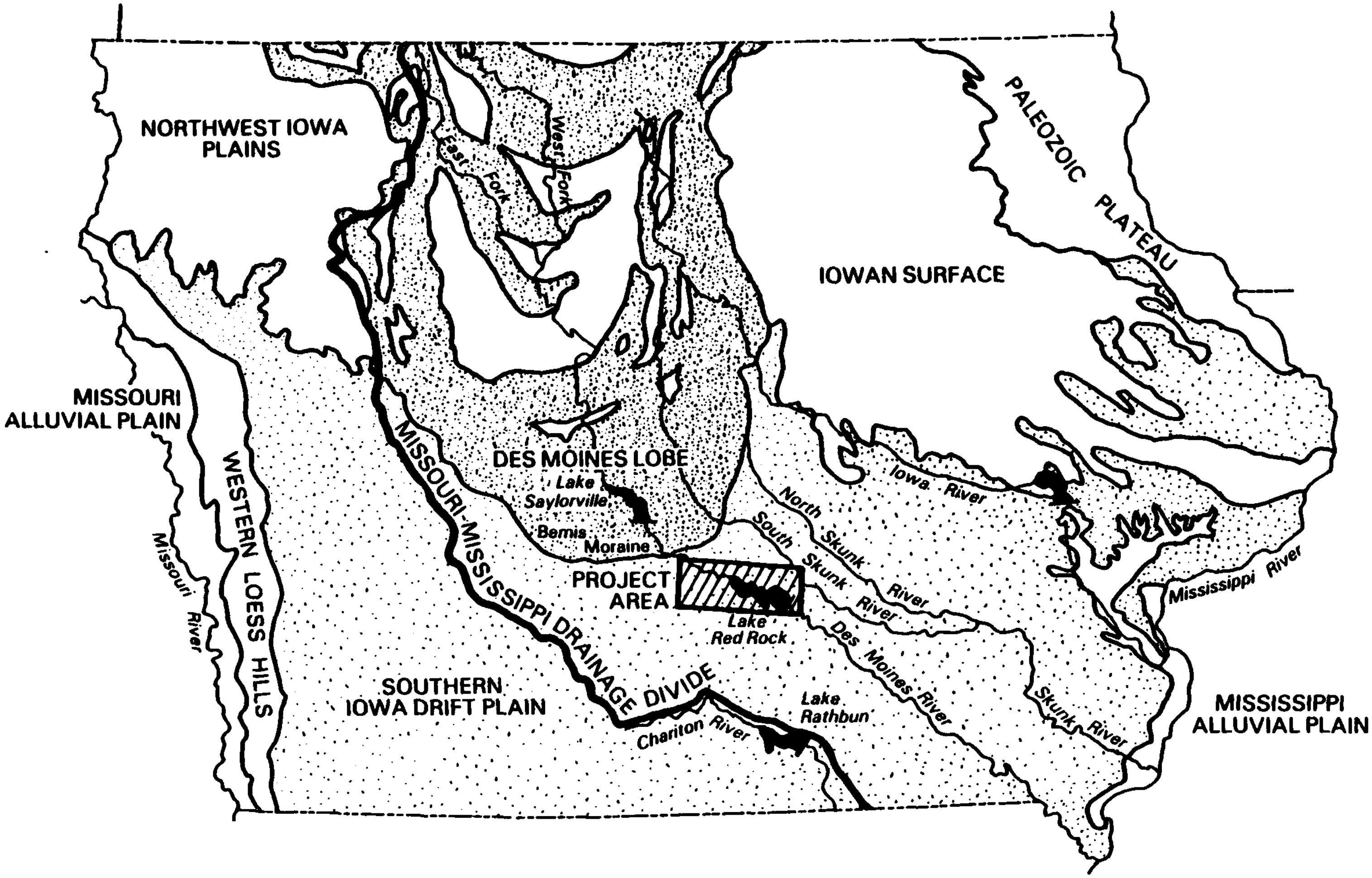


FIGURE 3-1
LANDFORM REGIONS AND PRINCIPAL DRAINAGES OF IOWA

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

COMMONWEALTH ASSOCIATES, INC

age tills regionally, but not at Lake Red Rock, where bedrock shales are the basal substrate encountered. The only well differentiated surface deposits near the study area are those of the Bemis end moraine of the Des Moines Lobe, marking the terminal Wisconsinan glacial advance to Des Moines around 14,000 B.P. (Ruhe 1969:Figure 2.9 and Table 2.7). The river valley in the reservoir has been incised to depths of 10 to 25 m exposing a sequence of weathered loess/paleosol capping Kansan tills which rest unconformably over dipping shale beds. A typical profile is recorded in the vicinity of site 13MA115 (see Figure 3-2). Variable thicknesses of the tills and loess were noted the length of the valley, but nowhere do till accumulations exceed 8 m, and the Wisconsinan loess falls within the band of 3 to 5.5 m as documented regionally (Ruhe 1969:Figure 2.2). In general, steeper and more abrupt topography defines the northern rim of the reservoir and is a function of the deeper thicknesses of the bedrock.

The bedrock geology reveals a series of abrupt and unconformable erosional surfaces that were periodically over-ridden by the glacial surges of the Pleistocene. The majority of bedrock outcrops and surfaces registered in the Red Rock area are Mesozoic and chiefly basal Pennsylvanian rocks of the Cherokee group. These have been mapped for the upper half of the reservoir and its catchments northwest to the project limits (Hershey 1969). The Cherokee group consists of cyclic deposits of carbonaceous shale, siltstone, sandstone, and thick coal beds, with minor limestone beds. The profile in Figure 3-2 shows the bedded and unconformable disposition of the shale beds which were semicontinuous the length of the valley axis. Sandstone exposures become somewhat thicker and more extensive downstream below the bridge at Highway 14. Flanking the reservoir here are limestone outcrops of the Mississippian Meramec Series. Though mapped as fossiliferous limestones with locally dominant sandstone and red and green shale beds (Hershey 1969), the reconnaissance along both north and south shores of the reservoir disclosed thick, prominent, and complex interbeds of yellow, black and gray shale beds extending below the lake level (730 feet AMSL at the time of fieldwork) and capped by weathered loess. In several alluvial exposures, notably at 13MA44, the laminar shale beds grade almost imperceptibly to a contact with compacted silts and clays rendering it difficult to document the transition from the erosional vegetation surface to the accreting floodplain. Stratigraphic relations are, of course, readily detectable along the scarps rimming the northern valley perimeter where the channel has often undermined the shale or sandstone bedrock, bedrock contours are more clustered (Cagle 1973), and graded terrace and fan formations do not mask the vertical contacts. Below the lowest surface elevations the project area is underlain most prominently by cherty dolomites of the Osage Series (up to 160 feet thick; see Harris and Parker 1964) and beneath that by lesser thicknesses of Yellow Spring silt stones and dolomites and La Porte city cherts (Dorheim, Koch, and Parker 1969; Parker 1967). These reports confirm field observations that nowhere in the vicinity of Lake Red Rock are there exploitable outcrops of siliceous rocks that would have been suitable for flint knapping. The significance of this limited availability of optimal lithic resources is discussed in a subsequent section.

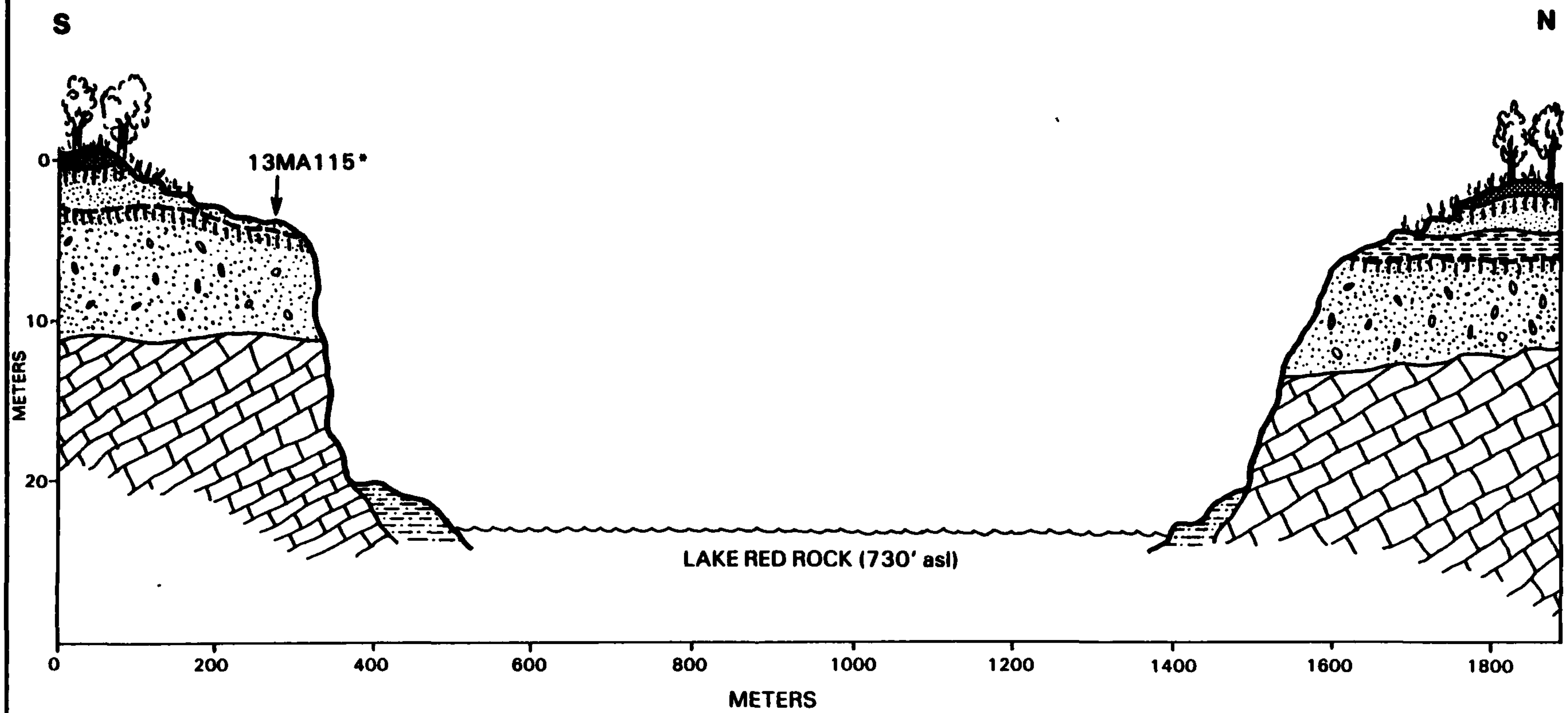
Soils in the study area have developed on parent materials including fine alluvium along the floodplains, lower terraces and graded fans, as well as on bedrock, loesses and glacial tills in the flanking uplands. For present purposes, and since the range of edaphic conditions is as broad as it is subtle, it is sufficient to group the soils by association and according to the parent materials on which they developed and by the terrain types on which they prevail. Of the eight soil associations identified across Iowa, four are represented in the study area and they are described in descending order of areal coverage. Detailed series descriptions have been mapped in detail elsewhere (Russell and Lockridge 1980).

Approximately 35 percent of the terrain lies along the floodplain immediately to the northwest of the lake limits extending to Des Moines. These alluvial soils are of the Nodaway-Zook-Ackmore association and are nearly level and gently sloping. They are poor to moderately drained and have accumulated along the flanks of both the present and former Des Moines River channel and its major arteries. Coarser, generally sandy or sandy-gravel textures are documented along residual point bars and meander scrolls of former flow lines, but most soils are subject to periodic flooding and seasonal waterlogging. Most common to the study area were Nodaway soils that contain an upper profile of very dark grayish-brown silt loam. The substrate below 15 cm is a stratified silt loam with thin bands of fine sandy loam extending to 30 cm. A richer but minor soil of this association that has been tied to several lowland sites is the Colo loam which has moderate permeability, high organic content, and is very productive agriculturally.

Upland soils are best represented by the Ladoga-Clinton-Otley association that takes in the loess tops north of the reservoir and the river, and covers 30 percent of the survey territory. These soils are on gentle to moderately sloping surfaces at the heads of the major gullies and tertiary drainageways. Clinton soils are prevalent at upland archeological localities and they generally have 5 to 9° slopes with permeable substrate. Surface soils support forest covers and contain dark grayish-brown silt loams to about 10 cm where they are underlain by brown silt loams (to 16 cm) and finally by a heavier silty clay loam (to >100 cm). Stronger slopes often feature deeper colors. It is emphasized that in situ Clinton soils are the source sediments for the gently sloping Colo and Ely soils occurring as colluvium and talus deposits at footslopes and terraces in association with many of the Woodland sites at secondary drainage confluences.

South of the lake, 25 to 30 percent of the land is blanketed by soils of the Ladoga-Sharpsburg-Clinton association which do not differ significantly from those to the north. The southern slopes are somewhat more variable, however, due to the steeper subsurface topography of the bedrock and consequent higher drainage densities that result in more dynamic slope stripping. Gentle to moderate slopes exist on convex ridge tops, while side slopes are steep, and the Sharpsburg profiles, developed under native prairie, are generally dark grayish-brown silty loams (to 36 cm) that grade down to silty clay loams. Organic matter contents here are moderate to high. Even more so than the north lake loesses, soils in the south side are prone to extensive sheet and slope wash colluviation and high energy sediment transport. There is a lower likelihood of encountering in situ archeological materials along interfluve edges and at footslope settings because of accelerated and periodic erosion that would tend to redistribute cultural materials.

Only 5 to 10 percent of the study area contains soils of the Fayette-Downs association. These occur along bluff tops flanking the floodplain to the southwest and in the vicinity of Sugar Creek (Figure 1-1). They are



Contemporary Podsol
Weathered Wisconsinan Loess
Kansan Till
Proglacial Lake Deposits (silts, clays)
Pennsylvanian Bedrock Shales
Holocene Alluvium (silts, clays)
Wisconsinan Surface (c. 14,000 BP)
Yarmouth Sangamon Surface (>24,000 BP)
Tread-Risers Cut into Stepped Erosional Surfaces

*Detailed stratigraphy summarized in Table 5-7.

FIGURE 3-2
GENERALIZED STRATIGRAPHY AT SITE 13MA115

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

COMMONWEALTH ASSOCIATES, INC

generally formed under mixed prairie grasses and trees. Upper layers are very dark silt loams (to 7 cm) with subsoils of silty clay loams. Slopes are gentle to steep, but they are uniformly well-drained. Minor soils of the association have a widespread distribution and include the steeply sloping Gosport soil developed on shale as well as Lindley soils formed on till. A variety of profiles are therefore registered that reflect primarily on subsurface sediment matrices susceptible to differential weathering and erosional rates. Progressive headcutting and gullying has worn away much of the original tablelands supporting this association and has left a disjunct array of dissected swells.

The vegetation communities presently dominant across project lands reflect the upland-loess and bottomland floodplain zonation noted for soil associations (U.S. Army Corps of Engineers 1975). The mesophytic bottomlands are characterized by willows (Salix spp.), sycamores (Platanus occidentalis), and cottonwood (Populus deltoides), with silver maple (Acer saccharnum), ash (Fraxinus spp.) and river birch (Betula nigra) also abundant. Grading upward to lower northern slopes flanking the bottoms, the maple-basswood community features sugar maple (Acer saccharum) and basswood (Tillia americana) with lower representations of American elm (Ulmus americanus). Upland and steeper slope tracts are of the oak-hickory association and include white ash (Fraxinus americana), northern red oak (Quercus rubra), white oak (Quercus alba) and shagbark hickory (Carya ovata). Vegetation communities present during the early years of European settlement are described in Chapter 4.

The lake itself is evenly surrounded by both mature upland forest and agricultural lands. At the level of the conservation pool (725 feet AMSL), the shoreline perimeter incorporates large (>40 percent) marshland tracts and mud flats that include such weedy species as foxtail (Setaria spp.), ragweed (Ambrosia spp.) and smartweed (Polygonum spp.).

The soil and plant communities developed in a climate that is Humid Continental (Köppen:Daf). Normal annual precipitation averages 33.7 inches with yearly variability generally less than 10 inches (Cagle and Heinitz 1978). Rainfall is seasonal with peaks occurring in spring and summer months; seventy percent of all precipitation falls in the six months April through September. Normal air temperature is 50.5°F with a monthly average high and low of 72°F in July and 22°F in January.

Iowa's setting in the Humid Continental climatic zone partially explains the hydrographic conditions of Des Moines River stream flow. Runoff, or that part of precipitation that appears in surface streams, is climatically regulated, with mean annual runoff increasing exponentially with mean annual precipitation; leveling off trends have been documented with increasing temperatures (Langbein et al. 1949). In the northern Midwest average annual runoff falls in a range of 1 to 10 inches, intermediate between the arid western U.S.A. (<0.25 inches) and the moist coastal environments of the Pacific northwest and northeast coasts (>20 inches) (Leopold, Wolman, and Miller 1964:Figure 3-11). Increased stream flow therefore occurs in late spring or early summer, when precipitation is highest and temperatures are in the optimal 50 to 60° range. These trends have been verified experimentally by discharge records at stations along the river near Des Moines, Whitebreast Creek, and Tracy (Cagle and Heinitz 1978; Schuetz and Matthes 1977). Similar discharge peaks are registered for principal tributaries; in the South River, emptying into the Des Moines east of Pleasantville, daily stream flow records suggest peak daily stream flows for the months of April and June with minimal discharge for August through October (Cagle and Heinitz 1978:Figure 1.3). The entire drainage basin displays systemic stream flow patterns and these are reinforced regionally as the Des Moines empties into the Mississippi, 120 miles southeast of Red Rock Dam.

Seasonal climatics and runoff, then, account for the maintenance of the Des Moines drainage net. The overall configuration of the basin must be examined in more regional context. Key to the integrity of the system is the alignment of the Des Moines and its principal arteries with the trend of the Mississippi-Missouri drainage divide and the morphology of the Des Moines Lobe, both of which are illustrated in Figure 3-1. As Figure 3-1 shows, the progressive downstream direction for stream flow along the Des Moines Lobe is south to southeast.

The pulsating retreats of the terminal Wisconsinan ice sheets are largely responsible for the evolution of the net since the advances and retreats represent transitions and transformations of the total hydrological budget. The surface of the Des Moines Lobe is irregular and features numerous ponds, marshes and other closed drainages with relatively shallow outlets. As a result the principal flow lines are relatively young and are incised through older outwash plains that formerly drained more extensive areas in the earlier Pleistocene. Once streams cut through the Bemis end moraine they are captured by older and more extensive lines cutting through the deeper Kansan drifts. Terrains of the Southern Drift Plain feature more intricate and dendritic nets by dint of both their ages and the accelerated fluvial activity occurring along downstream reaches. Flow patterns here follow the orientation of the divide and trend southeasterly.

The sharp hydrographic transition that occurs at the break between the Des Moines Lobe and the southern Drift Plain (Figure 3-1) is best exemplified by the changing morphology of the river and by its passage from an outwash valley into a till and bedrock corridor. It is stressed that significant Holocene accumulations and landforms are widely encountered along both regions, but the general composition of the valley fills is qualitatively different. In terms of river morphology, the general axis along the lobe to Saylorville and past the Downstream Corridor is north-south, although Benn and Bettis (1981) have verified significant deviations and sinuosity of channel behavior in the Holocene. The river here has downcut through coarse outwash deposits accumulated on valley floors at the mouths of tributary streams and the Des Moines drainageway. Benn and Bettis (1981:10-11, Figure 2) trace these developments along the Raccoon confluence suggesting that "down cutting of the Des Moines. . .left the former valley floor as a terrace above the new valley floor"; exposures have shown that outwash has accumulated to depths of 15 m or greater.

For the drainage below the Raccoon the outwash has been swept down, reworked and selectively redeposited along bars and convexities of the present floodplain. The river leaves the narrow and steep-sided outwash valley and enters the broad plain which extends two to three miles across on the average. Lees (1916:588) considered this expanse to be "mature. . .(the plain is) bordered by slopes which for the most part rise gently to the uplands. . .". Whereas opposing slopes in the constricted Lobe region valleys featured paired topographic associations, long-term down- and back-wearing of the interfluves of the older drift plain surface display no such homogeneity. Tributary streams flow in wider channels with low gradients and gentle side walls as well. The deposits of the Kansan drift plain are reddened clayey sand matrices with dark, pitted and water worn heterogeneous cobbles and glacial erratics that stand in sharp contrast to the well stratified high sand and gravel benches forming the outwash terraces to the north. As Figure 3-2 shows, the Kansan drift and overlying Wisconsinan loess cap the exposed bedrock unconformably in this portion of the valley. The valley is not uniformly wide and in areas of constriction, for example in the vicinity of the former town of Red Rock, bedrock outcrops of shale and sandstone are high and steep; the cause for attenuation is the bedrock lithology. The long-term evolution of the dendritic drainage net in the project area accounts for the well dissected appearance of the general landscapes. Accentuated relief reflects the effects of protracted slope denudation compounded by differential deposition of the Wisconsinan loess.

While the major landscape relations were determined by climatic and environmental shifts that occurred during the Pleistocene, Holocene geomorphic process was significant and altered uplands and slope as well as alluvial settings. In floodplain tracts especially, the Holocene history of sedimentation is extremely complex. This is initially evidenced by the clustered array of terraces, oxbow lakes, meander scrolls and scars, and alluvial fans that flank the valley sides and tributary entrants. In most recent times the wide range of human activities have severely impacted natural balances as well. The following discussion examines the dynamic Late Quaternary environments of the Des Moines valley.

LATE QUATERNARY GLACIAL AND POSTGLACIAL SETTINGS

Information bearing on the late glacial history of the valley below the Raccoon River is limiting due to its location at the terminus of the ice front (Des Moines Lake) and the absence of diagnostic landforms and exhumed fills of that period. Lees (1916) hypothesizes on the late Wisconsinan history of the upper drainage traversing the Des Moines Lobe on the basis of the complex of morpho- and rock-stratigraphic outwash settings that define the past and present borders of channel-valley activity. His observations were subsequently refined by other researchers (Walker 1966; Kemmis, Hallberg, and Luteneggar 1981) concerned with various aspects of glacial geology. Most recently two distinct outwash terraces mapped to 28 miles north of the Red Rock project area have been tied to the terminal retreat of the Wisconsin glacial. The upper Beaver Creek terrace (elevation 820 feet AMSL) dates to 12,160 B.P., has been associated with the Algoma Moraine, and is a regional chrono-stratigraphic benchmark (see Benn and Bettis 1981:11, Figure 4). For reasons discussed below, however, the distinctive sands and gravels of this terrace do not occur below the Des Moines Lobe. The attention of valley researchers has also been focused on the lower reaches of the Des Moines, where depositional features and prominent alluvial landforms were recognized as high energy stream flows of the late Quaternary channel emptying into the Mississippi. The central portion of the valley from the Raccoon to Harvey, a distance of some 40 miles, remains uncharted with respect to its late Pleistocene history since it defines, in geomorphic terms, a threshold between (upstream) erosion and (downstream) deposition for the Des Moines fluvial system. As noted, valley morphology changes over the course of this sector as it breaks into a wide plain that served as a long-term conduit for periodic outwash surges since earliest Pleistocene (glacial) times. Lees (1916:564) notes only the presence of "...sand beds...(that) form low terraces at the floodplain margin" as well as "numerous oxbows that mark old meanders of the channel." The present investigations show that these differentiated alluvial settings are exclusively of Holocene age. They register multiple stages of floodplain dynamism and index climatically regulated environmental impacts (see Figure 8-2).

Systematic reconstructions of the late Pleistocene events that affected the study area must be generalized from more regional accounts, specifically those providing datable scenarios and revealing climatic conditions. It is clear from the above discussions that over much of the valley there is no depositional record for the Pleistocene since there are no outwash sediments. The most informative sources are the weathering profiles studied along the interfluves of the Southern Drift Plain, in this case the loess-capped uplands flanking the reservoir and river valley, and several pollen profiles that have generated late Pleistocene paleoclimatic models on a broader scale. Each source is assessed in terms of its applicability to the project area.

Figure 3-2 keys in the major Pleistocene stratigraphic relations for the bluff tops flanking the Red Rock Reservoir. As shown, the forest cover is supported by a thin recent podsol formed on a deeply weathered loess. The loess features both B_{2t} and B_3 horizons (see discussion below) and is then abruptly separated from the Kansan till, the basal Pleistocene unit locally. It is the loess profiles that furnish the sole sedimentary records for the late Pleistocene. Ruhe (1969) has mapped the extensive loess distributions across the Drift Plain and with an average thickness of 10 feet, they have been dated to a range of 24,000 to 14,000 B.P. from base to top. The strong weathering profile suggests stability of a land surface that was dominant during the terminal retreat of the Wisconsin (Cary) ice sheets around 14,000 B.P. when long-term cold and dry climates were succeeded by mid-latitude xerothermic trends (Ruhe 1969; Wright, Matsch, and Cushing 1973). The loess accumulations actually occurred during drying cycles when floodplain-outwash surfaces were exposed to deflation. Recent research suggests that such episodic loess deposition during the late glacial across plains and steppic areas near the ice front was probably a world-wide trend regulated by global climatics (Goudie 1977; Kukla 1975).

The base of the loess, locally as elsewhere in the northern Midwest, rests atop a major unconformity, the truncated surfaces of the upper Pleistocene loess from early to mid-Pleistocene Kansan tills. These were originally designated gumbotil (Kay 1916) for their sticky and massive consistency and thick clayey textures. More recently the sediments have been reclassified as paleosols on the basis of differential leaching horizons and diagnostic deep illuviation features (Ruhe 1956, 1969) and, in the absence of Sangamon soil profiles, the Kansan surfaces are thought to represent two interglacial weathering cycles, the Yarmouth-Sangamon. By such criteria the surface shown in Figure 3-2 represents the oldest paleogeomorphic surface of major extent across Iowa, spanning the interval between 600,000 and 24,000 B.P. On sedimentological and mineralogical grounds as well, the magnitude and significance of this stratigraphic break and the exhumed Yarmouth-Sangamon surface has been documented by Pleistocene stratigraphers (see Hallberg 1980 and references). Little is known of the depositional environments of the region during this time frame. What is significant, however, is the recognition of graded slope profiles from the bluff-crest to the valley sides. Most side slopes of the interfluves are characterized by distinctive Sangamon surfaces that rise from lower levels to the crest where they are laterally offset from the firmer paleosols. The interfluve edges do not have pedogenic profiles and for this reason they are subject to more severe erosion. These lowest erosional surfaces must be of Wisconsin age since they are unweathered and are underlain exclusively by loess.

Neither the valley bottoms nor the bluff tops preserve complete Pleistocene sequences. Bedrock erosional surfaces are the most widespread stratigraphic signature across the study area. They too are only selectively exposed at steep-sided bluff scarps, but are buried beneath various depths of alluvium along the valley floor and margins. At several floodplain bank lines only surficial clastic veneers (<40 cm) covered shale regolith and suggested that channel dynamics were primarily responsible for laterally discontinuous and heterogeneous alluvial sedimentation. The age of these deposits is later Holocene. The second most widespread stratigraphic unit is the Kansan till sequence, consisting of an unsorted orange- red boulder clay matrix exposed the length of the valley, generally 4 to 10 m above the normal flood pool elevation of 725 feet AMSL. The top of the till is capped by the Yarmouth-Sangamon paleosol. It defined the only interglacial erosional surface encountered (except for the present bluff tops). The base of the Wisconsin is signalled by the onset of aeolian loess sedimentation. A paleosol also caps the top of the loess and marks a large-scale and widespread climatic oscillation and departure from the generally cold-dry regimes associated with the interval 30,000 to 14,000 B.P. Along valley-ward slopes the above-mentioned stepped erosional surfaces have been cut into the Kansan till and these date progressively younger levels so that the lowest are of Wisconsinan age. On the basis of gastropod analyses, it may be concluded that terrestrial environments dominated the upland landscapes over the course of these 15,000 years. The upland crests thus mark the terminal depositional cycle of the Pleistocene. Evidence suggests that the glaciers of the Des Moines Lobe retreated between 14,000 and 12,000 B.P. Again, since there are no outwash deposits at Red Rock it is difficult to index events of the Pleistocene/Holocene boundary.

The most relevant Holocene sequence to the Red Rock study area was reconstructed on the basis of the alluvial morpho- and rock-stratigraphies dominating the valley landscapes of the Saylorville Downstream Corridor, to the north. Benn and Bettis (1981) identified three discrete Holocene surfaces underlain by the late Pleistocene outwash fills described above. In observations consistent with those made along the Red Rock Des Moines channel, it is suggested that during the Holocene competence of stream flow was minimal and that the essential work performed by the river involved lateral swinging and meandering; net degradation was also very low. Comparisons between the meander loops and oxbow scars of the Downstream Corridor (Benn and Bettis 1981:Figures 3 and 4) channel with those of the Red Rock segment show similar, albeit, complex patterns (see Figure 8-2). Sinuosity indices are similar for both reaches, 1.21 and 1.40 for Downstream and Red Rock, respectively (Table 8-2), though it is significant that the amplitude of channel migrations increases downstream. The most telling features of the Holocene alluvial landscape, however, are three discrete terrace levels whose identifying characteris[illegible] may be summarized as follows (see Benn and Bettis 1981:11ff):

1. High Terrace (TH) - outcrops 1 to 1.5 m above Intermediate Terrace and features 3 m accumulation of overbank sediments atop outwash sands and gravels. Contains buried soil with a cultural horizon. Terrace forms semicontinuous graded plain with eastern valley wall and is associated with alluvial fans at tributary mouths;

2. Intermediate Terrace (TI) - features four distinct levels, the two upper defined by Mollisol and lower by Entisol profiles. Unique alluvial landforms and features are strongly associated with these levels as is a buried Oneota site. Lower levels are still accreting and expose prehistoric surfaces;

3. Low Terrace (TL) - this is the present floodplain and it occurs 0.5 to 1.0 m below the Intermediate surfaces. All soils are Entisols. The level of the terrace is still developing and much channeling across the surfaces has occurred over the past 100 years.

These terraces date to 8500 to 2500 B.P. (TH), 4000-1000 B.P. (TI), and "late prehistoric to recent" (TL). Benn and Bettis (1981:16) postulate that channel migrations and downcutting were fluvial responses to the general desiccation of the Altithermal and that by 4000 B.P. river and floodplain gradients stabilized and adjusted to the lusher, deciduous vegetation and forest biomes that extended the length of the valley. It is implied that higher sinuosity, the graded topographies of the two lower terraces, and the overbanking sedimentary regimes establish a new geomorphic equilibrium for the floodplain after mid-Holocene times.

At Red Rock the preliminary observations made on the basis of field reconnaissance, and map and aerial photo study verify the general trend towards a more laterally extensive and micro-environmentally differentiated floodplain through time. Base level controls for floodplain development were significantly different from those documented upstream, however, as bedrock lithology and not outwash terraces defines the valley margins and channel regimen. The subsurface investigations as well as the bank and terrace profiles did not disclose substantial or discrete coarse fluvio-clastic accumulations analogous to the sand-gravels of the glacial valley. Across the study area the sediments are complex intergradations of fine sands, silts, and clays that display subtle weathering profiles and generally low energy stratification. As detailed in Chapter 5, even altimetrically paired terraces define inconsistent subsurface stratigraphies and micro-strata exposed in section often represent anomalous episodic inundations preserved only at select reaches. The lack of extensive marker horizons and continuous landform features coupled with the singular dispositions of graded channel deposits provided firm indications of the relatively recent (i.e., mid-late Holocene) age of the surficial deposits and their exposed substrate. While the Holocene paleogeography at Red Rock does, in fact, articulate with the reconstructions offered in the Saylorville Downstream Corridor, the time frame represented at Red Rock is considerably shorter and younger while the resolution of the sequence is in some ways more complex and much finer grained.

The development of the model for Holocene landscape at Red Rock derives from synthesis of field observations into a geomorphologic map, compiled following systematic field study of exposures and cores and supplemented by archeo-stratigraphic and site-landform correlations that furnished temporal controls (see Figure 8-2 and Chapter 8).

Prior to assessing these results, however, it is necessary to streamline the regional paleoenvironmental framework, specifically for the interval following the terminal ice retreat, around 12,000 B.P. It is the climatic oscillations since the Pleistocene/Holocene interface that structured the major changes in the valley and the ones that must be invoked to explain why there are no relict landforms and chrono-stratigraphic controls in the study area.

In recent years archeologists have become increasingly concerned with the effects of climate on shifting prehistoric settlement patterns. Numerous efforts have been made to reconstruct late glacial and postglacial cycles from perspectives that range from the global (Wendland and Bryson 1974; Lamb 1982; Denton and Karlen 1973; Goudie 1977) to the regional. Approaches to regional climatic analysis generally draw on thematic studies of, for example, glacio-eustatic balances, fluvial landform successions, hydrologic shifts, and vegetation successions. The latter approach has been strongly emphasized in paleoclimatic studies of the northern Midwest and Plains provinces since the broad land expanses feature either preserved inland drainages that are natural sediment traps for pollen, or contain paleoenvironmental transition zones, specifically ice-margin-meltwater settings, that define ecotonal situations in periods of climatic change. The Red Rock study area (Figure 1-1) occurs precisely at such a sensitive environmental interface and since some of the principal pollen and paleo-vegetation analyses have been conducted at proximate and analogous settings they are of major utility (Webb and Bryson 1972; Brush 1967; Durkee 1971; King and Allen 1977; Wright 1968; Baker and Van Zant 1980; Van Zant and Hallberg 1980). The efforts of several researchers have been directed towards synthesizing profiles and local successions in regional perspective (Bernabo and Webb 1977; Wendland 1978; Wendland and Bryson 1974), and their extrapolative criteria and mapped distributions will be brought to bear on the project area.

The retreat of the southernmost glaciers of the Laurentide ice sheet would have had probably the most singular impact upon the paleoenvironments of the study area. When the ice withdrew from the Des Moines Lobe to approximately 40° N latitude, around 11,500 B.P., the central Iowa landscapes were dominated by a thin (c. 100 mile wide) mixed conifer-hardwood belt that defined an ecotone grading southeastward from the lower boreal forest to the deciduous province and southwestward to the grasslands (Bryson, Wendland, Ives, and Andrews 1969). The climate at this time underwent most abrupt changes and Webb and Bryson (1972) suggest that of the standard climatic variables, those related to temperature showed the largest increase; specifically, length of the growing season, degree days, moisture stress and July mean temperatures surged. This was largely due to a circulation shift where Pacific south air masses prevailed in winter and became most frequent in July. As cloudiness declined with the rise in dry westerly flow, snowfall decreased and the length of the summer season increased by a month (see Webb and Bryson 1972:Table 7). The net effect of these changes in the ecotone was a displacement of spruce by pine pollen in the coniferous communities and proportionate increase of deciduous species.

Between 10,500 and 9500 B.P. the conifer-hardwood boundary retreated to north of the project area and the eastern grasslands advanced to south-central Iowa. Maps (see Wendland 1978:Figure 3) show that the Grasslands-Deciduous Forest-Conifer/Hardwood zones all converged near the central Des Moines River valley. Pollen evidence from a central Wisconsin pollen locality (Disterhaft Farm Bog) in the Coniferous Hardwood zone suggested to Webb and Bryson (1972) that climatic zones south of the boreal latitudes continued to experience progressive warming during this period, while precipitation balances remained the same and winters became less snowy and cloudy. Mean temperatures were only several degrees cooler (in ^{o}C) than at present (Wendland 1978). Birch and pine pollen counts increased at the expense of spruce, and it is suggested that in the Des Moines valley microenvironment, the gallery forests were beginning to dominate as at the Cherokee Sewer site in northwest Iowa (Baker and Van Zant 1980); it is also at this time that the prairie was invading the former dry and patchy openings in the uplands.

During the succeeding boreal climatic period forest borders continued their northern retreat while the grassland margin reached the central Mississippi valley. Mesic deciduous forests expanded along principal drainages and the general vegetation pattern in the Des Moines probably resembled that of the present with willows, sycamores and cottonwoods dominating the bottoms, the maple-basswood communities growing along the northern slopes and the oak-hickory forest extending across the uplands. Temperatures were on the order of the present day.

The major paleoenvironmental shift occurred during the Atlantic (ca. 8500 to 5000 B.P.) when the conifer-hardwood border reached its modern latitude and palynological evidence from Europe points to temperature elevations 2 to 3^{o} higher than now (Van der Hammen, Wijunstra, and Zagwign 1971; Wendland 1978; Lamb 1982). The warming-drying trend across central North America may be explained by an increase in the flow of drier Pacific air masses and decrease of Tropical air circulation with the result that less precipitation fell during the growing seasons (Webb and Bryson 1972). Essentially dry western air displaced humid air flows from the south. This was the warmest episode of the Holocene and it was during this period that the Prairie Peninsula was established. In the study area the basic lowland vegetative communities assumed their modern distributions, although the river valley may have experienced a reduction in deciduous tree diversity. The upland bluffs, however, were strongly affected as prairie grasses encroached across the level as well as sloping interfluve surfaces. The vegetation succession for the mid-Holocene Altithermal is reasonably well documented for the mid-continent (Bernabo and Webb 1977; Durkee 1971; Brush 1967; Van Zant 1976; Watts and Winter 1966; Baker and Van Zant 1980).

After 5000 B.P. the Laurentide ice sheet was essentially wasted and the effects of a northerly retreating tree line had no bearing on the Central Plains. Moister climatic surges have been selectively documented for the sub-boreal (5000 to 2750 B.P.), and it is possible that reforestation of the bluffs occurred at that time. Baker and Van Zant (1980:125) show that oak returned to the Lake West Okoboji area in northwestern Iowa after 3200 B.P. and similar reemergences of forest-stands have been registered by pollen studies at Missouri and Illinois prairie peninsula settings (King 1980, 1981; King and Allen 1977). Valley bottoms may have witnessed minor changes in relative dominance of particular species. With the reestablishment of the mixed forest-prairie along the uplands, the vegetation communities in the study area assumed their approximate modern limits.

The net effects of climatic events over the subsequent sub-boreal (2750 B.P. to present) vegetation communities are difficult to assess. There is evidence of limited drying intervals and tree lines, for example, showed significant southward shifts to 1000 B.P. (Sorenson, Knox, Larsen, and Bryson 1972). The impact of such cycles on the prairie-forest balances in either lowland, bottoms, valley slopes or uplands cannot be measured. Researchers have suggested that after 1000 B.P. (neo-Atlantic times) the plains were moister and that short-term climatic oscillations would have affected prehistoric settlement trends (Baerreis, Bryson, and Kutzbach 1976).

In summary, this chapter has offered the environmental background to the Late Quaternary of the central Des Moines valley. The research area was viewed in terms of its geological and biotic settings. Special attention was focused on the Holocene sequences since these are at the same time the most extensively distributed and subtly articulated across Lake Red Rock and the northwestern arm of the Des Moines drainage. The geomorphic sequences of the valley are described in Chapter 5.

CHAPTER 4

PROTO-EURO-AMERICAN VEGETATION

Presettlement undisturbed vegetation in the vicinity of the Red Rock Reservoir most likely consisted of a mosaic of oak-hickory forest and bluestem prairie. The oak-hickory forest would have occupied the slopes and upper valley bottoms and the bluestem prairie would have covered the more gradual upper slopes and level uplands. The moist floodplain along the Des Moines River and its larger tributaries were in all likelihood covered by an elm-ash-maple-cottonwood forest (Campbell 1961; Küchler 1964). Ecotonal areas between the forest and prairie should have been small (King 1983).

This mosaic of forest and prairie covered large regions of the central lowlands of North America (Thornbury 1965) in areas now known as southern Iowa, northern and western Missouri, eastern Nebraska and Kansas, most of Illinois, and northwestern Indiana. The area represents a broad transitional zone between the oak-hickory forests to the south and east, and the tall grass prairies to the west and northwest (Küchler 1964).

The boundary between the forest and prairie vegetation was often abrupt. The two very dissimilar vegetation communities alternated with each other due to changes in local microenvironmental factors (King 1983; Carpenter 1940). These factors have been reviewed by many botanical investigators and include variations in temperature, moisture, soil development, topography, and the occurrence of natural and Indian-initiated fires (Transeau 1935; Albertson and Weaver 1945; Curtis 1959; etc.).

FOREST

Methods

Data used to reconstruct the presettlement forest were taken from field notes of the original U.S. General Land Office Surveys (1845-1848) of northwestern Marion and southwestern Jasper counties, Iowa. These surveys are on file at the Iowa State Historical Society in Iowa City, Iowa. Figure 4-1 illustrates the forested and non-forested areas, as compiled from the original maps sketched by the Land Office surveyors during the 1845-1848 period.

Numerous workers have used the Land Office field notes to obtain quantitative data for tree species (King and Johnson 1977; Anderson and Anderson 1975; Kenoyer 1933; Howell and Kucera 1956; Wuenscher and Valiunas 1967). As described by Stewart (1935) the surveyors were instructed to record the distance from section and quarter section corners to the nearest suitable tree, and to record the species of the tree and its diameter at breast height (dbh). Examination of the Land Office field notes for the Red Rock Reservoir area shows that in forested areas distances were measured in chain links (0.66 feet), and dbh measurements were recorded in inches for one to four trees at each section and quarter section corner. Common tree names were recorded by species or general group (e.g., white elm or elm).

For this study quantitative measurements were made from the Land Office survey notes for the area outlined on Figure 4-1 (approximately 2560 acres). The intersection points of the section and quarter section corners were located on modern U.S. Geological Survey (U.S.G.S.) 7.5 minute topographic maps. Each point was then classified as being either in a floodplain, on sloping (over 10 percent) uplands, or on level to nearly level (less than 10 percent) uplands.

For each of the three topographic positions, species specific density, expressed as trees per acre, was computed from the distances recorded in the Land Office notes using the methods outlined by Cottam and Curtis (1956). Average species specific basal area per acre was computed from the dbh measurements in the Land Office notes. Species specific frequency expressed as a percentage was calculated from the occurrence of each species in the density data. Relative density, relative basal area (dominance), and relative frequency were computed for each species, and the values summed and divided by 3 to provide species specific importance values for each topographic community.

The limitations of the Land Office survey vegetation data should be obvious. No information was obtained on the forest understory vegetation and on trees too small to be marked with the surveyor's ax. Older or damaged trees not considered to be a prospect for long-term retention of markings were ignored. Questions remain about how far a distance surveyors would go to find a tree for marking. However, the survey records form a useful body of data recorded according to a pre-determined plan prior to intense settlement and alteration of the forests (Bourdo 1956).

Results

Tables 4-1 through 4-3 illustrate the results of the quantitative analysis for the floodplains, sloping uplands, and level to nearly level uplands. In the floodplains the species with the highest importance values was the elm (Ulmus sp.). While the actual species is not specified, it is probably white elm, better known today as American elm (Ulmus americana). This remains a common species on floodplains throughout Iowa, although its numbers and the size of the oldest trees have been greatly reduced by the Dutch elm disease. In the mid-nineteenth century, before the arrival of the Dutch elm disease, American elm should have been very common in the mesic floodplains throughout the area (U.S.D.A. 1965; Braun 1950).

Other trees with a high importance value in the floodplain are bur oak (Quercus macrocarpa), hackberry (Celtis occidentalis), and black walnut (Juglans nigra). Except for bur oak, all of these species are believed to have been common throughout midwestern floodplains during presettlement times (Campbell 1961). Bur oak grows on many types of topography and soils, including moist floodplains or lowlands (U.S.D.A. 1965; Putnam and Bull 1932). However, its relatively large importance value in the floodplain data indicates a larger presence than expected. This could result from either the presence of dense stands of bur oak on the edges of floodplains, or from the inclusion of marginal areas of the surrounding sloping uplands (which are dominated by bur oak) in the floodplains.

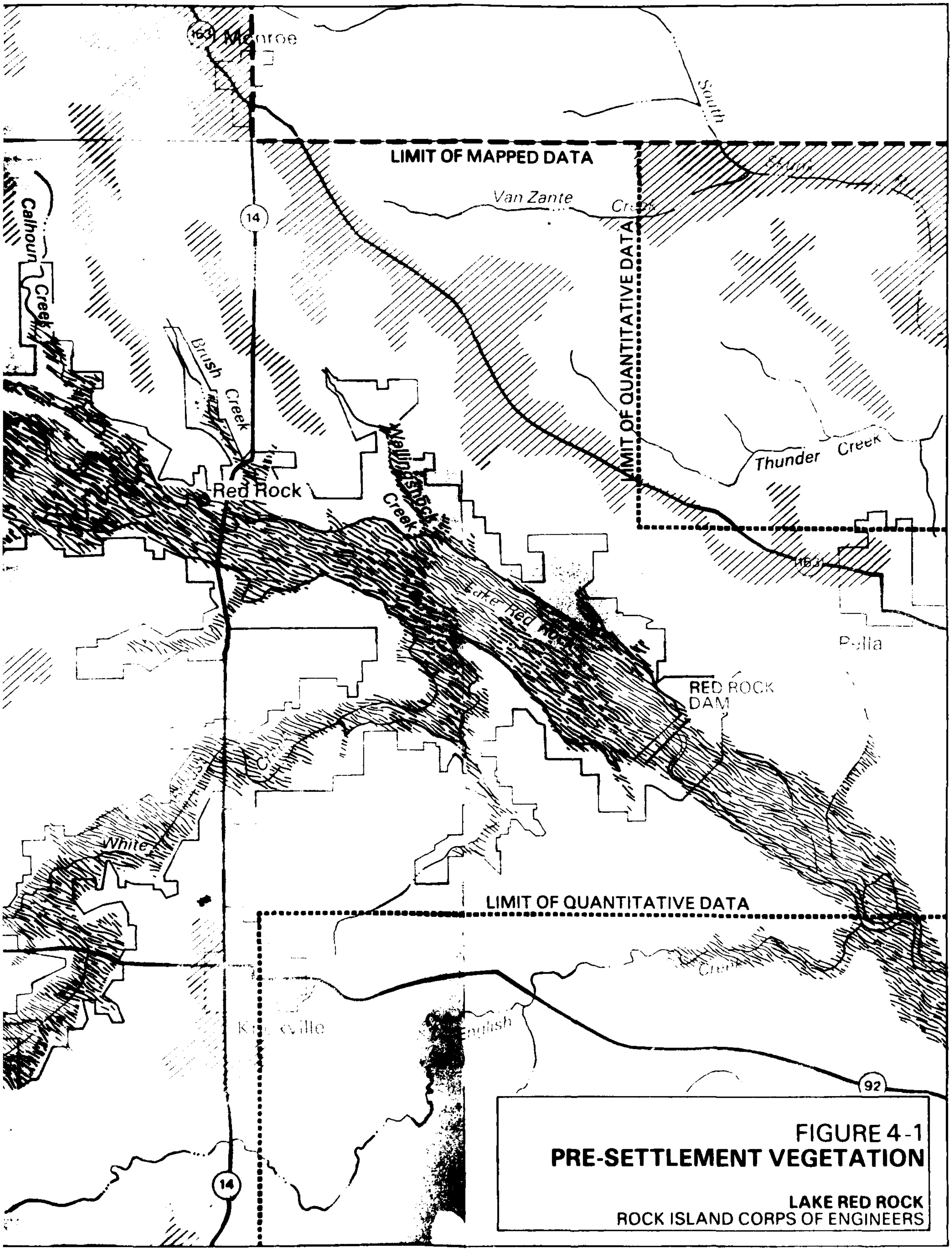
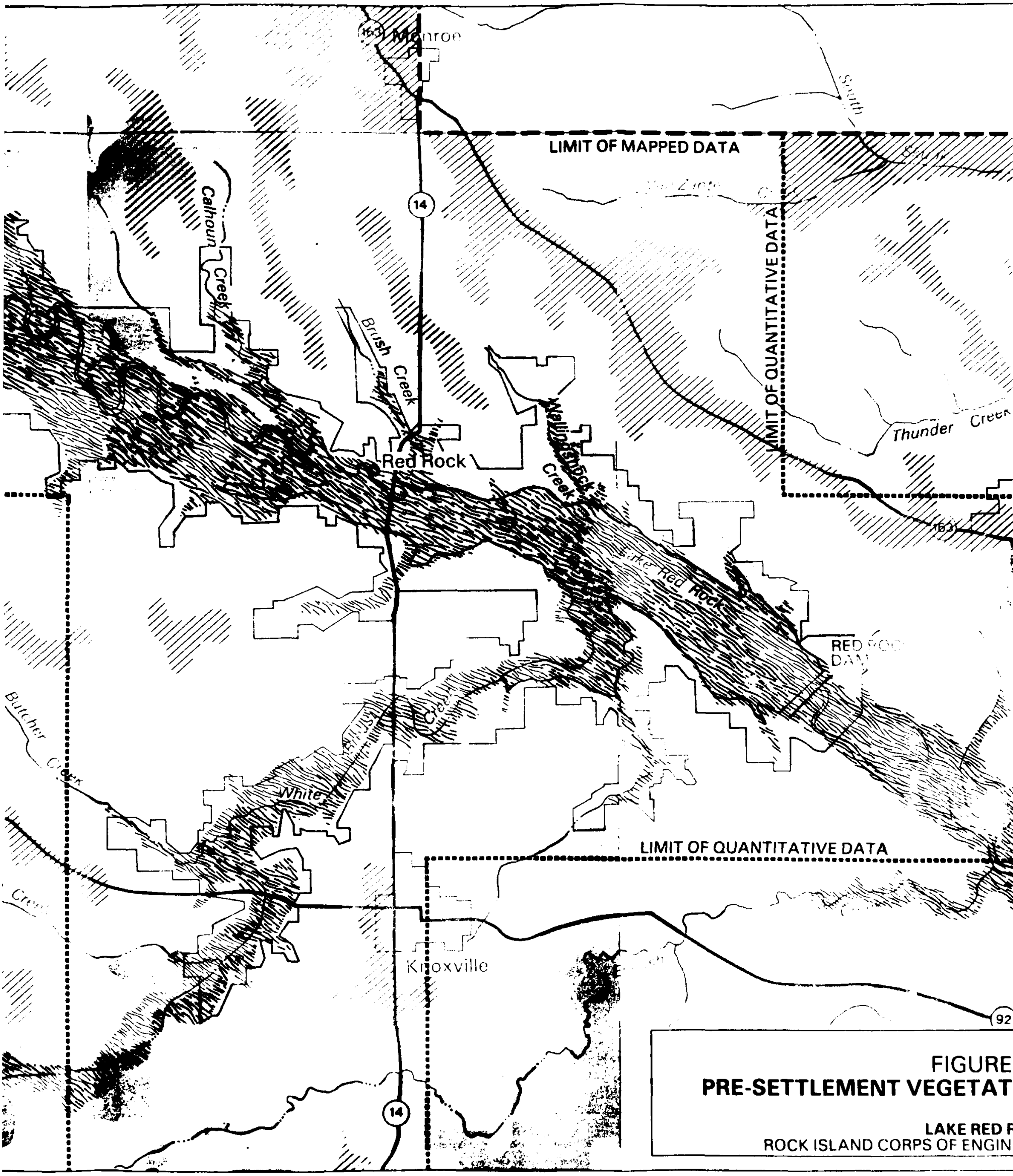


FIGURE 4-1
PRE-SETTLEMENT VEGETATION

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

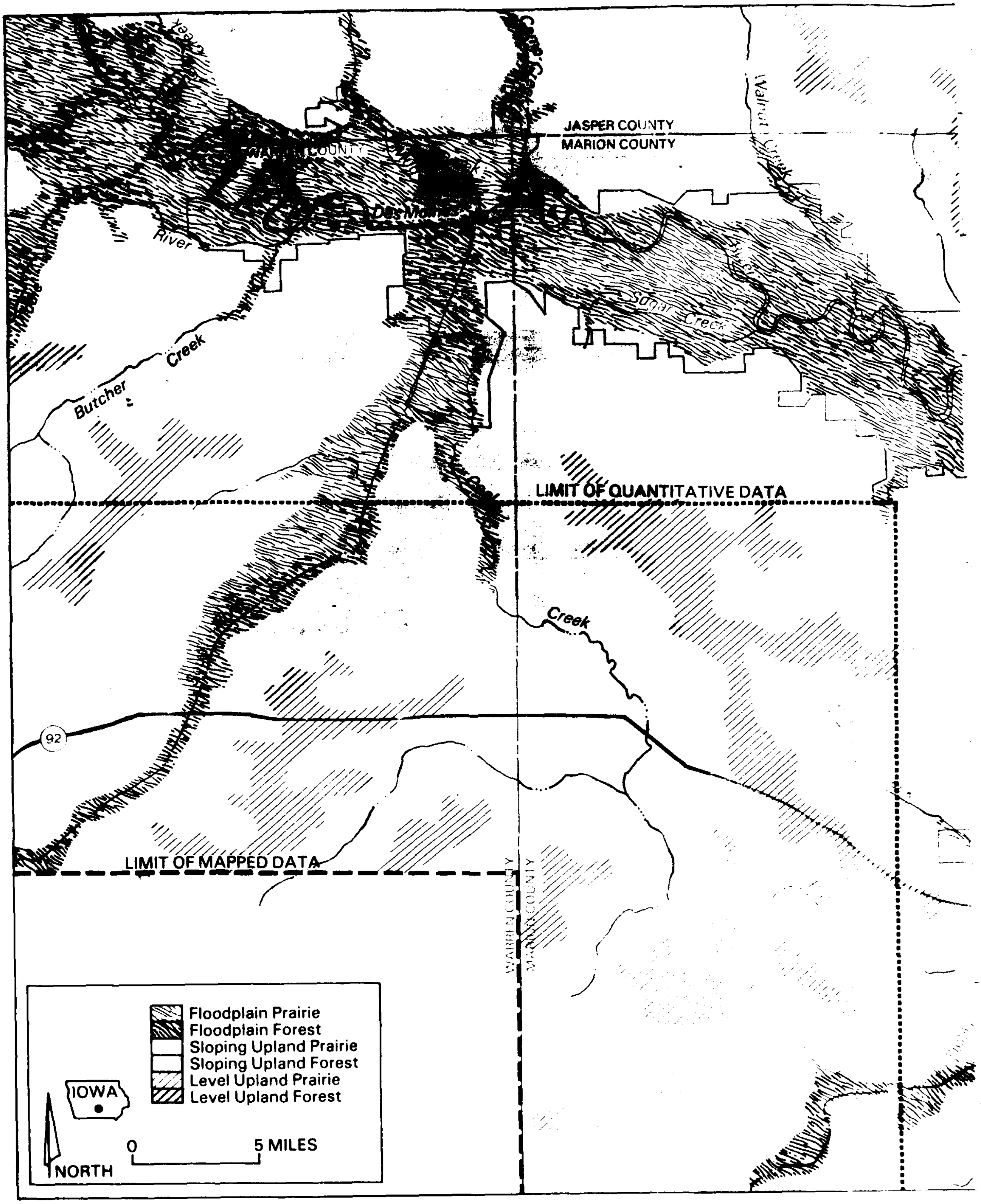


FIGURE

PRE-SETTLEMENT VEGETATI

LAKE RED R

ROCK ISLAND CORPS OF ENGINI



COMMONWEALTH ASSOCIATES, INC

TABLE 4-1

LAKE RED ROCK
ARCHEOLOGICAL STUDY

U S ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT

POINT-QUARTER FREQUENCY, DENSITY, BASAL AREA

VEGETATIVE TYPE

FLOODPLAIN

SPECIES	FREQUENCY PERCENT	FREQUENCY RELATIVE	DENSITY #/ACRE	DENSITY RELATIVE	BASAL AREA SQ FT/ACRE	BASAL AREA RELATIVE	IMPORTANCE VALUE
ULMUS SP	36.66	21.89	6.5	22.63	607.05	27.29	23.94
QUERCUS MACROCARPA	23.31	13.92	4.5	15.65	366.85	16.49	15.36
CELTIS OCCIDENTALIS	20.90	12.48	3.4	11.95	176.52	7.94	10.79
JUGLANS NIGRA	12.41	7.41	2.2	7.84	246.22	11.07	8.77
TILIA AMERICANA	11.28	6.73	1.5	5.22	168.74	7.59	6.51
CARYA SP	11.28	6.73	1.8	6.40	80.12	3.60	5.58
POPULUS DELTOIDES	4.86	2.90	1.6	5.45	146.66	6.59	4.98
ACER SP	6.78	4.05	1.7	5.97	80.20	3.61	4.54
FRAXINUS SP	6.85	4.09	1.1	3.89	47.99	2.16	3.38
QUERCUS VELUTINA	4.19	2.50	0.7	2.36	36.41	1.64	2.17
CARYA CORDIFORMIS	3.19	1.91	0.6	1.94	17.06	0.77	1.54
ULMUS AMERICANA	2.94	1.76	0.4	1.24	35.45	1.59	1.53
QUERCUS ALBA	2.50	1.49	0.4	1.26	29.86	1.34	1.37
QUERCUS RUBRA	2.11	1.26	0.2	0.77	40.50	1.82	1.29
BETULA NIGRA	2.33	1.39	0.4	1.56	12.48	0.56	1.17
BETULA SP	1.72	1.03	0.2	0.76	23.40	1.05	0.95
JUGLANS CINERA	1.72	1.03	0.2	0.76	22.73	1.02	0.94
GLEDITSIA TRIACANTHOS	1.89	1.13	0.2	0.63	15.81	0.71	0.82
ULMUS RUBRA	1.47	0.88	0.2	0.54	19.21	0.86	0.76
AESCULUS GLABRA	1.86	1.11	0.2	0.56	8.49	0.38	0.68
QUERCUS MUEHENBURGII	0.86	0.51	0.1	0.38	16.27	0.73	0.54
ACER NEGUNDO	1.25	0.75	0.1	0.40	7.50	0.34	0.49
FRAXINUS AMERICANA	0.86	0.51	0.1	0.38	6.59	0.30	0.40
OSTRYA VIRGINIANA	0.86	0.51	0.1	0.38	2.69	0.12	0.34
POPULUS TREMULOIDES	0.86	0.51	0.1	0.38	1.61	0.07	0.32
PLATANUS OCCIDENTALIS	0.64	0.38	0.1	0.23	1.42	0.06	0.23
ACER SACCHARUM	0.61	0.36	0.0	0.16	2.25	0.10	0.21
GYMNOCLADUS DIOICUS	0.61	0.36	0.0	0.16	2.25	0.10	0.21
CARYA TOMENTOSA	0.61	0.36	0.0	0.16	2.25	0.10	0.21
TOTALS FOR VEGETATIVE TYPE:	167.45	100.00	28.6	100.00	2224.60	100.00	100.00

TABLE 4-2

LAKE RED ROCK
ARCHEOLOGICAL STUDY

U S ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT

POINT-QUARTER FREQUENCY, DENSITY, BASAL AREA

VEGETATIVE TYPE

SLOPING UPLAND

SPECIES	FREQUENCY PERCENT	FREQUENCY RELATIVE	DENSITY #/ACRE	DENSITY RELATIVE	BASAL AREA SQ FT/ACRE	BASAL AREA RELATIVE	IMPORTANCE VALUE
QUERCUS MACROCARPA	37.50	24.04	5.5	24.90	440.31	24.93	24.62
QUERCUS VELUTINA	27.07	17.35	3.4	15.44	263.42	14.91	15.90
ULMUS SP	24.52	15.72	3.8	17.12	252.34	14.29	15.71
QUERCUS ALBA	14.17	9.09	2.3	10.41	300.01	16.98	12.16
CARYA SP	18.59	11.92	2.4	10.66	129.45	7.33	9.97
TILIA AMERICANA	12.57	8.06	2.0	8.87	170.49	9.65	8.86
ACER SACCHARUM	3.43	2.20	0.6	2.86	71.70	4.06	3.04
JUGLANS NIGRA	4.27	2.74	0.5	2.19	36.09	2.04	2.32
JUGLANS CINERA	3.18	2.04	0.5	2.04	33.72	1.91	2.00
CELTIS OCCIDENTALIS	2.88	1.84	0.5	2.09	26.29	1.49	1.81
ULMUS RUBRA	2.96	1.89	0.3	1.34	8.23	0.47	1.23
QUERCUS RUBRA	1.62	1.04	0.2	0.94	22.87	1.29	1.09
PLATANUS OCCIDENTALIS	1.09	0.70	0.1	0.36	4.79	0.27	0.44
CARYA CORDIFORMIS	1.09	0.70	0.1	0.36	3.67	0.21	0.42
MALUS IOENSIS	0.53	0.34	0.0	0.22	1.74	0.10	0.22
CRATAEGUS SP	0.53	0.34	0.0	0.22	1.30	0.07	0.21
TOTALS FOR VEGETATIVE TYPE:	155.99	100.00	22.2	100.00	1766.41	100.00	100.00

TABLE 4-3

LAKE RED ROCK
ARCHEOLOGICAL STUDY

U S ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT

POINT-QUARTER FREQUENCY, DENSITY, BASAL AREA

VEGETATIVE TYPE

LEVEL TO NEAR
LEVEL UPLAND

SPECIES	FREQUENCY PERCENT	FREQUENCY RELATIVE	DENSITY #/ACRE	DENSITY RELATIVE	BASAL AREA SQ FT/ACRE	BASAL AREA RELATIVE	IMPORTANCE VALUE
QUERCUS MACROCARPA	47.39	31.81	9.7	38.06	402.71	53.60	41.16
ULMUS SP	27.00	18.12	5.9	22.95	111.74	14.87	13.65
QUERCUS ALBA	21.93	14.72	2.6	10.07	86.00	11.45	12.08
QUERCUS VELUTINA	24.56	16.49	2.5	9.95	43.78	5.83	10.75
TILIA AMERICANA	10.90	7.32	2.2	8.77	52.81	7.03	7.70
ACER SACCHARUM	2.50	1.68	0.6	2.46	28.73	3.82	2.65
JUGLANS CINERA	2.50	1.68	0.6	2.46	14.08	1.87	2.00
FRAXINUS AMERICANA	5.00	3.36	0.3	1.23	2.73	0.36	1.65
CELTIS OCCIDENTALIS	2.50	1.68	0.6	2.46	4.60	0.61	1.58
CARYA SP	2.08	1.40	0.3	1.19	1.73	0.23	0.94
FRAXINUS SP	1.32	0.88	0.1	0.20	1.68	0.22	0.44
JUGLANS NIGRA	1.32	0.88	0.1	0.20	0.74	0.10	0.40
TOTALS FOR VEGETATIVE TYPE:	148.99	100.00	25.5	100.00	751.31	100.00	100.00

Floodplain forests in a climax state are believed to have been dominated by American elm, silver maple (Acer saccharum), ash (Fraxinus sp.) and cottonwood (Populus deltoides) (Braun 1950). Comparison to the trees recorded in the Land Office Survey indicates that the forest was not in a climax state, as indicated by the relatively low importance of silver maple, ash and cottonwood.

In both the sloping uplands and the level uplands (Tables 4-2 and 4-3), bur oak was the most important species by a large margin. In these two regions, bur oak accounted for 24.93 percent and 53.60 percent of the basal area, respectively. Other important species included elms, black oak (Quercus velutina), white oak (Quercus alba), and hickory (Carya sp.).

The dominance of bur oak in the uplands may indicate that the forests in these areas were disturbed several years earlier. While bur oak would be expected in the climax forest, the more dominant species would tend to be black oak, white oak, red oak, and bitternut hickory (U.S.D.A. 1965; Curtis and McIntosh 1951). Bur oak would dominate only in pioneer stands and on the edges of prairies (U.S.D.A. 1965; Daubenmire 1936).

PRAIRIE

Government Land Office surveyors unfortunately did not note the species of prairie vegetation or its abundance as they passed through Iowa. Today, nearly all of the original tall grass prairie in southeastern Iowa has been destroyed or greatly altered by decades of farming and grazing (Hayden 1946; Smith 1981), and it is therefore more difficult to quantify the presettlement prairie vegetation.

Inferences about the vegetation can be made based on studies of the generic American tall grass prairie. Table 4-4 lists the grasses and forbs which most likely made up the presettlement prairie vegetation according to studies by Weaver (1954, 1968).

Lengthy studies by Weaver and Fitzpatrick (1934) and Weaver (1958) of prairies west of Des Moines indicated that the lowlands and lower slopes supported a dense stand of big bluestem (Andropogon gerardi) with smaller amounts of Indiangrass (Sorghastrum nutans). On more moist soils these species became mixed with switchgrass (Panicum virgatum) and in sloughs these were replaced by prairie cordgrass (Spartina pectinata). These grasses were coarse, and grew to heights of 5 to 8 feet.

The hilltops and upper and middle slopes were dominated by little bluestem (Andropogon scoparius), since the reduced soil moisture was not as favorable to the growth of big bluestem. Little bluestem grew to heights of 1 to 3 feet. In the lowlands little bluestem could not compete with the taller big bluestem, which in moist soil produces dense shade (Weaver 1958). The bunch grasses, needle grass (Stipa spartea), prairie dropseed (Sporobolus heterolepis), side oats grama (Bouteloua curtipendula), and Junegrass (Koeleria cristata), often occurred on the drier ridges.

TABLE 4-4

PRESETTLEMENT PRAIRIE VEGETATION
(Listed in Approximate Declining Order of Abundance)

Floodplains or Lowlands

Major Grasses

Andropogon gerardi	Big bluestem
Sorghastrum nutans	Indiangrass
Poa pratensis	Kentucky bluegrass
Spartina pectinata	Prairie cordgrass
Panicum virgatum	Switchgrass
Elymus canadensis	Canada wildrye

Other Grasses

Tripsacum dactyloides	Eastern gamagrass
Agrostis alba	Redtop
Calamagrostis inexpansa	Northern reedgrass
Calamagrostis canadensis	Bluejoint
Phalaris arundinacea	Reed canary grass
Distichlis stricta	Saltgrass
Agropyron smithii	Western wheatgrass
Elymus virginicus	Virginia wildrye
Cinna arundinacea	Stout woodreed
Beckmannia syzigachne	American sloughgrass
Glyceria striata	Fowl mannagrass
Leersia oryzoides	Rice cutgrass
Leersia virginica	Whitegrass

Major Forbs

Galium tinctorium	Stiff marsh bedstraw
Fragaria virginiana	Scarlet strawberry
Steironema ciliatum	Fringed loosestrife
Aster praealtus	Willow aster
Anemone canadensis	Canada anemone
Solidago altissima	Tall goldenrod
Silphium laciniatum	Cutleaf rosinweed

Other Forbs and Shrubs

Phlox pilosa	Prairie phlox
Silphium integrifolium	Entire-leaved rosinweed
Helianthus grosseserratus	Saw-tooth sunflower
Liatrus pycnostachya	Prairie button snakeroot
Equisetum laevigatum	Scouring rush
Zizia aurea	Golden meadow parsnip
Teucrium canadense	American germander

TABLE 4-4 (Cont.)

PRESETTLEMENT PRAIRIE VEGETATION

Floodplains or Lowlands (Cont.)

Other Forbs and Shrubs (Cont.)

Apocynum sibiricum	Indian hemp
Viola papilionacea	Meadow violet
Glycyrrhiza lepidota	Licorice
Pycnanthemum virginianum	Mountain mint
Pycnanthemum flexuosum	Mountain mint
Cicuta maculata	Water hemlock
Veronicastrum virginicum	Culver's root
Asclepias verticillata	Whorled milkweed

Uplands

Major Grasses

Andropogon scoparius	Little bluestem
Bouteloua curtipendula	Side-oats grama
Koeleria cristata	Junegrass
Sporobolus heterolepis	Prairie dropseed
Stipa spartea	Needlegrass

Other Grasses (or grass-like)

Andropogon gerardii	Big bluestem
Panicum scribnerianum	Scribners panic grass
Panicum wilcoxianum	Wilcox panic grass
Sporobolus asper	Tall dropseed
Carex pennsylvanica	Penn sedge
Eragrostis spectabilis	Purple lovegrass

Major Forbs and Shrubs

Amorpha canescens	Leadplant
Helianthus rigidus	Stiff sunflower
Aster ericoides	Many flowered aster
Antennaria neglecta	Prairie catsfoot
Erigeron strigosus	Daisy fleabane
Solidago missouriensis	Missouri goldenrod
Psoralea argophylla	Silver-leaf psoralea

Other Forbs and Shrubs

Petalostemon candidum	White prairie clover
Petalostemon purpureum	Purple prairie clover
Echinacea pallida	Pale purple coneflower

TABLE 4-4 (Cont.)

PRESETTLEMENT PRAIRIE VEGETATION

Uplands (Cont.)

Other Forbs and Shrubs (Cont.)

Euphorbia corollata	Flowering spurge
Solidago rigida	Stiff goldenrod
Astragalus crassicarpus	Ground plum
Liatris scariosa	Large button snakeroot
Rosa arkasana	Prairie rose
Coreopsis palmata	Tickseed
Kuhnia eupatorioides	False boneset
Psoralea tenuiflora	Slimflower scurfpea
Sisyrinchium campestre	Prairie blue eyed grass
Ceanothus ovatus	Redroot

SOURCE: Weaver 1954, 1968; Lommasson n.d. Names follow the three sources.

On the south and southeast facing slopes, the transition from big bluestem to little bluestem occurred about a third of the way up the slope. But on the north and east slopes where the soils were less exposed to drying, big bluestem extended farther up the slopes, especially in small depressions or drainages (Weaver 1958).

Both bluestems are warm season grasses (growth begins in April) with pronounced tillering habits of spreading. Big bluestem is a robust grass which produces aggressive rhizomes and great quantities of seed. This grass forms a dense sod and almost pure stands on deep, well-watered soils and large bunches on drier soils. Little bluestem is not as coarse as big bluestem and forms bunches on hilltops or circular patches of sod from its tillering habits and rhizomes (Weaver 1958).

Many species of forbs and shrubs occurred on the undisturbed prairies (Table 4-4), but they contributed relatively minor amounts of biomass in comparison to the grass species. Lead plant (Amorpha canescens) is a forb or semi-shrub, which was the most abundant of the upland broadleaf species. Stiff marsh bedstraw (Galium tinctorium) is a shade tolerant perennial which forms a dense understory in wet grasslands and many stands of big bluestem (Weaver 1968).

CHAPTER 5

FIELD RECONNAISSANCE AND RESULTS

FIELD EVALUATION - PROCEDURES

The goal of the field reconnaissance was to revisit as many previously reported sites as possible, to assess their current condition and obtain materials that would be useful for temporal and functional assessment. Given the large number of reported sites and the relative brevity of the time available for fieldwork it became necessary to set priorities. First, visitation was limited to sites on lands owned in fee simple by the Rock Island District of the Corps of Engineers, but included sites on those lands managed by the Iowa Conservation Commission as well as those directly managed by the Corps of Engineers.

Second, although some bluff-top locations were visited early in the period of fieldwork, priority was given to assessing those sites below about 780 feet AMSL or, in other words, those sites between the conservation pool and the flood control pool levels. The lake level fluctuated between about 730 and 731 feet AMSL (above mean sea level) during the period of fieldwork; thus, most sites examined were within an area of about 50 vertical feet. This latter priority was set not only because sites higher than about 780 feet AMSL were not subject to inundation, but also because they tended to be more isolated, thus requiring a much greater time outlay to reach each one and move on to the next. Although we believe that examination of bluff-top sites is every bit as important to a full evaluation of central Des Moines River valley archeology as is examination of bottomland sites, it was felt that the need to assess sites being periodically subjected to inundation should take precedence at this stage of the investigations.

Site forms and site locations as mapped on U.S.G.S. 7.5 minute topographic maps were obtained from the Office of State Archeologist prior to fieldwork. That office color-codes site plots, differentiating between those whose locations are considered reliable and those which are not. Some special effort was made to visit and evaluate locations considered less reliable, although many of these sites were surrounded by sites whose locations are considered more reliable and all sites in an area were visited when possible.

Fieldwork then consisted of going to the mapped and described locations of known sites, examining their status and present condition, and obtaining a collection of surface material. Shovel testing was employed to assist with location if the surface was obscured, but this was largely necessary only above the August 1983 high-water mark. A boat was occasionally used but it was found that road access to most places was adequate and that shallow water made boat access difficult to precisely those places where a boat might have been an efficient means of transportation.

On-site inspection consisted of confirming the location on the map, recording its status and condition, and making a collection. Confirmation of the location normally consisted of checking not only the plat on the map, but also the verbal description on the site form. Recording consisted of completing a description and assessment form describing the site's location and appearance.

Collection procedures were usually rather casual and were limited to obtaining temporally diagnostic materials (projectile points, ceramics) and a grab sample of material exposed on the surface. This latter might not be a wise strategy in a less disturbed situation, but clear signs of on-going unauthorized collection in addition to the disturbance produced by recent inundation suggest that collection would allow us to assess site age and function by use of materials whose spatial relations are likely already compromised. Within-site provenience was maintained on several sites, however, and the specifics are described for each site.

Several new sites were also recorded, usually as a result of crossing their locations to reach previously recorded sites. Inspection procedures were identical to those employed on previously recorded sites, except that initial plotting of the location was of course substituted for confirming the location. Iowa state survey numbers were subsequently obtained for these sites from the Office of State Archeologist.

A total of 57 prehistoric and historic sites were examined. Nine of these were newly recorded, the other 48 were previously recorded sites which were verified during this reconnaissance. Each of these sites is described in turn, the prehistoric sites in this chapter and the historic sites or historic components of multicomponent prehistoric/historic sites in Chapter 7. Site descriptions are followed by a description of the collections, site-specific geomorphic assessments, and an integration of the site and collection data. The relations of specific sites to specific RP3 objectives are reserved for the discussion of RP3 objectives and the Lake Red Rock area in the next chapter.

SITE DESCRIPTIONS

13MA2. This site was previously described (Wheeler 1949:6; McKusick and Ries 1962:5) as a single mound, measuring 3 feet high and 45 feet in diameter. It is located at an elevation of approximately 770 feet AMSL along the edge of the bluff on the north side of the Des Moines River and northwest of the confluence of a second order stream and the Des Moines River. The site has recently been totally impacted by bulldozing, landscaping, and the construction of blacktop roads associated with the north unit of Elk Rock State Park. No mound was visible, nor was any cultural material observed when the location was visited in September 1983. Wheeler (1949:6; 1959:41) notes that projectile points, axes, and mauls had been reported during previous years. This is not consistent with a mound, but sites 13MA80 and 13MA219 both lie immediately south of the reported location and may be the source of the materials described to Wheeler.

13MA3. A site numbered 13MA3 was recorded as a mound site by Wheeler (1949:9) but as an occupation site by McKusick and Ries (1962:5). The reported location lies at an elevation of approximately 790 feet AMSL at the end of a point of land southeast of the confluence of Whitebreast Creek and the Des Moines River. This discrepancy makes ambiguous the evaluation of the site's present condition. The specific locus has been altered for development of the Whitebreast Creek Recreation Area and a picnic shelter now occupies the point. If 13MA3 really was a mound, then it was probably destroyed by recreation area development if not before. McKusick and Ries (1962:18) report that the site could not be located. Their reporting of the site as an occupation site could be erroneous or, it could somehow refer to an occupation site subsequently reported and numbered 13MA119, which is immediately adjacent to 13MA3.

13MA11. A site described by McKusick and Ries (1962:6) as three knolls in a north-south line is numbered 13MA11. The site form describes the site as associated with habitation and burial activities and as located in the bottoms east of Whitebreast Creek. This site may be mis-plotted. The above verbal description does not match that for the plotted location, which places the site on a point of land southeast of the confluence of Whitebreast Creek and the Des Moines River at an elevation of about 830 feet AMSL. This area has been extensively developed into a paved terraced campground where no indication of the site was observed. A more probable location of the site is one that is one section (i.e., one mile) due west of the plotted location. This would place it in the Whitebreast Creek bottoms. This location is now inundated, leaving little possibility that the site has survived at either location.

13MA14. The description on the site form for 13MA14 lists four possible burial mounds on the edge of a sloping bluff east of Brush Creek and observes that no artifacts were found in the area. McKusick and Ries' (1962:6) report gives the same description, except that the site is described as having three possible mounds. Four low rises each about 20 feet across, are presently observable along the bottom edge of a sloping bluff at an elevation of approximately 760 feet AMSL east of Brush Creek. These rises are accentuated by taller and lighter colored vegetation, and have not been disturbed by pot holes. Whether or not these rises are in fact burial mounds is questionable. The rises are situated in an area where slope wash and erosional deposits are likely, and no artifacts were observed in spite of the good visibility in September 1983.

13MA20. The site form for 13MA20 lists the site as two low conical mounds about 40 feet in diameter and 30 feet apart near a fence on a high ridge overlooking the Des Moines River valley. The site was subsequently described in the McKusick and Ries (1962:7) report at which time it was noted that both mounds appear potted. The plotted location was verified. Two mounds each with a maximum height of about 2 m were located at an approximate elevation of 860 feet AMSL on the north bluff edge of the Des Moines River valley and near an east-west fence line. The mounds are located in a wooded area with older, but not mature, hickory and elm. A possible disturbance was noted on the eastern mound. No artifacts were observed in September 1983, although ground cover was sparse.

13MA21. This site is described on the site form and by McKusick and Ries (1962:8) as a few flint chips possibly associated with a number of arrowheads collected in a cornfield. The site area is now covered with dense second growth. It is located at an elevation of approximately 850 feet AMSL on a ridge northwest of the head of a ravine created by a first order stream. The area was shovel tested, but no cultural material was recovered. The site may have represented a small, ephemeral occupation and been almost totally collected, either during the earlier survey or by collectors.

13MA33. The original site form describes this site as two burial mounds, one on either side of a road, one-quarter mile from a section line. McKusick and Ries (1962:9) give a similar description. The site form however, also notes that the mounds were both about 20 yards from the road, and that the northern mound was bisected by a fence. The reported location is on a point of land southeast of the confluence of Whitebreast Creek and the Des Moines River at an elevation of about 830 feet AMSL, and is now within the Whitebreast Creek Recreation Area. The site locus, as plotted, has been bulldozed for the development of a paved and terraced campground. No indication of the site was observed in September 1983.

13MA42. No site form was available for 13MA42; the description here is entirely based on observations at the plotted location. This site is a light scatter of primarily debitage, on the fringes and flat of a terrace lobe at an elevation of about 740 feet AMSL. A lake-like depression is west of the site, and low bluffs are discernible to the south. The terrace at the site very gently grades into the floodplain, resulting in a surface lower than that of an Oneota site (13MA209) to the east. The site area was a fallow cornfield in September 1983 and is subject to periodic flooding. Some erosion was observed, but it was not judged to be serious.

13MA44. Site 13MA44 was first recorded by Iowa State University and is described on a survey form filed in 1981 by a collector as a "half-moon shaped site with the Des Moines River forming the flat side to the south and a high semicircular, timbered ridge protecting it to the west, north and east." The form also observes that "This site is a few feet higher so there was no danger of flooding," and gives an estimated size of 100 x 300 feet. This information does not exactly match the plotted location of 13MA44. On the plot, the site area is located on the north bluff and slope of the Des Moines River valley and is bisected by a large ravine. The actual area of the plot is about 400 x 1600 feet. The Commonwealth crew visited the area and observed a large, high density site eroding from the north shore of the lake. The site is on a high terrace of the Des Moines River, at an elevation of about 750 to 780 feet AMSL. The scatter of cultural debris extends several hundred meters west of the ravine along the terrace and up the slope into the woods. The material appears scattered in most areas, but some dense concentrations were discernible. The entire site area (including the wooded area on top of the slope) has been subjected to inundation, resulting in rapid and extensive erosion of the site, and in large deposits of driftwood along the woods line. Because of the discrepancies in site descriptions and cultural materials, it may be that 13MA44 is actually two sites located at opposite ends of the plotted area. The area we visited may have been largely limited to the westernmost site. Although the east side of the ravine cut was examined for material, it is possible that another site may exist .2 to .25 mile to the east, where the topography of the bluff edge approximates the "half-moon" description. This area is at the extreme east edge of the plot, and should be checked for the presence of a Woodland site in the future.

A controlled surface collection was conducted on 13MA44. This was done for four reasons: 1) the surface density was very high; 2) the variety of surface materials was high; 3) the initial inspection suggested that the site is multicomponent and that the components might be separable, and 4) the site is undergoing rapid and severe erosion and it was deemed important to sample the site to be in a position to make recommendations for testing.

Collection consisted of the total pick-up of all material within each of 12 circular units with a 3 m radius. Unit locations were deliberately chosen to coincide with clusters of material observed and marked during the initial inspection. A sketch map showing all units, auger holes placed by the geomorphologist, fence lines, and the riverbank was prepared using compass and tape (Figure 5-1).

13MA47. No site form is available for 13MA47, but it is listed as having been designated by Iowa State University (Gradwohl and Osborn 1974b:Table 3). The present description is solely based on the September 1983 observation of the plotted locus. The plotted locus is on the east bank of a north-south meander of the Des Moines River. It is in the conservation pool and thus permanently inundated.

13MA80. The Water Tower West site (13MA80) was reported in 1978 as a "village site" located on a long ridge running southeast towards the Des Moines River bottoms, and with Lake Red Rock covering the lower portion of the site. The site now appears on the south face of a ridge to the northwest of the confluence of a second order stream (and ravine) and the Des Moines River. The site appears as a fairly dense, but spotty, scatter of material eroding out of a high shoreline at an elevation of about 750 to 760 feet AMSL. The actual area of the scatter is approximately 100 m along the shoreline by about 50 m vertically. No material was observed on the ground surface at the top of the ridge.

13MA81. Site 13MA81 is named the Water Tower East site. It was recorded in 1978 as a village on a semicircular second bottom extending to the top of the ridge. The site now appears as a dense scatter along the eroding shoreline at an elevation of about 770 to 790 feet AMSL. The site is located on a point of land northeast of the confluence of a second order stream (ravine) and the Des Moines River. The actual area of the scatter appears to be about 50 m by 50 m. The wooded ridge above the site has material in context, and should be tested. The site is eroding badly. The slope was devoid of vegetation in September 1983 and wave action has exposed roots and cultural material in a band 5 to 7 m wide at the wooded shoreline.

Three systematic transects were intensively surface collected across the site. These transects were parallel to one another and followed the contours of the slope. The purposes of this controlled collection were to: 1) assess the impact of inundation; 2) evaluate the microtopography, and 3) correlate surface veneers with artifact distribution to evaluate the context of artifacts. The results of these evaluations are described later in this chapter.

13MA103. No site form is available for 13MA103. It is listed by Gradwohl and Osborn (1974b:Table 3) as having been recorded by Iowa State University. The information provided here is based solely on Commonwealth's inspection of the area plotted on maps filed at the Office of State Archeologist in Iowa City. The site is plotted along the west bank of an old meander of the Des Moines River at an elevation of 730 feet AMSL. The locus is now permanently inundated and cannot be further assessed.

13MA106. The information base for 13MA106 is identical to that just described for 13MA103. The locus plotted is in the Des Moines River bottoms at an elevation of 710 feet AMSL. This area is permanently inundated and cannot be further assessed.

13MA112. A site form was also lacking for 13MA112, but it was also recorded by Iowa State University personnel (Gradwohl and Osborn 1974b:Table 4). The locus at which this site is plotted was a fallow field in September 1983. It is at the head of a small ravine emptying into the Des Moines River from the north. A single find consisting of the mid-section of a projectile point was located at an elevation of about 840 to 850 feet AMSL in a terraced field. The area was shovel tested, but nothing more was observed. The site is high and far from water. Consequently, it is possible that this was a small, ephemeral site.

13MA114. Data for 13MA114 is also based solely on the Commonwealth visit of the area plotted by the Office of State Archeologist. An isolated projectile point and one flake were located on a developed trail in the plotted area. These finds were within 1 m of each other, and were to the northwest of the head of a small ravine emptying into Lake Red Rock from the southwest. The material was at an approximate elevation of 840 feet AMSL. The area was shovel tested, but no additional material was observed. This site is in the Stu Kuyper trails which were recently developed. It is high and relatively distant from water. It may, therefore, represent another ephemeral, small occupation.

13MA115. The information sources for 13MA115 are the same as for 13MA114. The fairly light lithic scatter numbered 13MA115 is located along the eroding shoreline of Lake Red Rock. This site lies to the east of a small ravine at an elevation of approximately 780 feet AMSL. A very small point of land extends into the lake and has been recently inundated. Debris was collected from the eroded banks on all three sides of the point, yet shovel tests across the upper level surface itself recovered no additional material. However, these may not have penetrated the recent deposition. The site is severely disturbed by recent erosion and deposition. It should also be noted that a till is exposed along the same bank cut. Debris must therefore be sorted carefully since naturally broken cobbles are present.

13MA116. No site form is available for 13MA116. The plotted location is immediately northwest of the head of a small ravine at an elevation of about 820 feet AMSL. The locus is now completely altered by campground development in the Whitebreast Creek Recreation Area. An extensive search was made, but no cultural materials were observed in September 1983.

13MA117. The site form for 13MA117 was also not available. The plotted site area is located on the mid-slope of a point of land southeast of the confluence of Whitebreast Creek and the Des Moines River and at an elevation of about 830 feet AMSL. This area has been developed into the Whitebreast Creek Recreation Area, and the plotted locus has been altered by bulldozing for a paved, terraced campground. No indications of the site were noted at the time of the September 1983 visit.

13MA119. The Iowa State University personnel who recorded 13MA119 noted material washing from the sand bank below the turnaround and picnic shelter at the tip of Whitebreast Creek point. This location is at an elevation of about 770 to 780 feet AMSL. Very little material was observed in 1983, and all materials collected were from the westernmost end of the plotted area. The area is obviously heavily eroded. No shovel testing was conducted on the flat top of the ridge since an obvious fill capped the original sediments.

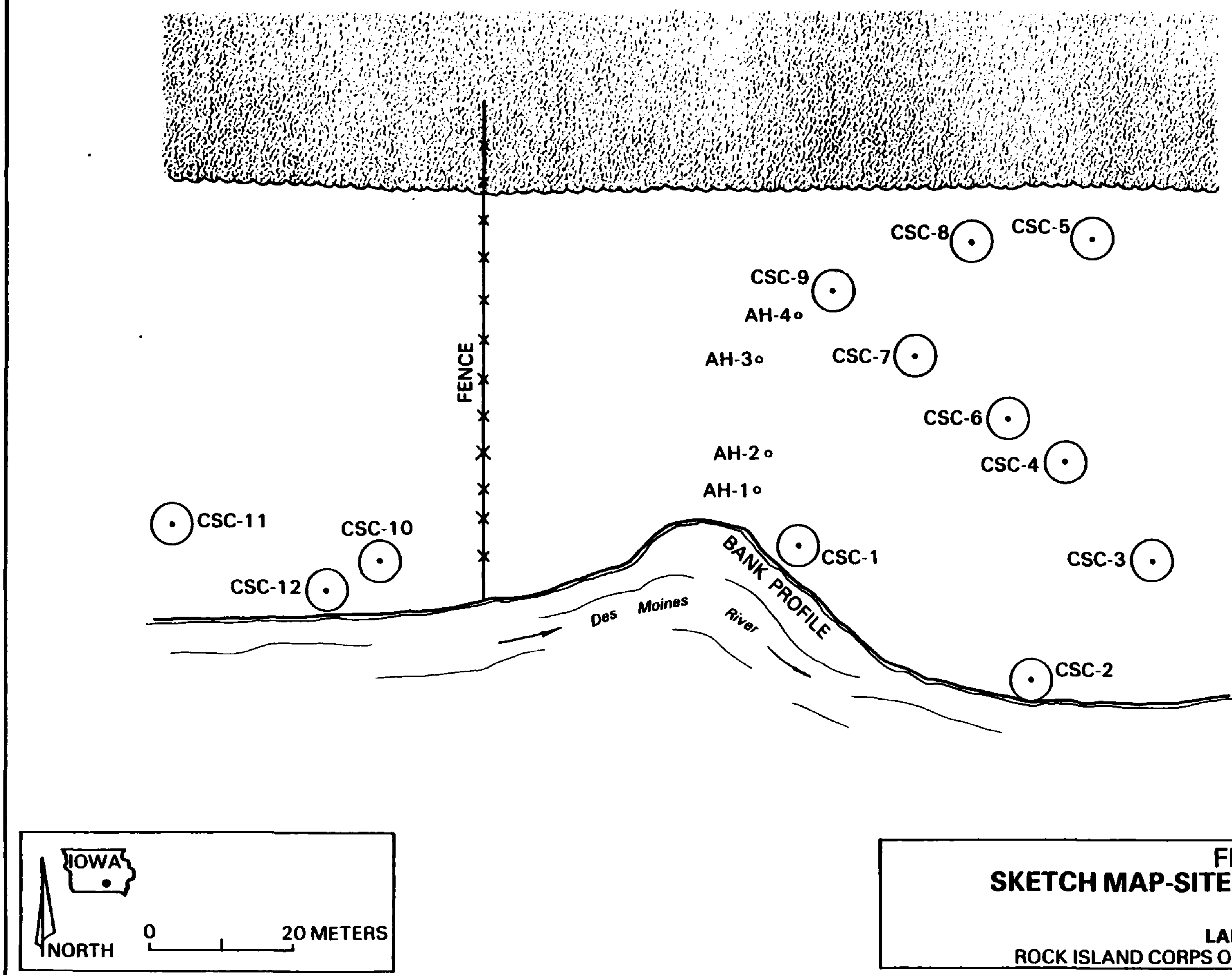


FIGURE 5-1
SKETCH MAP-SITE 13MA44

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

COMMONWEALTH ASSOCIATES, INC

13MA122. Site 13MA122 was recorded by Gradwohl in 1976 and was listed as a Woodland site. It was described as being located at the margin of the conservation and flood control pools of Lake Red Rock (Osborn and Gradwohl 1976:3). The site is a moderate scatter of cultural material on a small lobe of land at an elevation of about 730 to 740 feet AMSL. It is located just south of a boat ramp in the south unit of Elk Rock State Park, and to the north of a small ravine. Actual site size is approximately 100 m x 60 m. The site has been inundated recently and is rapidly eroding into the lake. Footprints criss-crossed the site area, and diagnostic lithics were absent.

13MA123. Previously recorded as a "Prehistoric Woodland" site and described by Osborn and Gradwohl (1976:3), 13MA123 is located on the east side of a small ravine and 400 feet from its mouth. It lies at an elevation of about 740 to 750 feet AMSL. The area has been heavily silted as a result of flooding and no cultural material was observed in September 1983.

13MA127. To the southwest of the confluence of Whitebreast Creek and the Des Moines River is an old river terrace which now forms the Lake Red Rock shoreline. Six sites (13MA127, 13MA162-165, and 13MA167) are located within a half-mile along this shoreline. This area is within the south unit of Elk Rock State Park, and all six sites were recorded during construction monitoring in the park (Osborn and Gradwohl 1976). Site 13MA127 is the northwestern-most site of this group. It is located just north of a fence line (shown on the Otley 7.5 minute quadrangle) and a small erosional cut which creates a small lobe of land overlooking the lake at an elevation of 730 to 740 feet AMSL. The site is a dense scatter of debris which is eroding rapidly along the slope of the terrace.

13MA128. The Rousseau site (13MA128) is located along the wave cut shore of Lake Red Rock at an elevation of 730 to 740 feet AMSL. It is located to the northwest of a boat ramp in the south unit of Elk Rock State Park. The site appears heavily damaged by wave action which rip-rap associated with the boat ramp has not deterred. It was originally recorded as a village site approximately 60 x 400 feet in size and a large collection was obtained from the surface. Only a small amount of material was collected during the 1983 reconnaissance, all of it from along an erosion cut wall of a massive washout in the bank below the ranger station. Material is eroding from the original ground surface and from just below this surface. A lighter sandy fill now caps this surface.

13MA130. A series of seven sites (13MA130, 131, 133, 134, 153, 135, and 136) are located along the north shoreline and near the mouth of Teter Creek between Highway 14 and Old Highway 14. This area is in the westernmost part of Elk Rock State Park's south unit and all sites were recorded during construction monitoring in that park (Osborn and Gradwohl 1976:37). Site 13MA130 is the southernmost of these sites. It is located 300 to 400 feet northeast of Highway 14, south of a ravine, and on a moderately sloping shore at an elevation of about 730 to 740 feet AMSL. The site faces east, overlooking the old course of Teter Creek, and is represented by a light scatter of material near the waterline (730.29 feet AMSL in mid-September 1983). The site appears to be heavily washed and partially silted over. No material was observed at higher elevations.

13MA131. Site 13MA131 is immediately northeast of 13MA130 and separated from it by a small draw. It lies on a gentle to nearly level surface overlooking Teter Creek at an elevation of 760 to 770 feet AMSL. A moderate scatter of lithics and ceramics was observed between the two draws shown on the Otley 7.5 minute quadrangle. The site has been washed over but is not badly eroded.

13MA133. A light lithic scatter is located on a bench shoreline at an elevation of 760 to 770 feet AMSL along the south-southeast wall of the old Teter Creek valley. The site is about 500 feet northeast of 13MA131 and separated from it by a draw. The bench has a moderately steep slope, and stepped erosion has occurred below the site. The site itself is eroded.

13MA134. Approximately 600 to 700 feet northeast of 13MA133 is a continuous scatter of cultural debris (lithics, ceramics) on a flat bench and gentle slope. The site is located at an elevation of 730 to 750 feet AMSL on an old terrace overlooking Teter Creek where it intersects the Des Moines River valley. The fairly continuous scatter is broken only by two draws emptying into the lake.

13MA135. A high (780 to 790 feet AMSL) sandy point lies southwest of the confluence of Teter Creek and the Des Moines River, and on it is site 13MA135. The locus is a steep and heavily eroded bench. A very light debitage scatter was observed overlooking the Des Moines River to the northeast. The site is severely eroded and disturbed by aeolian sand deposition and wave action.

13MA136. The area on which 13MA136 is plotted is now a steep bank (750 to 780 feet AMSL) of Pennsylvanian age bedrock facing east and north over the old Des Moines River channel. Driftwood deposits and a lack of vegetation suggest recent scouring and deposition. No cultural material was observed in September 1983.

13MA153. The plotted location of 13MA153 is about 300 feet southeast of 13MA135 and just south of a ravine at an elevation of about 780 feet AMSL. The beach is fairly steep at this point, but levels off to the south (toward 13MA134). No cultural material was observed. The site may either be buried by deep sand deposits (far too deep to be penetrated by ordinary shovel testing) or it may have been stripped by erosion, which is severe in this area.

13MA162. Southwest of the confluence of Whitebreast Creek and the Des Moines River is an old river terrace which now forms part of the Lake Red Rock shoreline. Site 13MA162 is the second most northerly oı six sites (13MA127, 13MA162-165, and 13MA167) located in a north-south line within a half mile along this shoreline, which forms the northeast edge of the south unit of Elk Rock State Park. The site is about 500 feet southeast of 13MA127 at an elevation of about 730 to 740 feet AMSL. Little material was observed at this particular location, but this slope appears more heavily silted (and eroded) than at other nearby sites. Very small debitage and a large quantity of rock was observed scattered across the surface at the top of the slope.

13MA163. Site 13MA163 lies about 300 feet southeast of 13MA162 and is divided from it by a slight ravine. It is on a low terrace edge southwest of the confluence of the Whitebreast Creek and Des Moines River valleys at an elevation of about 730 to 740 feet AMSL. The debris scatter appears to be densest on the level surface at the top of the slope suggesting that intact deposits remain. The edge of the site has been washed over and is eroding, however. It is also being actively collected as is evidenced by fresh footprints crossing the site when it was visited in September 1983.

13MA164. Site 13MA164 is another of the continuous scatter of sites on a low terrace edge southwest of the confluence of Whitebreast Creek and the Des Moines River. This site is located some 250 feet southeast of 13MA163 and is divided from it by a slight ravine. It appears as a moderate scatter of debris eroding from the sloping terrace edge at an elevation of about 730 to 740 feet AMSL. Some historic ceramics and glass were also observed but not collected. The site is being actively eroded and had been recently collected at the time of the September 1983 reconnaissance.

13MA165. A light lithic scatter numbered 13MA165 was located on the north side of the mouth of a shallow draw as it graded down into the lake. The site is another of the series of sites on a low terrace edge (730 to 740 feet AMSL) southwest of the confluence of the valleys of Whitebreast Creek and the Des Moines River. It is similar to the other sites, and is being eroded by wave action and collectors' footprints were in evidence.

13MA166. A moderate scatter of lithics and ceramics, 13MA166 is located to the southeast of the first ravine encountered when walking northwest up the shoreline from the boat ramp near the supervisor's residence in Elk Rock State Park. The site is located on an exposed surface at an elevation of about 760 to 770 feet AMSL. Erosion is pronounced on the north and east slopes.

13MA167. Site 13MA167 is the southernmost of the series of sites located on a low terrace edge southwest of the confluence of the Whitebreast Creek and Des Moines River valleys. The site is just north of a ravine on a slope at an elevation of 730 to 740 feet AMSL. (It is almost directly across from the Whitebreast Recreation Area.) The site is represented by a scatter of debris along the slope. It is eroding into the lake and had been recently collected when visited in September 1983.

13MA203. Site 13MA203 was recorded as a "campsite" in 1981. No culture-historical identification is listed on the site form, even though several projectile points were collected. The site is severely eroded and is now represented by a few flakes and pieces of fire-cracked rock on a gentle slope at an elevation of just above 730 feet AMSL. It is located just south of the mouth of a stream which formerly emptied into Whitebreast Creek. The location is about one-quarter mile south of Elk Rock State Park. Soil profiles in shovel tests showed about 4 inches of loose silty matrix over clay. The site is very low, and may be adversely impacted by frequent inundation.

13MA205. Site 13MA205 is located in a fallow field, dense with tall weed growth, on a high ridge (800 to 810 feet AMSL) overlooking the Whitebreast Creek valley to the south. The site is about a half mile east of the nearest road. It is well above the conservation pool, and is not endangered by any current activity. The original site form suggests that the site is small and this observation matches the 1983 assessment. Shovel testing was necessary but little material was observed.

13MA207. The Dawson site, 13MA207, was recorded in 1981 as an Oneota village and is a large dense scatter of material located on a raised, mildly undulating floodplain which overlooks an inundated gravel pit to the west. Walnut Creek lies to the east of the site. Cultural debris is eroding out of the gentle slopes at an elevation of about 740 feet AMSL. The material eroding out is often mixed with lag gravels associated with the former quarry operation. The site is north of the Des Moines River channel, and access is from the road between Sections 13 and 14. The site is within a wildlife refuge which was closed to all access during the period of fieldwork. It was not fully evaluated, but while it appears to be undergoing some erosion it is still fairly well preserved.

13MA209. A site recorded in 1982 was also identified as an Oneota village. This site, 13MA209, lies 100 yards east of the dirt road on the edge of a low terrace which extends well out into the Des Moines River floodplain. The elevation is 750 feet AMSL. The location is about 250 yards south of the Des Moines River and immediately north and west of Wildcat Creek. Cultural material is densest in erosional cuts and sandy areas at the edge of the terrace, although material was also observed on the flat surface. Although the site was covered with 20 feet of water in August and has been similarly inundated in the past, it is generally well preserved; only slight erosion is occurring. The area is, however, presently receiving a variety of uses. Dirt bike tracks liberally covered the surface at the time of the September 1983 visit and other recreational activity is heavy in this part of the lake.

13MA210. Site 13MA210 is a small, but fairly dense scatter of lithic debris located in a fallow, slightly sloping field at an elevation of about 750 feet AMSL. The site overlooks the Des Moines River channel to the north, and a road lies about 300 feet to the west. A very light scatter of lithic debris was observed in a small area.

13MA212. Site 13MA212 is located at an elevation of approximately 750 feet AMSL along the east edge of a small, low ridge extending into the Des Moines River bottoms. It was first recorded in 1982 but its cultural affiliation was not identified. It is now represented by a moderate scatter of tools and debris on the slope and the top of the ridge. Some historic materials were also observed but not collected. The area of the scatter is about 100 m (north-south) x 50 m (east-west). Access to the site is from a gravel road 100 yards to the south. (Note: The site is mis-plotted on the quadrangle maps obtained from the Office of State Archeologist. It is actually located a little farther west of where it is plotted and lies on the east side of the rise, not on the flat.)

13MA213. This site was originally recorded as a village site, but appeared in September 1983 as a light density scatter on the edge of a low sandy terrace (ca. 750 feet AMSL) in the Des Moines River bottoms. The observed area of scatter was about 60 m x 100 m. The terrace is near the edge of a wildlife refuge northeast of Swan. Access is via an unnamed road 350 feet to the west. Footprints were apparent on the site, possibly suggesting that an unauthorized collector had preceded the Commonwealth crew to the site.

13MA215. This site was previously recorded (1982) as a village site. The cultural affiliation was unspecified although a small side-notched triangular point was listed as having been collected. It appeared in September 1983 as a small, light density scatter on top of a ridge formed between the Des Moines floodplain to the north, and a tributary stream/ravine to the south. The site is located in a cornfield at an elevation of about 800 feet AMSL at the head of a small draw leading into the tributary stream. The site is high and in no danger of further impact except via continued cultivation.

13MA216. Site 13MA216 was also originally recorded as a village site, but also appeared as a light scatter of debris in September 1983. It is located on a low sand ridge at an elevation of 745 feet AMSL along an old creek channel about three-quarters mile west of the confluence with the Des Moines River. The estimated size of the site is about 200 feet x 300 feet. The site lies in a washed fallow field with access from a road between Sections 21 and 22 (600 feet west of the site). It has been disturbed by recent washing and sedimentation, and footprints were apparent at the time of the Commonwealth visit.

13MA217. The previous description of 13MA217 lists only flakes in the collection. The site is located south of the Des Moines River on a small sand knoll rising slightly above the surrounding floodplain at an elevation of about 750 feet AMSL. Sugar Creek flows approximately 400 to 500 feet to the north of the site. No prehistoric material was observed, but historic materials including cement, brick, crockery, whiteware, glass and metal were noted. The site lies in a fallow, washed field, and has been disturbed by sedimentation.

13MA219. Site 13MA219 is the first of eight prehistoric sites which were newly recorded by Commonwealth during this project. A moderate scatter of lithics and ceramics was visible along the south slope of a small point of land extending south into Lake Red Rock. The material was observed along the eroding shoreline at an elevation of about 745 to 765 feet AMSL. The estimated size of the site is about 100 m x 30 m. No material was visible on the surface of the flatter top of the ridge.

13MA220. Another lithic scatter is eroding from the north shoreline of Lake Red Rock, about 300 feet west of a small ravine. The site area measures about 10 m x 100 m and is on a wave cut bench at an elevation of approximately 750 to 760 feet AMSL. The site is rapidly eroding.

13MA221. A low conical mound was located on top of the north bluff of the Des Moines River about 100 feet east of a fence line which runs along a section line near the head of a small, but deep, ravine. It is on a level surface at an elevation of approximately 840 feet AMSL, in an area of dense second growth seedlings and briars. The mound is about four feet high, and has a , ›t hole in the middle. It is otherwise well above the flood pool of Lake Red Rock and does not appear to be in danger of impact by any current activities.

13MA222. Site 13MA222 is a small, light density lithic scatter located on a high knoll (880 feet AMSL) on a narrow ridge between two ravines on the north shore of Lake Red Rock. The site is located in a terraced, fallow field and covers an area approximately 10 m (east-west) by 20 m (north-south). It has probably been disturbed by the terracing. The site is far from water, both vertically and horizontally, and is similar in location to other rather small ephemeral sites in the general area. It appears to be in no danger of further impact at this time.

13MA223. On a sand ridge along an old creek channel is a small scatter of cultural material designated 13MA223. This scatter covers a low ridge in a fallow field, approximately three-quarters mile west of the confluence of the creek with the Des Moines River and at an elevation of 745 feet AMSL. A road runs north-south along the section line just west of the site, and a drive access from this road into the field borders the west edge of the site. Site 13MA216 lies about 150 m to the northwest. The site area has been disturbed by sedimentation as a result of flooding, and the area had been recently used for target practice in September 1983.

13MA224. This site appears to be a small (40 m x 60 m) light density lithic scatter. It is located on a knoll in a fallow field on the Des Moines River floodplain at an elevation of about 750 feet AMSL. The site lies slightly east of 13MA213, and is separated from it by a lower swale which contained no material. An old, small creek bed borders the site to the east, and some cultural material was observed to be washing downslope into it. Footprints liberally covered the site suggesting the Commonwealth crew had been preceded to the site following the August high-water.

13MA225. Along a low terrace at an elevation of 750 feet AMSL, and just north of Sugar Creek is another low density lithic scatter. The scatter is in a fallow field and follows the slope along Sugar Creek, in a band about 10 m wide (north-south), from just east of the road to a point about 200 m to the east. An old foundation east of the road is the practical limit of the scatter. Footprints were again noted on this site.

13MA226. This site is a small (30 m x 30 m) scatter on the highest part of a lobe of land which projects northeast into the mouth of the Whitebreast Creek valley; southwest of the confluence of the Des Moines River and Whitebreast Creek. The site is in a fallow field about .25 mile east of a two-track road and is 70 to 100 m north of a ravine. It is at an elevation of approximately 755 feet AMSL, and has been subjected to recent flooding. Some disturbance by erosion and siltation was noted.

COLLECTIONS ANALYSIS

The primary objectives of the analysis of the Lake Red Rock collections were to: 1) isolate artifacts that could potentially be identified to a named cultural-historical type or at least equated with a particular period (e.g., Late Archaic, Late Woodland, etc.); 2) evaluate the nature and diversity of the asemblages, insofar as possible, to assess general site type and function, and 3) evaluate the technologies represented to establish the potential for isolating temporally sensitive trends or providing data that may be of use in addressing research questions which cross-cut time and space. Overall project objectives (described in Chapter 1) would suggest, however, that only the first of these collections analysis objectives be given detailed attention and that the second and third objectives be treated at a rather general level at this point.

Collections were initially sorted into the major categories of lithics, including chipped stone and ground stone, ceramics, historic material, bone, and rough rock. Each class was then subdivided into several categories for both cataloging and analysis purposes. Analytic routines were then selected to be appropriate for the category and responsive to the analytic objectives. Categories and analytical procedures are described for each class.

Lithics - Chipped Stone

The lithics collections from the Lake Red Rock sites are not particularly large but are, of course, of major importance for addressing all three collections analysis objectives. Chipped stone tools and debitage comprise by far the majority of the lithics.

Chipped stone was divided into six major traditional classes: projectile points, bifaces, unifaces, cores, utilized flakes, and unmodified debitage. Basic tabulation and cataloging of the collections was accomplished at this level of division. Each class was then further subdivided into appropriate categories and various morphological, technological, and functional attributes recorded and described.

Projectile Points

The chipped stone class of greatest utility for culture-historical purposes is the projectile points. Unfortunately, it is this same class that holds the greatest attraction for artifact collectors. The number of footprints crossing many sites and the scarcity of projectile points on these same sites suggests that the fresh exposures created by recession of the August high water levels provided an irresistible temptation to many collectors. In fact, in one instance we observed a trail of footprints interrupted by parallel prints suggesting the walker had paused, and, sure enough, in front of one foot was an impression in the mud in the size and shape of a triangular projectile point. This particular trail of footprints continued across six sites. The Commonwealth crew collected only two badly broken point fragments from these six sites. This and other pieces of circumstantial evidence suggest that the collection of projectile points is extremely biased.

A projectile point is here defined as a bifacially worked chipped stone tool with provision for hafting (notching, constriction, grinding) on one end and with lateral margins meeting in a point at the other end. Broken specimens are included if they possess the traits on the remaining portions that suggest placement in this class would be correct. Specimen elements here designated include: lateral margins, base, haft, blade, notches, shoulders, and barbs. Definitions of these elements follow those of Binford (1963).

The major dimensions, including length, maximum width, basal width, haft length, thickness, notch width, and notch depth were measured for descriptive purposes and comparison with published descriptions of similar specimens. Qualitative observations were then made of lateral margin morphology (straight, concave, convex), base morphology (straight, concave, convex), notch placement (side, corner), extent of chipping, condition (unbroken, location of fracture if broken), basal thinning, and basal and lateral haft margin grinding. Typological identifications were made using the archeological literature for Iowa and the surrounding states.

A total of 26 projectile points were collected. This total includes only 5 complete specimens, 8 proximal fragments, 5 fragments, broken both just above the notch and longitudinally through the haft or which for convenience will be referenced as corner fragments, 2 blade tip fragments, 1 specimen retaining the tip and a portion of the base, but missing one proximal corner, 3 medial segments, 1 barb fragment, and 1 specimen apparently broken obliquely across the blade and haft and subsequently reworked along the fracture. Specimens are here described by morphological classes which may include specimens from several of these breakage categories.

Triangular unnotched. (Pl. 5-1, a-c). The single most common projectile point category is that of triangular unnotched points. Four complete specimens, three proximal fragments, and the fragment missing only one basal corner are included in the Commonwealth collections. Complete or reconstructable lengths of 6 specimens range from 18.5 to 30.4 mm ($\bar{x}$ = 24.6), maximum widths which occur near the base of all 8 specimens range from 11.3 to 17.5 mm ($\bar{x}$ = 14.7), thicknesses of 8 specimens range from 2.4 to 4.6 mm ($\bar{x}$ = 3.5). Lateral margins are straight to slightly convex; bases are similarly straight to slightly convex except on one specimen where it is slightly concave. Flaking covers the entire surface of both faces except on one specimen where about one-third to one-half the area is unflaked.

Triangular unnotched specimens are associated with late prehistoric occupations in Iowa. They occur in Late Woodland context (e.g., Benn 1980:103) but are the predominant form on Oneota sites (Alex 1980:73; Osborn 1982:41; Straffin 1971:15; Harvey 1979:81; et al.). The dimensions of the six specimens described here are completely consistent with those reported by Osborn (1982:41) for specimens excavated at the Clarkson site in the maximum flood pool of Lake Red Rock in Warren County, with the sample described by Straffin (1971:46) from the Kingston Oneota site in Des Moines County, and presumably from other sites as well. The presence of flake scars across both surfaces is also characteristic of the Kingston specimens (Straffin 1971:15; cf. also Henning 1970:43, who reports that this is also characteristic of specimens from Oneota sites in Missouri, and Harvey 1979:81, who makes the same comment regarding specimens from northwest Iowa), but from published illustrations (Osborn 1982:42) may not necessarily be characteristic of specimens from the Clarkson site.

Side-notched triangular. (Pl. 5-1, d). Two proximal fragments are broken across the blade and can be clearly identified as portions of side-notched triangular points. The blade fracture on one specimen makes it impossible to reconstruct the length; a reconstructed length of the second specimen is approximately 16 mm, although beveling suggests that earlier breaks had been reworked and that the specimen had been shortened from its original dimension. Maximum widths are 11.8 and 12.3 mm, while basal widths are 11.8 and 12.1 mm. The thickness of each specimen is 3.0 mm. Small elliptical side notches range from 2.0 to 2.4 mm deep and 2.1 to 2.5 mm wide. They are placed moderately high on the margins, leaving the specimens with hafts 8.4 and 9.9 mm long. Lateral margin morphology cannot be reliably determined, bases are slightly

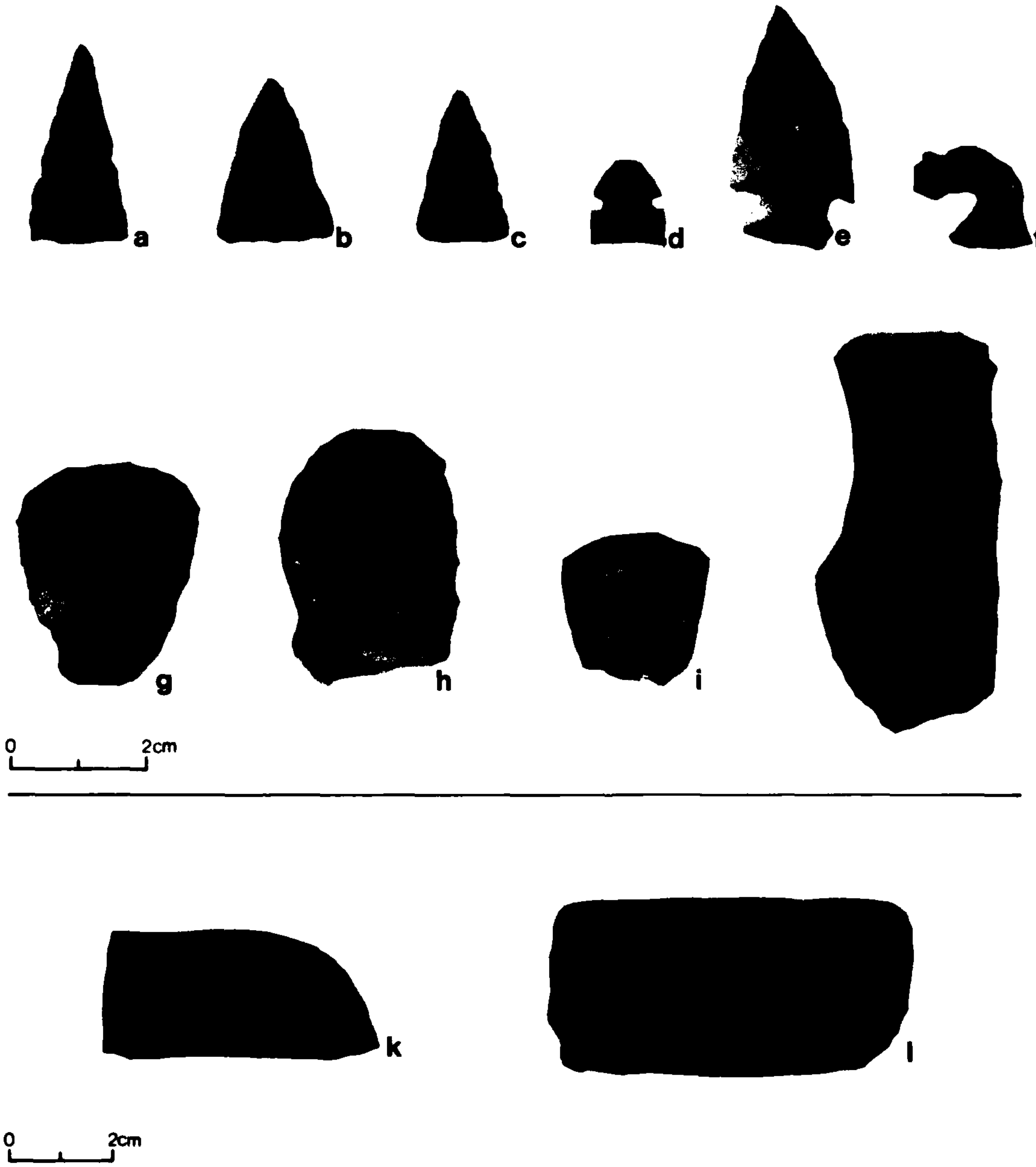


PLATE 5-1
SELECTED LITHIC ARTIFACTS

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

concave and meet the lateral margins of the haft at well-defined corners. Like the unnotched triangular points, these specimens exhibit flaking all over the surface.

Side-notched triangular points are also common in the late prehistoric period in Iowa and beyond. They regularly appear on Oneota sites, but always in very small numbers (e.g., Osborn 1982:41; Straffin 1971:15; Harvey 1979:81, 145; Hall 1962:37). They also appear in Late Woodland context (e.g., Benn 1980:102-103; Logan 1976:111), and in the assemblages of other late prehistoric complexes in Iowa (Alex 1980:74).

Corner-notched. One complete specimen is a corner-notched point of uncertain type. Two corner fragments are definitely from corner-notched specimens, one of which is probably Middle Woodland. The single barb fragment is also likely from a corner-notched specimen; and one proximal fragment is also likely from a Middle Woodland specimen.

The complete specimen (Pl. 5-1, e) is 36.0 mm long of which 9.4 mm is haft length, 19.1 mm in maximum width, but 12.8 mm wide at the base, and 6.2 mm thick. The elliptical notches are placed at about a 45^{o} angle to the long axis and are 4.2 to 4.4 mm deep and 4.5 to 5.0 mm wide. The blade is asymmetrical with one nearly straight and one convex lateral margin meeting in a tip displaced so far from the center of the point that it is perpendicularly above one notch. The base is only very slightly convex and is lightly ground. The barbs over the notches are sharp but short. The specimen has not been identified.

One corner fragment (Pl. 5-1, f) is probably from a Middle Woodland Snyders group point. None of its dimensions are measurable or reconstructable except the haft length which is not too much longer than 10.7 mm and the notch dimensions which are 7.7 mm deep and 5.3 mm wide. Base morphology is entirely indeterminate, but the remaining section of the one finely chipped lateral margin suggests that it was almost certainly convex. The deep moderately narrow notch is generally elliptical with one side of the ellipse flattened.

A proximal fragment, perhaps more accurately described as a basal fragment is perhaps also from a Snyders group or related Middle Woodland point. The specimen is broken across the haft element, leaving the 28.0 mm basal width the only measurable or reconstructable dimension. The basal margin of this point is convex. The lateral margins of the haft are slightly concave and converge distally, suggesting that the original specimen had the deep elliptical corner-notches typical of Middle Woodland specimens. Some pink coloration near the base does not seem to be characteristic of the raw material but rather is probably a result of heat treatment during manufacture, a trait also characteristic of Middle Woodland specimens in the Prairie Peninsula (e.g., Struever 1973).

Another corner specimen has a haft length of 9.7 mm, and a hyperbolic notch 3.0 mm deep and 7.2 mm wide. No other dimension is measurable or reconstructable. Neither the basal nor the lateral margin morphology could be determined. The fragment is unidentifiable.

One very small fragment was determined to retain a section of a lateral margin and notch and to be a barb fragment, albeit one on which the end of the barb is missing. The presence of the barb indicates that the specimen is almost certainly from a corner-notched point. No dimension is reconstructable, but it is notable that the thickness of the small fragment is 5.5 mm, suggesting the original specimen was of moderate size. The retained lateral margin section is straight and evenly chipped. The type cannot be determined from such a fragment.

Side-Notched. Two proximal fragments, two corner fragments and one medial segment are portions of side-notched specimens. The obliquely broken and reworked specimen was also originally a side-notched point. None of these specimens can be identified with any certainty and no two are very much alike. Each specimen is therefore described individually.

The largest specimen represented in the entire collection is the proximal portion of a side-notched point. It is broken across the proximal portion of the blade, leaving its lateral margins of indeterminate form. The shoulders are rounded above parabolic notches at least 5.7 mm deep and 9.4 mm wide. The haft element is 16.1 mm long. An oblique fracture proceeds from the apex of one notch to the base, thus removing one corner. The other corner is also broken. The remaining portion of the base is straight. The specimen is rather casually manufactured. One face shows very little chipping except along the edges, the other face likewise reveals a minimum of chipping, although flake scars do cover most of the face. This specimen is not identifiable.

The other proximal section is also broken transversely across the proximal portion of the blade and has lateral margins of indeterminate form. The notches are 8.5 mm wide but only 2.5 mm deep, joining the lateral margins of both the blade and the haft element at distinct, but not pronounced shoulders. The base is concave. The specimen is 18.8 mm wide and 7.7 mm thick, giving it a thick biconvex cross-section. This specimen is not identifiable with certainty, but it bears some resemblance to Matanzas points first described by Munson and Harn (1966:153-154) in the central Illinois River Valley in Illinois and now known from throughout central and northern Illinois (e.g., Cook 1976; Mayer-Oakes 1951; Schnell 1974:27-28) and the Mississippi valley in the Illinois-Iowa border area (e.g., Boszhardt and Overstreet 1983:164). Matanzas points have been securely dated to the Middle Archaic period in Horizon 6 at the Koster site in Greene County, Illinois, where six dates average 5220 B.P.±37 (Cook 1976:70).

A corner fragment from a side-notched point may belong to the Middle Archaic small side-notched point tradition. No measurement of this specimen is complete or reconstructable except that the haft is not much more than 13.1 mm long and one notch is 6.9 mm wide and 3.9 mm deep. Lateral margins are of indeterminate form and the base is slightly concave and has an "earred" appearance.

Another corner fragment is not unlike that just described. The haft element of this specimen is 12.7 mm long and the one remaining notch is 5.1 mm wide and 1.8 mm deep. The lateral margins are of indeterminate form; the base is concave.

A specimen correctly classed as a medial segment since it retains neither the tip nor the base does retain one notch and part of the other and is almost certainly from a side-notched point. Measurements are not accurately reconstructable, but it is apparent that the specimen would be considered at least medium sized, since a rough extrapolation of its original length is around 50 mm. The nearly semicircular notch is 2.7 mm deep and 7.7 mm wide. A remaining portion of the lateral margin is convex; basal morphology is indeterminate. The specimen is not identifiable.

One specimen was once broken obliquely from one lateral margin across to the base at a point likely near the opposite notch. The fracture was subsequently steeply reworked on one face only. The specimen is now 23.2 mm long, 19.3 mm wide at the base which is the point of maximum width, and 5.6 mm thick. The haft length is 11.3 mm. The one remaining notch is 6.5 mm wide and 2.2 mm deep, i.e., of similar measurements and proportions to the two specimens just described. Both lateral margins are of irregular morphology; the base is generally convex but also somewhat irregular.

An additional fragment retains nothing much but a notch and some of its surroundings. The notch is 2.3 mm deep and 6.8 mm wide. The specimen is apparently heavily water-worn and is completely unidentifiable.

Two fragments are distal fragments retaining only the tip and sections of the lateral margins of the original specimen. Both represent breaks through the blade. Both are completely unidentifiable although one fragment is clearly from a rather small but well-made specimen.

The final two specimens are medial segments. Both represent breaks across the blade and retain no portion of the haft element. Both are completely unidentifiable. One specimen is of a very grainy chert and appears burned.

The identifications of all projectile points are summarized in Table 5-1. This tabulation shows that of the 26 specimens only 14 could be placed within any temporally identifiable or tentatively identifiable categories. These 14 specimens were collected from just nine sites. While ceramics will be useful for further identifying Woodland and Oneota sites, the paucity of projectile points seriously biases the analysis against the identification of Archaic sites.

Bifaces

Bifaces are here defined as any chipped stone tool, or fragment thereof, exhibiting chipping extending onto both faces of the artifact and lacking any obvious provision for hafting. The Lake Red Rock collections include 17 such tools - most of them fragmentary. This class of artifacts is here described by dividing the aggregate among a set of categories defined by morphological and breakage criteria. Although about 20 classes are theoretically possible by combining edge morphology and breakage, not all are observed in the present collection. The category definitions included in this discussion are therefore limited to forms actually observed in the collection.

Circular. One complete specimen is nearly circular. The longest dimension is 38.5 mm, the width measured along a perpendicular axis is 36.1 mm.

TABLE 5-1

PROJECTILE POINT IDENTIFICATIONS

Site Number	Side-Notched Middle Archaic	Corner-Notched Middle Woodland	Triangular Side-Notched Late Woodland	Triangular Unnotched Oneota	Side-Notched Unidentifiable	Corner-Notched Unidentifiable	Unidentifiable Fragments
13MA44	-	-	-	1	-	-	5
13MA80	1	-	-	-	-	-	-
13MA81	-	1	1	2	-	-	1
13MA112	-	-	-	-	-	-	1
13MA114	-	-	-	-	-	-	1
13MA119	-	-	-	1	1	-	-
13MA131	-	-	1	-	-	-	-
13MA166	-	-	-	-	-	-	1
13MA167	-	1	-	-	-	-	-
13MA207	-	-	-	1	-	-	-
13MA209	-	-	-	2	-	-	-
13MA212	1	-	-	1	-	1	-
13MA213	-	-	-	-	-	-	1

Thickness is 16.9 mm. The cross-section is asymmetrically biconvex, i.e., one face is considerably more convex then the other. This is partially a result of an apparent difficulty experienced by the maker when attempting to thin the specimen.

Ovoid. The second complete biface is a specimen with slightly convex lateral margins that converge at a well-rounded distal end. The juncture of the slightly convex proximal edge with the lateral margins is likewise at well-rounded corners, one of which is irregular by virtue of a large inclusion in the raw material. Total length is 33.4 mm, width is 24.0 mm, and thickness is 7.4 mm. Cross-section is generally biconvex with one face slightly more arched than the other.

The only other complete biface is a specimen that is not continuously flaked on either face; rather, it has received only chipping around the edges. Nevertheless, the chipping is continuous along the lateral margins of both faces and the specimen does meet the criteria for classification as a biface. The lateral margins are asymmetrical, one being concave, the other convex. The margins do, however, converge to a point. The base is continuous with the lateral margins, with the chipping interrupted where the striking platform of the original flake. Length is 26.8 mm, width is 20.2 mm, and thickness is 4.3 mm.

Rounded end segments. This category contains three specimens and is defined as a specimen truncated by a single transverse fracture, but which retains portions of both lateral margins and an end that is convex and meets the lateral margins in rounded corners. While all specimens fit this definition they are of disparate size. The smaller specimen is 16.8 mm long, 16.2 mm wide, and 4.1 mm thick. It is plano-convex in cross-section and may have been heat treated. The other specimen is considerably larger but broken not far above the remaining end. The fragment is 23.4 mm long, but 37.4 mm wide, and 14.5 mm thick. The cross-section is biconvex and the specimen may have been heat treated. The final specimen is intermediate in size with dimensions of 16.2 mm long, 30.7 mm wide, and 7.0 mm thick.

Longitudinally broken end segment. This category is defined by the same criteria as the category just described except that the specimens are also longitudinally fractured. Three specimens fit these criteria. Two are from small specimens and display fine chipping. Thicknesses are presently 5.3 and 5.8 mm and cross-sections are plano-convex. The third specimen is from a rather larger specimen 6.9 mm thick and rather more coarsely chipped. Its cross-section is plano-convex.

Edge segments. Edge segments are defined as retaining a portion of one margin, presumably a lateral margin, and to be truncated either by two transverse and a longitudinal fracture or two converging transverse fractures. The Lake Red Rock collections contain eight specimens meeting these criteria. The fact that this represents almost half the bifaces in the collection is perhaps indicative of some bias, but, as will be discussed in a later section, may also be reflective of the technological tradition of the central Des Moines River valley.

The ten specimens range from a rather tiny fragment retaining a portion of the edge to specimens with broken dimensions of over 30 mm and clearly from well made larger tools. At least four specimens were probably heated at some time and the crenated fractures (cf. Purdy 1975:137) on two of them suggest breakage as a result of overheating.

The final two bifaces are irregular fragments that may be from projectile points but which are now sufficiently broken that identification is difficult. One fragment may be from an irregularly formed contracting stemmed point that is now damaged by transverse and other fractures. The other fragment could be from a longitudinally fractured haft of a side-notched point. If so, the blade is terminated just above the notch and the fracture is reworked to a straight and blunt edge.

Unifaces

Unifacial tools are distinguished from bifacial tools by having been worked on only a single face. A total of 11 such tools are included in the Lake Red Rock collections. They are here considered to fall into three categories: end scrapers, side scrapers, and uniface fragments.

End scrapers. (Pl. 5-1, g-i). The majority of the unifacial tools are describable as end scrapers; six such tools were collected. These artifacts are defined as being not only unifacially formed, but as also possessing a steeply beveled edge on an end, i.e., a margin perpendicular to the long axis of the tool.

All specimens meeting these criteria are manufactured on thick flakes. At least one of these was derived from a water-worn cobble and retains cobble contex on about two-thirds to three-quarters of the dorsal surface. Another specimen also retains cortex on a portion of the dorsal surface. All specimens have a keel, formed either by the cortex or scars of previous flake removals, following the long axis of the specimen. Lengths vary from 22.4 to 38.2 mm ($\bar{x}$ = 26.4) although 4 of the 6 vary from 32.7 to 38.2 mm. Widths range from 21.6 to 27.0 mm ($\bar{x}$ = 24.8); thicknesses vary from 4.5 to 14.4 mm ($\bar{x}$ = 9.4). Angles of the distal (i.e., working) edge vary from 65° to 110°. The morphology of the working edge and lateral margins varies. On five of the six specimens the distal edge is convex and meets the lateral margins at rounded corners, sometimes sufficiently rounded to form a continuous curve. Two of these five then show an additional working edge with 70° angles on the right side (when viewed with the dorsal surface up and the distal end away from the observer). The sixth specimen also has a convex working edge, but it intersects the lateral margins at pronounced corners. These lateral margins are very straight, appear to also have beveled edges with angles of about 70°, and are worn smooth. All six scrapers exhibit minute step fracturing and edge rounding on the working edges.

Side scraper. (Pl. 5-1, j). A single specimen is defined as a side scraper. This class is defined by similar criteria to the end scrapers except that the working edges are parallel to the long axis of the specimen. The single specimen collected is 59.6 mm long, 27.4 mm wide, and 7.6 mm thick. Both lateral margins are worked. One is straight and has an edge angle of 65°; the other is concave and also has an edge angle of 65°.

Uniface fragments. Five specimens are simply fragmentary unifaces; a category which is essentially a residual category comprised of fragments of tools that were worked on only one face. All fragments retain portions of edges with angles varying from 55° to 100°.

Utilized Flakes

Utilized flakes are unifacial tools in one sense, but are distinguished from the tools just described in that working is confined to a single row of scars on one or more edges of the artifact. Retouch or use may or may not be continuous along the edge.

The Lake Red Rock utilized flakes were analyzed on the basis of edges. Each tool was oriented with the dorsal side up and the striking platform toward the observer. It was then considered to have four edges: A - left lateral, B - right lateral, C - distal end, and D - proximal end. The edge angle of each worked edge was recorded; by default, therefore, the number of worked edges was also recorded.

A total of 23 utilized flakes were included in the collection. These tools have a total of 92 edges of which 39 (42.4 percent) were actually worked. About half the tools (n = 12) had only one worked edge, 8 had two worked edges, one had three worked edges, and two specimens had use or retouch on all four edges. Lateral margins were the most frequently used (13 of one, 14 of the other), the distal end (n = 10) was the next most commonly used edge. Only two specimens were used on the proximal end.

Edge angles were measured using a goniometer. Since this is not necessarily the most precise technique for measuring edge angles (but not the least precise either, see Dibble and Bernard 1980) measurements were recorded to the nearest 5 degrees. A cumulative graph of the distribution of angles of the lateral and distal edges is portrayed in Figure 5-2. It is apparent that the majority of the lateral edges are 50° or greater, and the distal ends are often even steeper. Both utilized proximal ends have angles of 70° which probably is at least partially a function of the steepness of the striking platform of the original flake.

Cores

Cores are defined as chipped stone artifacts from which flakes have been removed from multiple faces and often in multiple directions. They may serve as the source of flakes for manufacture or themselves be the object of reduction to a tool form.

The total number of cores collected during the Lake Red Rock reconnaissance is 47. This rather large aggregate of artifacts can be divided into four groups: split cobbles-bipolar cores, cores of tabular material, bifacial cores, and core fragments.

Split cobbles - bipolar cores. The majority of the specimens, 33 of 47, were classed as split cobbles - bipolar cores. In virtually all cases the specimen is a glacial or water-worn cobble which has been split or from which flakes have been removed. Cobble cortex remains on all specimens, sometimes covering a large part of the surface. The technology involved in manufacture will be more fully discussed in the lithics discussion section; for present purposes it is sufficient to note that splitting or flake removal is accomplished by holding the cobble on an anvil and striking a direct blow with a hard hammer. The resulting force will split the cobble, remove flakes from both ends simultaneously (thus producing opposing bulbs of percussion and ripple marks), remove flakes of varying length, or do little harm to the cobble except to produce some battering and perhaps very small flakes. Which of these effects will result depends on fracture plans or inclusions in the cobble, the direction and amount of force, and accuracy of the blow. Since a well-aimed blow striking a cobble of homogeneous material with sufficient force will travel the length of the specimen, it is a means of maximizing use of small pieces of raw material.

It is because of the potential variability in the results of an attempt to fracture a cobble that the specimens in this category are placed together. In fact, all of the possible results are observable in the present collection. Split cobbles and variable length flake removals are the most common, but specimens with flakes removed from two directions and scarcely damaged cobbles are both present. The goal of the present analysis was simply basic description of the collection and general technological observation; therefore, a detailed accounting of the technology was not produced. The only measurement taken was length which in this case did not necessarily refer to maximum length of the specimen, but rather to length of the direction of force. Lengths range from 18.6 to 61.4 mm with a mean of 32.5, standard deviation of 10.2, and median of 31.2. Figure 5-3 shows, however, that these central tendency measures are slightly misleading and the majority of the cores are 35.5 mm or less in length.

Cores of tabular material. Only a single specimen was considered to be a core of tabular chert. It retains some weathering on one surface but this may be from solution in old fracture planes. All flakes are removed from a single direction and from an apparently prepared surface. The angle of the striking platform with the flake scar face is 90°. The core is 35.7 mm long.

Bifacial cores. Four specimens are elongated, thinner cobbles from which flakes have been removed in a manner that resembles bifacial flaking. In two cases, if it was biface manufacture that was being attempted, it was soon abandoned. A transverse fracture on a third specimen may have terminated the attempt to reduce it. The fourth specimen has had large flakes removed across most of both faces but has no additional reduction.

Core fragments. This residual category includes nine specimens with fragments of the edges of core platforms but which were not considered to be whole specimens. In at least one case, the bulb of percussion from removal of the edge from the core is pronounced. Other specimens retain the angularity associated with shatter and may well be essentially fragments that shattered from a core when a blow was struck elsewhere. Their fragmentary state is shown by measurements of lengths along the axis of the flake scars. These lengths range from 10.1 to 30.8 mm for all 9 specimens. The mean length is 19.8 mm, standard deviation is 6.3 mm, and the median is 18.4.

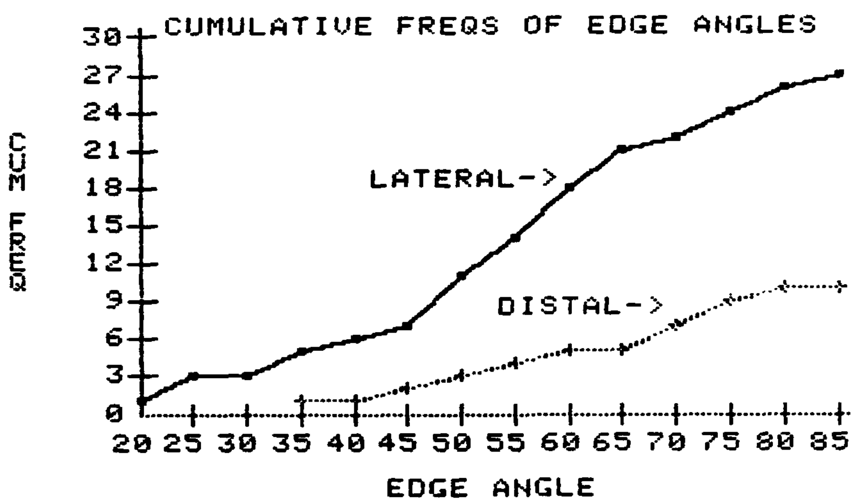


FIGURE 5-2

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

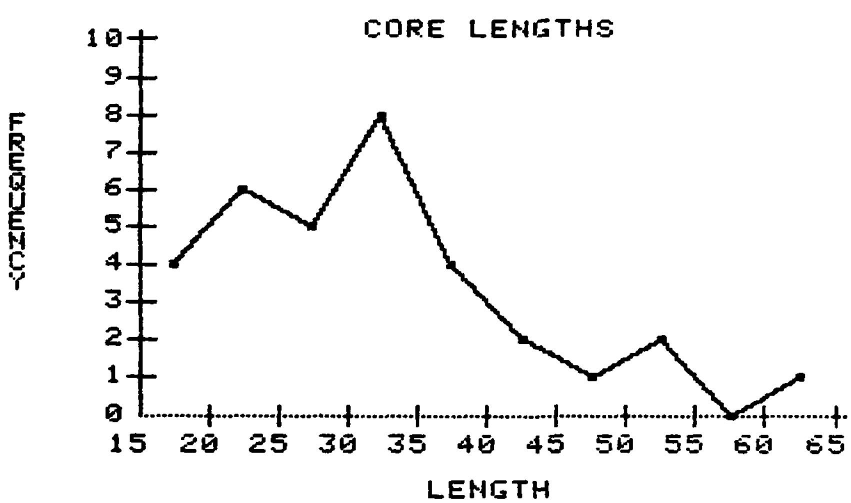


FIGURE 5-3

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

Debitage

Debitage was not systematically collected except at two sites (13MA44, 13MA81) where portions of the exposed surfaces were sampled for reasons detailed in each of the site descriptions. Grab samples were made of debitage from most sites, however. This was done to get an overview of the technology represented at each site.

The aggregate of debitage was sorted into three classes: whole flakes, broken flakes (flake fragments), and shatter. Whole flakes were defined as those retaining a striking platform and positive bulb of percussion and which generally also show ripple marks on their ventral surface (for definitions of flake terminology, see Crabtree 1972). Flake fragments are thin pieces of chipped stone which retain portions of the ripple marks but do not retain the striking platform or bulb of percussion. Shatter is considered to be those pieces of chert which are angular and broken along more or less straight cleavage planes with no bulbs of percussion or striking platforms. All debitage is, by definition, subsequently unmodified.

Broken flakes and shatter were not further divided. The number of items within each class was simply enumerated. Whole flakes were further divided, however, by the simple expedient of size-grading them through a set of nested sorting screens with mesh sizes of 2, 1, 1/2, 1/4, and 1/8 inches.

The relative amounts of debris in each class are summarized for the entire collection in Figure 5-4a. The results are striking. In spite of the fact that the collection was casual, it is biased toward smaller flakes and shatter, probably those classes least likely to be collected under such circumstances. A comparison with the systematic collection from 13MA44 (Figure 5-4b) suggests that the relative frequencies in the entire collection may be reflective of lithic assemblages in the Red Rock area. This is further discussed below.

Lithics - Ground Stone

Only three ground stone tools are included in the Lake Red Rock collections. They are here described individually.

Pitted cobbles. A sandstone cobble has a single pit on each face. The cobble itself measures 70 x 63 mm and is 39 mm thick. The two faces are each naturally flattened and each has a 23 cm diameter circular pit in the center. The pit on one face is 4 mm deep, that on the opposite face is slightly over 2 mm deep.

A second fragment (Pl. 5-1, k) retains a portion of only one face and is broken across the single pit. Diameter of the pit along the fracture is 22 mm, depth is 4 mm.

Grooved abrader. A single grooved abrader (Pl. 5-1, l) is made from coarse sandstone. It is roughly rectangular in plan view and measures 73 mm long and 35 mm wide. Its maximum thickness is 16 mm. Each face bears a deep U-shaped groove running the entire length of the artifact but at a slight angle to the long axis. The groove on one face is a fairly even 3 mm deep and 8 to 10 mm wide; that on the other face varies from 1 to nearly 7 mm deep and is 9 to 11 mm wide. Grooved abraders are common on Oneota, and other late prehistoric sites in the Plains (e.g., Harvey 1979:85). Although several varieties occur, those with U-shaped grooves were the most common at, for example, the Clarkson site in Warren County (Osborn 1982:48). The morphology of the present specimen and dimensions of the groove are entirely consistent with published dimensions of specimens from, for example, Missouri (Henning 1970:52), the Blood Run site in northwest Iowa (Harvey 1979:149), and the Grant Village site in northeast Iowa (McKusick 1973:46).

Lithics Discussion

A general discussion of lithic technology in the central Des Moines River valley is not to be found in the reports of investigations in the area. It is apparent, however, that one observed aspect in particular of the assemblage has important ramifications for the interpretation of tool morphology and assemblages. This is the response to the scarcity of chippable chert in the valley. This response is manifested in three ways: 1) extensive use of bipolar flaking technology; 2) extensive maintenance and modification of useful tools, and 3) the overall small size of the tools.

Bipolar flaking is a very old technique. It was used during the Middle Pleistocene by inhabitants of Choukoutien cave in China (Oakley 1949:65, 113) and later in many different areas and periods of world prehistory (Bordaz 1970:20). It was only in the early 1960s that it was recognized in New World lithic assemblages from the northern Lake Michigan area (Binford and Quimby 1963). It has since been recognized in additional areas of North America and it is often thought that the major barrier to a wider known distribution is lack of recognition.

Bipolar flaking is actually a very simple technique. The raw material is held on a stone anvil and a hammerstone is used to deliver a vertical blow. The expected result is the travel of the force through the material and its rebound. Flake scars are thus produced at both ends, hence the name bipolar. The ability to detach flakes the length of the raw material suggests it as an ideal means of maximizing the amount of usable edge that can be obtained from small pieces of material. Detailed studies of bipolar cores and bipolar flaking techniques have been presented by Binford and Quimby (1963), McPherron (1967:135-140), and Leaf (1979) among others. The details of core morphology are of less interest here than are the ramifications for interpretation of Lake Red Rock assemblages.

Several noticeable attributes of the Lake Red Rock assemblages are likely related to the use of bipolar technology. One is, of course, the apparent large number of cores. Another is the large amount of shatter and broken flakes in the collections. Third is the fact that the presence of pitted cobbles ("manos") need not necessarily imply food processing as is sometimes assumed. Personal experiments with bipolar flaking have shown that wide, shallow circular pits are readily produced on an anvil stone by repeated placement of cobbles in the same place.

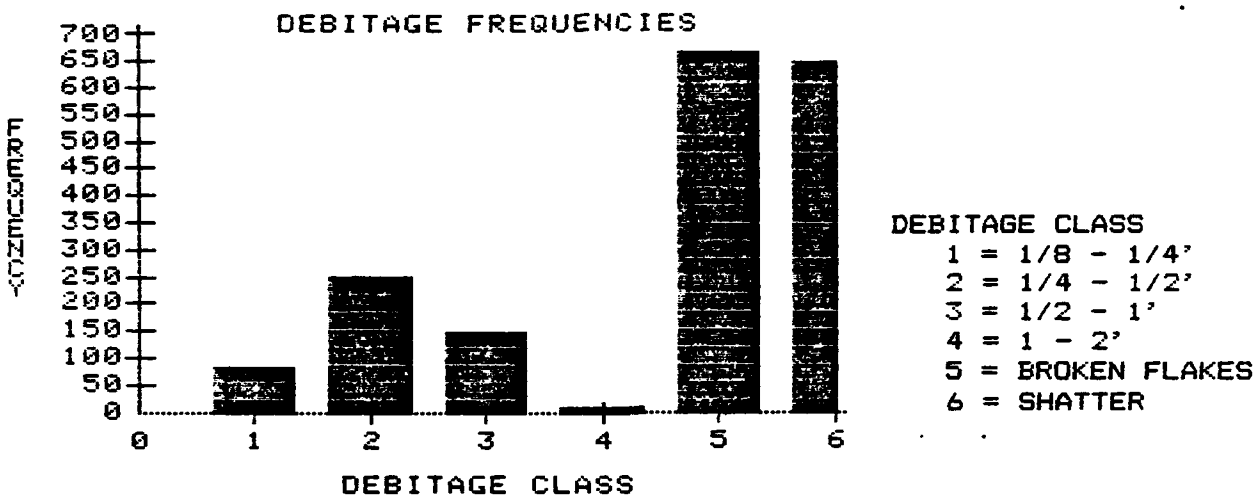


FIGURE 5-4a

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

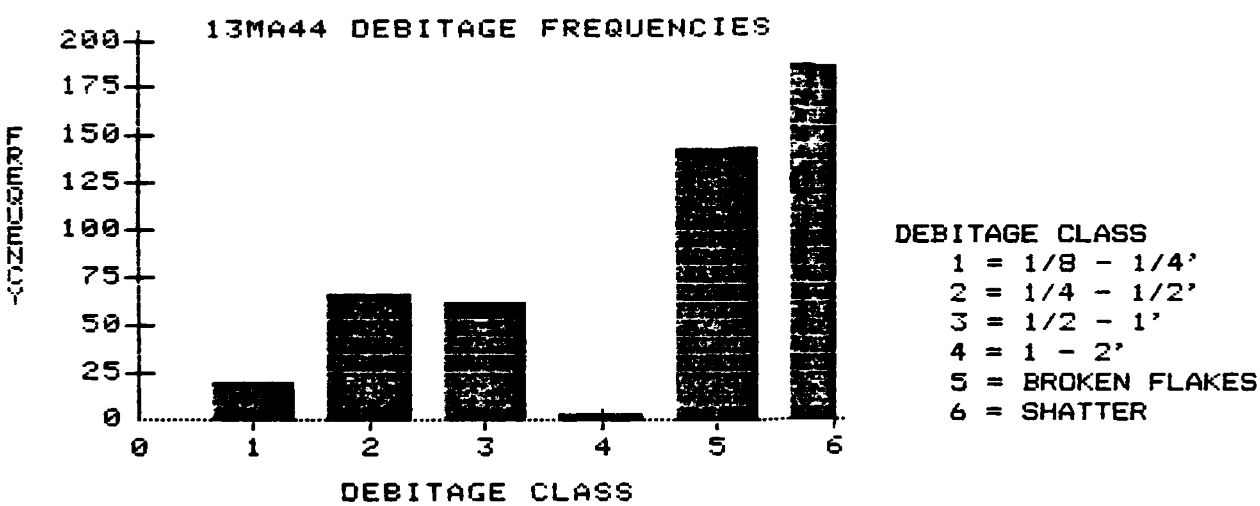


FIGURE 5-4b

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

The effects of maintenance and modification of tools are rather more subtle. The foregoing descriptions make periodic reference to obvious cases of reworking broken edges. The asymmetry noted for several other tools may also have resulted from tool maintenance. The relative paucity of whole tools or even major parts thereof (i.e., the fragmentary nature of the aggregate of bifaces and unifaces described here) also suggests that tools were likely used and maintained ("curated") for as long as possible and that even large fragments were probably reworked to new forms. This behavior would reduce the number of whole tools and large fragments by lowering the probability of a tool being discarded at a given locus.

Finally, we have noted the overall small size of the tools and debitage in the collections. For example, the longest dimensions of 12 complete bifacial and unifacial tools range from 22.4 to 59.6 mm, but only one of these 12 artifacts is longer than 38.5 mm. This calculation excludes the small unnotched triangular points which are expected to be small. Presumably some tools are small for stylistic and functional reasons; nevertheless, the overall sizes are considerably smaller than those observed in assemblages from areas such as the Mississippi and Illinois valleys where large quantities of large blocks of chippable chert are available. This is also reflected in the small size of the debitage and suggests that evaluation of size trends in debitage assemblages for purposes of evaluating site function may be misleading.

This trend has been noted and described in other portions of the Midwest where chippable chert is scarce. For example, Winters (1969) very explicitly discusses the scarcity of large nodules of chert in the Wabash River valley of Illinois and the response used by peoples of the Late Archaic Riverton culture and Roper (1978:28) has noted the same trend in the Sangamon River valley, also in Illinois.

It is interesting to note that the inhabitants of the central Des Moines River valley did not employ one common response to the scarcity of chert, viz., the importation of high quality cherts from outside the valley. The analysis of the Red Rock collections did not include an assessment of raw material types; however, certain raw materials, particularly from southern Illinois and the Crescent Hills area of east-central Missouri, were widely circulated and used during the Middle Woodland period in particular and none of these materials were observed in the Lake Red Rock collections.

Ceramics

Even more useful for addressing the first objective for analysis of the collections (i.e., isolation and identification of temporally diagnostic artifacts) is the analysis of the ceramics. Certainly pottery can be analyzed for more than culture-historical data, but the present level of the development of theory suggests that pottery is more useful for non-chronological purposes at the intrasite, rather than the intersite level. This is particularly true in situations such as the present where ceramic collections represent casual collection of opportunistic surface exposures. The single major objective of the ceramic analysis was therefore the identification of sherds and their equation with defined periods of prehistoric occupation.

The ceramic analysis did, however, seek to describe the outstanding attributes of the pottery from each site. To this end, the aggregate of sherds was sorted into three groups: rim sherds, decorated body sherds, and undecorated body sherds. Each group was separately considered.

A brief series of attributes was recorded for each rim sherd. The series was designed to consider the major descriptive characteristics of each sherd, but to do so in a manner that would permit comparison with published studies of Iowa pottery. Traits considered therefore included temper, interior and exterior surface treatment, lip form and decoration, the angle of the lip with the interior surface, lip thickness, mid-rim thickness, rim height, shoulder angle, decoration, and type.

Decorated body sherds were also examined for several traits. Body part was recorded if the sherd was obviously from a neck, shoulder, base, etc. Temper, interior and exterior surface treatment, design technique, design motif, and type were also recorded.

Undecorated body sherds were simply placed within categories defined by external surface treatment and temper and then counted. Note, however, that this is merely an expedient procedure for recording the applicable attributes listed for decorated body sherds.

Certainly the most difficult portion of the analysis was the identification of the type. Major studies of Oneota ceramics in Iowa in general (Henning 1961) and parts of Iowa in specific (e.g., Harvey 1979; Wedel 1959; Straffin 1971; Osborn 1982) are available. Similar studies are available for Woodland ceramics in eastern Iowa (e.g., Logan 1976; Benn and Thompson 1977; Benn 1980) and numerous references describe ceramic complexes in western Iowa, few of which are relevant to the Red Rock area. Alex's (1980:77-105) overview of Iowa ceramics is useful, but critically needed are ceramic descriptions and a ceramic sequence for central Iowa. The following ceramic descriptions are organized by type to the extent that they were identifiable in the aggregate.

<u>Oneota specimens</u>

<u>Sample:</u> 11 rim sherds (Pl. 5-2, a)
13 decorated body sherds (Pl. 5-2, b-c)
46 undecorated body sherds

<u>Temper:</u> crushed shell, now largely leached leaving thin but broad holes or cells in the paste.

<u>Surface treatment:</u> internal: smooth on all determinable sherds
external: smooth on 49 of the 70 sherds (70.0 percent), cord-marked or smoothed-over, cord-marked on 8 sherds (11.4 percent), indeterminate on remaining 13 sherds (18.6 percent).

<u>Vessel form:</u>
<u>Lip:</u> Flat and 4 to 5 mm thick on two sherds, the angles with the interior surface are 105 to 110^{o} on these specimens;

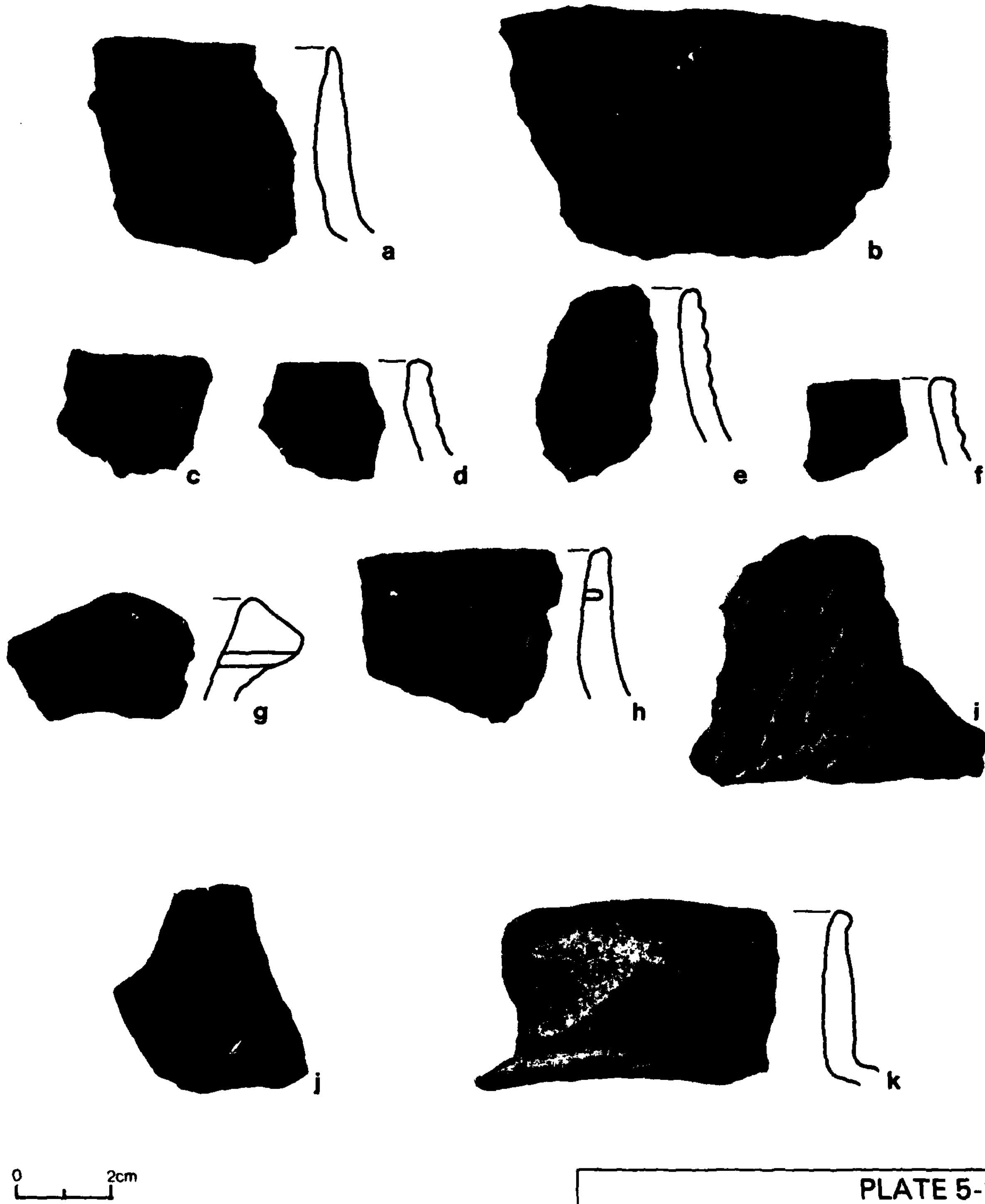


PLATE 5-2
SELECTED CERAMICS

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

pointed and generally 2 to 3 mm thick on seven specimens; indeterminate on the other two sherds.

Rim: Straight and perpendicular on the only two observable specimens. Rim heights of these same specimens are 40 and 42 mm; mid-rim thicknesses are 5.8 and 7.4 mm, respectively.

Shoulder: Formed at angles ranging from 50 to 90° on four specimens.

Body and base: Not determinable.

Decoration:

Lip: Three sherds exhibit short punctations on the interior of the lip. The apex or exterior of the lip is never decorated in the present sample.

Rim: No rim is decorated

Body: The predominant modes of decoration are trailing and punctating. Broad trailed lines occur in multiples and form geometric motifs of parallel and intersecting lines, with punctates placed below sets of parallel lines. All motifs observed on the sherds in the present collection can be accommodated within the set of stylized design components presented by Osborn (1982:35) for the Clarkson site.

Discussion: The Oneota manifestation has long been recognized throughout Iowa. The totality of Oneota material has long been recognized as divisible into several phases in various parts of the state. Stylistic variation in ceramics is an important element of this differentiation. Henning (1961: 27-29) has defined the major Oneota ceramic types in Iowa as Allamakee Trailed, diagnostic of the Orr Focus of northeastern Iowa (see also Wedel 1959:91-92), and Correctionville Trailed, diagnostic of northwestern Iowa Oneota. Henning also examined the ceramics from six Oneota sites at Red Rock and concluded that they had characteristics of both Correctionville Trailed and Allamakee Trailed (Henning 1961:32). The central Des Moines River Oneota has since been defined as a separate phase of Oneota and designated as the Moingona phase (Gradwohl 1967b). The ceramics representative of this phase were described in detail by Gradwohl (1973:21-60) and Osborn (1982:19-39). Moingona phase Oneota ceramics have not been assigned any type name.

Great Oasis Incised (Great Oasis High Rim)

Sample: 1 rim sherd (Pl. 2, d)

Temper: abundant quantities of crushed grit

Surface treatment: internal: smooth; external: smooth

Vessel form:
Lip: slightly rounded and 5 to 6 mm thick, at an angle of 95° to interior vessel surface.

Rim, shoulder, body, base: not determinable

Decoration:
Lip: no decoration on interior or apex of lip; narrow band of slightly oblique incisions just below lip on exterior.

Rim: The decorative field below the lip is at least 19 mm high. It is comprised of two parallel incised lines which zig-zag around the rim. The triangles within the zig-zags are filled with parallel incised lines oriented parallel to the lip; at least 5 such are present on the single sherd described here.

Discussion: Great Oasis pottery has been described as totally absent in the Lake Red Rock area (Henning 1971:129; Gradwohl 1974:97). The identification of this sherd is secure, however. Its decoration is wholly consistent with Wilford's (1945:36) original description of Great Oasis pottery and with descriptions and illustrations published since then (Alex 1980:96; Henning 1971:132; Williams 1975:5-13).

Comment: One additional sherd from the same site may also be Great Oasis. It is a body sherd from the neck-body juncture. The angle of this juncture is 95°. The juncture itself is thickened and has a slight T-shape. The body curves slightly and thins rapidly below the neck. This profile is characteristic of Great Oasis (e.g., Williams 1975:8) and does not appear to also be associated with Woodland pottery in Iowa.

Cord-Impressed Wares

Sample: 6 rim sherds (Pl. 5-2, e-h)
11 body sherds (Pl. 5-2, i)

Temper: abundant quantities of often coarsely crushed grit

Surface treatment: internal: smooth; external: smooth, although many sherds are sufficiently eroded that surface treatment exclusive of the decoration is difficult to evaluate.

Vessel form:
Lip: flattened on 3 sherds, rounded on the other 3

Rim: straight to slightly concave on 5 specimens; sixth rim sherd is outflaring at about a 55° angle and has a lug with a hole all the way through it.

Shoulder, body, base: not determinable

Decoration:

Lip: four of six rims in the sample have short, oblique punctates; one specimen has similar punctates on the interior of the lip; the sixth specimen has no lip decoration.

Rim: Five of the six sherds exhibit 3 to 6 parallel rows of cord impressions; three of these (Pl. 5-2, f) are sufficiently small that the 3 to 4 rows retained cover the entire sherd and it is impossible to determine if the motif was more complex. The lugged sherd (Pl. 5-2, g) has 4 parallel rows of cord impressions and is blank below this decoration. One rim (Pl. 5-2, e) has six parallel rows of cord impressions below the lip and above parallel rows of cord impressions placed perpendicular to the upper band. The final rim (Pl. 5-2, h) has a single cord impressed row surrounding the rim 21 mm below the lip. A row of bosses appears between the lip and the cord impression.

Body: The position on the vessel of most body sherds is indeterminate; therefore, the placement of the decoration is uncertain. One sherd retains perpendicular sets of cord impressions as on the fifth rim described above. It has the same provenience and could be from the same vessel. Another large sherd (Pl. 5-2, i), probably from the neck, exhibits a triangular motif of sets of parallel cord impressions intersecting other parallel cord impressions at an angle. Most sherds in the collection simply exhibit one to (usually) three parallel rows of cord impressions.

Discussion: The cord-impressed ceramics are not here identified to named types. Cord-Impressed wares are described in detail by several authors (Logan 1976:101-105; Benn and Thompson 1977:15-18; Benn 1980:38-99). They date to the Late Woodland period and, while exhibiting a wide range of variability, are part of a widespread tradition of cord-impressed wares that extends at least from central Illinois to central Nebraska.

Havana Ware - Cedar Ware

Sample: 1 body sherd

Temper: abundant quantity of crushed grit

Surface treatment: interior: smooth; exterior: smooth

Vessel form: indeterminate

Decoration: The single sherd is concave and likely from the neck of the vessel. The zone of concavity contains a row of perpendicularly placed slightly curved dentate stamped impressions. This motif is identifiable as Hummel Stamped var. Dentate (Griffin 1952:110).

Discussion: Havana pottery appears in Iowa although it is not as common as in Illinois. Logan (1976:107) has listed Hummel Stamped as a minor occurrence in northeast Iowa. Gradwohl (1974:94) reports Havana series pottery from the Boone Mound and associated village site in Saylorville Lake, but Hummel Stamped is not among the specifically identified types. Benn and Thompson (1977:21-22) consider the Boone Mound to represent a direct Havana excursion into Iowa and redefine the Havana-like material in interior eastern Iowa as Cedar Ware. Cedar Ware types similar to Hummel Stamped are considered to be rare or absent.

Spring Hollow Incised

Sample: 1 body sherd (Pl. 5-2, j)

Temper: grit, fairly finely crushed

Surface treatment: interior: smooth; exterior: oblique cord-marked

Vessel form: indeterminate

Decoration: The sherd exhibits 4 parallel lines incised over the cord-marking; the break is probably along a fifth line.

Discussion: Spring Hollow Incised is a problematic type in Iowa. As defined by Logan (1976:89-92) the type very strongly resembles Black Sand Incised from Illinois (Griffin 1952:98). Black Sand Incised is an Early Woodland type, but Spring Hollow Incised is considered by some to be late Middle Woodland (e.g., Logan 1976:91), and by others (e.g., Benn and Thompson 1977:10; A. Anderson 1971:4) as Early or Middle Woodland.

Plain Rims

Sample: 10 rim sherds (Pl. 5-2, k)

Temper: grit in varying quantities

Surface treatment: internal: smooth on all determinable sherds; external: smooth on 9 specimens, cord-marked or smoothed-over cord-marked on the tenth.

Vessel form:

Lip: flat on four sherds, rounded on four more, and pointed on the other two. Thicknesses range from 4 to, usually, 5 or 6 mm.

Rim: All rims appear straight to slightly concave. On only one specimen (Pl. 5-2, k) is the rim height complete; it measures 37 mm.

Shoulders: The only specimen on which this can be evaluated exhibits a sharply defined shoulder with an angle of 85°.

Body and base: Not determinable

Decoration:

Lip: One sherd exhibits short oblique punctations on the exterior. A second specimen is punctated on the apex of the lip. All other specimens have undecorated lips. A small lug appears on one otherwise undecorated lip.

Rim: Entirely undecorated

Body: Not determinable

Discussion: This category likely includes pottery referable to several different wares. None of them are identifiable with any certainty.

Miscellaneous Decorated Sherds

Sample: 3 body sherds

Temper: grit

Individual descriptions:

1. A single small but thick sherd exhibits a pair of small (3 mm diameter) circular punctates evidently made with a hollow instrument. At least one more punctate is evident at the broken edge of the sherd. The descriptive attributes of the sherd are consistent with an identification as Levsen Punctated (Logan 1976:94-97).

2. A single small and very thin (4 mm) sherd is completely covered with parallel rows of narrow but deep lines that are probably best described as stab-and-drag. The identification is uncertain.

3. A single sherd appears to be completely covered with a chevron pattern of shallowly incised lines. These may be over cord-marking but the sherd is sufficiently eroded that evaluation is tenuous. The identification is also uncertain.

TABLE 5-2

CERAMIC IDENTIFICATIONS

Site Number	Oneota	Great Oasis	Cord Impressed	Havana	Spring Hollow Incised	Plain Rims	Miscellaneous Decorated	Plain Body	Grit Cord-Marked Body	Indeterminant Body
13MA42	2	-	-	-	-	-	-	-	-	-
13MA44	4	1	7	1	1	5	1	86	55	63
13MA80	-	-	-	-	-	-	1	1	1	2
13MA81	-	-	4	-	-	5	1	58	21	34
13MA119	-	-	-	-	-	-	-	2	2	1
13MA122	-	-	1	-	-	-	-	-	2	3
13MA127	-	-	1	-	-	-	-	2	1	-
13MA131	6	-	-	-	-	-	-	-	-	2
13MA133	-	-	-	-	-	-	-	-	5	2
13MA134	-	-	3	-	-	-	-	2	15	12
13MA162	-	-	-	-	-	-	-	1	-	-
13MA163	-	-	-	-	-	-	-	4	3	-
13MA164	-	-	-	-	-	-	-	-	2	-
13MA166	-	-	1	-	-	-	-	3	-	1
13MA167	-	-	-	-	-	-	-	1	1	2
13MA207	2	-	-	-	-	-	-	-	-	-
13MA209	34	-	-	-	-	-	-	-	-	-
13MA212	3	-	-	-	-	-	-	-	-	-
13MA215	4	-	-	-	-	-	-	2	2	-
13MA216	1	-	-	-	-	-	-	1	-	5
13MA219	-	-	-	-	-	-	-	3	4	3
13MA222	-	-	-	-	-	-	-	-	1	-
13MA223	3	-	-	-	-	-	-	-	-	-

13MA44 where, for reasons described earlier, a controlled surface collection was conducted. The distribution of materials across the site is briefly considered.

Site 13MA44 produced remains of the several Woodland components identified in the collections, plus the single identified Great Oasis rim, and Oneota pottery. This material was collected from 12 circular units of 3 m radius each. Table 5-3 presents the distribution of these diagnostic artifacts across the site.

The paucity of identifiable material makes trends difficult to interpret. The single identified Great Oasis rim and second possible Great Oasis sherd are both from an area that was not intensively collected to the east of a ravine. Oneota, cord-impressed, plain rim, and other Woodland materials are found at both ends of the intensively collected area to the west of the ravine. Additional investigations will be required to establish the intrasite pattern of components at this site.

ASSEMBLAGE SUMMARY

Surface inspection of sites in the Lake Red Rock project area and analysis of these collections reveals an archeological record heavily biased toward the latter portion of the prehistoric sequence of central Iowa. The potential for site burial or removal in the alluvial bottoms is an important factor biasing recording of earlier sites. The heavy collector activity observed during the reconnaissance probably also biased the collections against the recovery of projectile points which in turn reduces the likelihood of identifying Paleo-Indian and Archaic sites.

A major objective of the projectile point and ceramic analysis was the identification of temporally diagnostic artifacts. This was rendered somewhat difficult by the virtual lack of type descriptions for central Iowa. It therefore became necessary to rely on descriptions for other portions of Iowa. This introduces the risk of overextending various types by using them in an area for which they were not intended and to which they may not be entirely applicable. However, until larger collections are intensively described and published, it will be necessary to resort to this expedient for smaller collections, such as those described in this report.

The specific projectile point and ceramic identifications were summarized in Tables 5-1 and 5-2, respectively. Table 5-4 combines all these data to indicate the presence of manifestations of the various periods at each site. All sites which are described earlier in this chapter but which are not listed on Table 5-4 produced no identifiable artifacts. A quick summary of this table shows that no Paleo-Indian or Late Archaic material was identified in the collections, Early/Middle Archaic material was identified (tentatively) at 2 sites, Woodland material was collected from 19 sites, Great Oasis pottery was recognized at one site, and Oneota material was identified in the collections from 5 sites. The Woodland material appears to represent several complexes including the Havana-Cedar Middle Woodland and the Late Woodland complexes which produced cord-impressed or fabric-impressed pottery. These complexes are more fully discussed in the next chapter.

TABLE 5-3

DISTRIBUTION OF DIAGNOSTIC ARTIFACTS AT 13MA44

	POTTERY						
Collection Unit	Oneota	Great Oasis	Cord-Impressed	Havana	Spring Hollow	Plain Rim	Triangular Projectile Point
1	-	-	-	-	-	1	-
2	-	-	-	-	-	-	-
3	1	-	-	-	-	-	-
4	-	-	-	-	-	-	-
5	-	-	-	1	-	-	-
6	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-
8	-	-	2	-	-	-	-
9	-	-	-	-	-	-	-
10	-	-	-	-	-	1	1
11	1	-	1	-	1	2	-
12	-	-	1	-	-	-	-
East	-	2	1	-	-	-	-
General	2	-	1	-	-	1	-

TABLE 5-4

COMPONENT IDENTIFICATIONS

Site Number	Early/ Middle Archaic	Middle Woodland	Late Woodland	Unknown Woodland	Great Oasis	Oneota
13MA42	-	-	-	-	-	X
13MA44	-	X	X	-	X	X
13MA80	X	X	-	-	-	-
13MA81	-	X	X	-	-	-
13MA119	-	-	-	X	-	-
13MA122	-	-	X	-	-	-
13MA127	-	-	X	-	-	-
13MA131	-	-	-	X	-	X
13MA133	-	-	-	X	-	-
13MA134	-	-	X	-	-	-
13MA162	-	-	-	X	-	-
13MA163	-	-	-	X	-	-
13MA164	-	-	-	X	-	-
13MA166	-	-	X	-	-	-
13MA167	-	-	-	X	-	-
13MA207	-	-	-	-	-	X
13MA209	-	-	-	-	-	X
13MA212	X	-	-	-	-	X
13MA215	-	-	-	X	-	X
13MA216	-	-	-	X	-	X
13MA219	-	-	-	X	-	-
13MA222	-	-	-	X	-	-
13MA223	-	-	-	-	-	X

Non-diagnostic artifacts were less systematically collected during the September 1983 reconnaissance. They were analyzed descriptively with the major goals being to evaluate technologies and assemblages. The casual surface collection procedures employed and the probable biases in recovered tools would suggest that the individual site assemblages shown in Table 5-5 should be regarded as indicative rather than representative.

The evaluation of lithic technology is less dependent upon representative samples. The analysis of the collections obtained in September 1983 suggests that lithic technology responded to a scarcity of chippable chert in the Des Moines River valley. This response is manifested in three ways: 1) use of bipolar technology; 2) extensive maintenance and modification of tools, and 3) overall small tool and debitage sizes.

SITE-SPECIFIC GEOARCHEOLOGICAL INVESTIGATIONS

Earth science investigations across the Red Rock project area were geared specifically towards formulating a predictive model for archeological site location. The strategy orienting the nature of the research stressed both documentation of landscape history and the articulation of the archeological sites in an evolutionary model of systematic landscape succession. A strong emphasis was placed on the latter objective since the overall project was designed to produce broad recommendations for preservation. An understanding and recognition of geographic patterns of site distribution is critical towards this end. Given the large area under study, it was necessary from the outset to conduct ground truthing and field examination only at representative outcrops and sites that provided diagnostic information on:

1. archeological site-landform correlations
2. archeo-stratigraphic resolution

Where major assemblages occurred they served to index the landscape history. Accordingly, geomorphological reconstructions, especially those covering the Holocene, could be placed in spatio-temporal perspective once site life histories could be synthesized. Since only select sites were shovel tested it was not possible to document the sedimentary history affecting most formerly in situ occupations. Contemporary disturbance processes were, however, registered by systematic field observation of surface assemblage dispositions. Many of the sites on upland interfluves or along valley foot-slopes have been affected by colluvial and sheetwash activity. At lower slope elevations, specifically at upland steps, terrace and floodplain locales, semicontinuous wave action has eroded both surfaces and slopes. Changing site integrity across all site settings was therefore monitored by profiling site surfaces and recording the matrix composition of subsurface sediments. Patterned assemblage articulations across given landscapes and settings revealed the nature and magnitude of contemporary erosion, and measures the degree at which sites are being destroyed and what priorities and steps must be taken for cultural resource preservation. The geoarcheological study, then, served to define the contexts of the prehistoric sites from site developmental as well as preservation vantage points.

TABLE 5-5

SUMMARY OF ASSEMBLAGES

	TOOLS						DEBITAGE				CERAMICS					
Site Number	Projectile Points	Bifaces	End Scrapers	Side Scrapers	Uniface Fragments	Utilized Flakes	Core Fragments	Whole Flakes	Flake Fragments	Shatter	Grit	Shell	Daub Ct.	Daub Wt.	Pitted Cobble	Sandstone Abrader
13MA42	-	-	-	-	-	1	2	7	15	13	-	2	-	-	-	-
13MA44	6	12	4	-	2	14	25	147	143	186	219	4	298	857.0	2	-
13MA80	1	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-
13MA81	5	3	-	-	-	-	8	116	111	126	121	-	2	12.7	-	-
13MA112	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13MA114	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
13MA115	-	1	-	-	-	-	-	3	12	9	-	-	-	-	-	-
13MA119	2	-	-	1	-	-	2	4	7	8	5	-	-	-	-	-
13MA122	-	-	-	-	-	-	1	25	28	24	6	-	-	-	-	-
13MA127	-	-	-	-	1	-	1	19	27	20	4	-	-	-	-	-
13MA128	-	1	-	-	-	-	-	3	4	1	-	-	-	-	-	-
13MA130	-	-	-	-	-	2	-	-	3	2	-	-	-	-	-	-
13MA131	1	-	-	-	-	1	-	8	21	3	2	6	-	-	-	-
13MA133	-	-	-	-	-	-	-	3	10	3	5	-	-	-	-	-
13MA134	-	-	-	-	-	-	-	9	6	14	32	-	-	-	-	-
13MA135	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
13MA162	-	-	-	-	-	-	-	3	13	16	1	-	-	-	-	-
13MA163	-	1	-	-	-	1	1	19	69	57	7	-	-	-	-	-
13MA164	-	1	-	-	-	-	-	10	28	13	2	-	-	-	-	-
13MA165	-	1	-	-	1	-	-	6	18	5	-	-	-	-	-	-
13MA166	1	-	-	-	-	-	2	5	13	17	5	-	-	-	-	-
13MA167	1	-	-	-	-	-	-	23	18	28	4	-	-	-	-	-
13MA207	1	-	-	-	-	-	-	-	1	-	-	2	-	-	-	-
13MA209	2	-	1	-	-	1	-	4	-	2	-	45	3	20.0	-	1
13MA212	3	-	-	-	-	2	1	18	25	24	-	3	-	-	-	-

TABLE 5-5 (Con't)

SUMMARY OF ASSEMBLAGES

	TOOLS							DEBITAGE			CERAMICS					
Site Number	Projectile Points	Bifaces	End Scrapers	Side Scrapers	Uniface Fragments	Utilized Flakes	Core Fragments	Whole Flakes	Flake Fragments	Shatter	Grit	Shell	Daub Ct.	Daub Wt.	Pitted Cobble	Sandstone Abrader
13MA213	1	-	-	-	-	-	-	4	11	6	-	-	-	-	-	-
13MA215	-	-	-	-	1	-	-	4	4	4	4	6	-	-	-	-
13MA216	-	-	-	-	-	-	-	11	6	6	6	1	-	-	-	-
13MA219	-	1	-	-	-	1	2	13	20	32	10	-	-	-	-	-
13MA220	-	-	-	-	-	-	-	4	10	12	-	-	-	-	-	-
13MA222	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-
13MA223	-	-	1	-	-	-	-	5	19	2	-	3	-	-	-	-
13MA224	-	-	-	-	-	-	-	7	7	2	-	-	-	-	-	-
13MA225	-	-	-	-	-	-	-	4	5	1	-	-	-	-	-	-
13MA226	-	-	-	-	-	-	-	2	7	9	-	-	-	-	-	-

More conventional techniques, including section profiling and coring, were applied to examine subsurface stratigraphic relations recording Holocene alluvial successions and the upland Pleistocene chronology. The geomorphic history of the project area was developed by assembling results of field study at stratigraphic profiles near principal site locales. Field visits were coordinated with archeological objectives and in general the two-man field team worked in the same vicinity as the archeological surveyors. Figure 5-5 shows the location of principal sites and locations studied and Table 5-6 describes the activities performed at each. As detailed in the research objectives, methods and activities for the eight locations, specific problems were isolated at each setting. Some furnished key data and analytical opportunities for study of site formation process while others were more optimal for reconstruction of local landscape history. In general the settings sampled may be subdivided into three physiographic units as follows:

1. Upland locations where loess profiles underlie sites and are in turn underlain by older Pleistocene deposits. Here hillslope and wave cutting are predominant erosional processes (locations 1 and 2);

2. Graded and stepped terrace-upland transects that register slope changes from the abandoned Des Moines River surfaces to the uplands. These locations feature comprehensive paleogeographic scenarios and crosscut the range of environments encountered in the project area (locations 3 and 4);

3. Low terrace and fan formations that articulate principally with the floodplain and index complex river migrations (locations 5, 6, 7, and 8).

As Table 5-6 shows, topographic groupings offset the locations with upland settings defined above the 780-foot contour and lowlands ranging below 750 feet. The terrace-upland transects take in elevations rising above higher terraces (>760 feet) and extending up to the loess-capped hill crests.

Interpretive problems particular to each setting are discussed under the appropriate sub-section. It is seen from the location map (Figure 5-5) that fieldwork was conducted principally in the eastern sector of the project area, or along the flanks of the reservoir. The logistics for this field program involved considerations of relative site significance as determined by both archeological and geomorphological teams. Archeological concerns structured research priorities and, on the basis of the stratified sampling design, high yield and site rich clusters that also featured diagnostic exposures, significant or obtrusive landforms, and settings indicative of paleogeographic potential, were selected for most intensive field study.

The results of the field investigations were analyzed and subsequently assembled for incorporation into a generalized geomorphological map (see Figure 8-2 in Chapter 8). The map was initially generated by grouping soil and landform distributions across the project area utilizing stereoscopic resolution of aerial flyovers. Several sets of photographs were made available at the Soil Conserva-

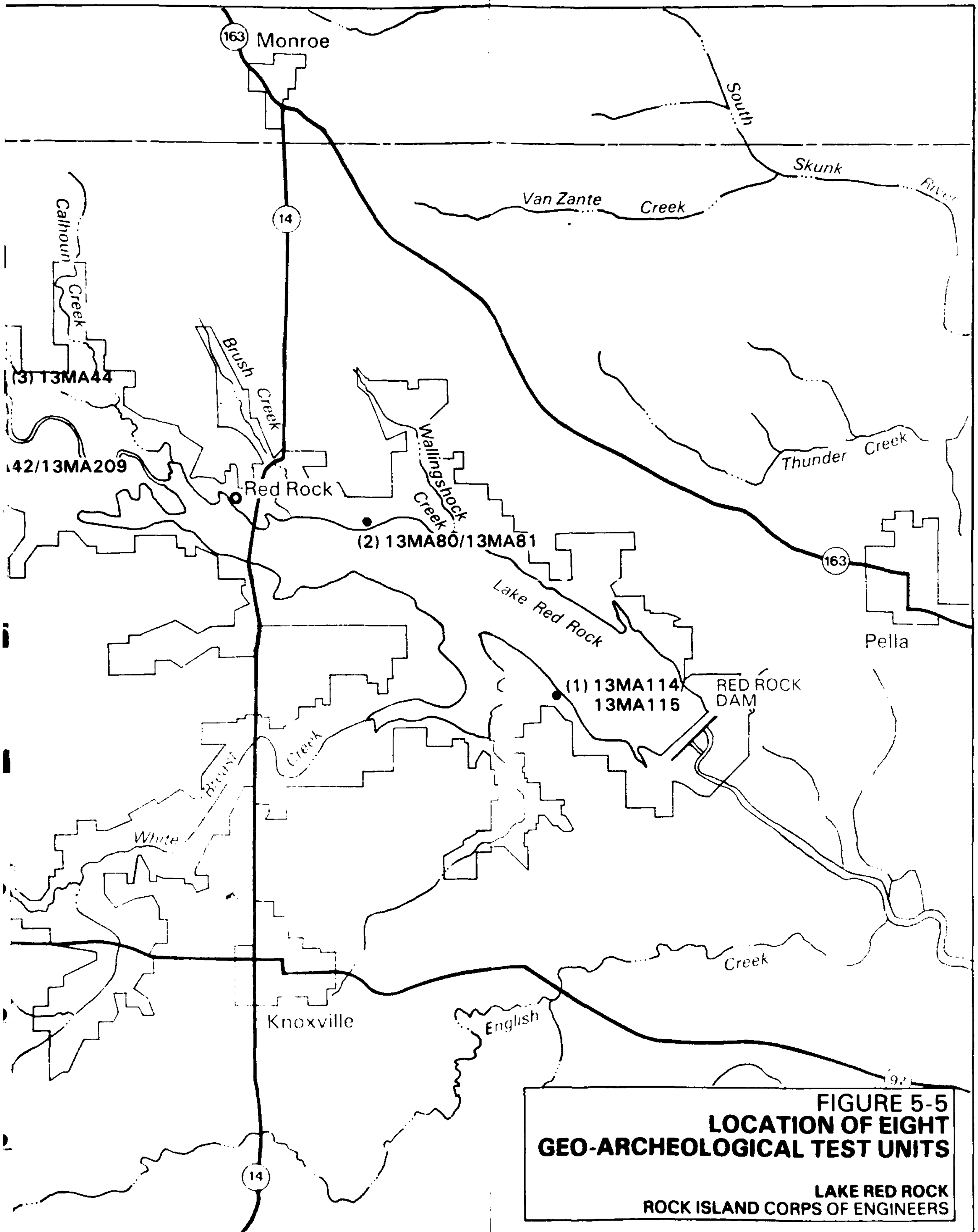


FIGURE 5-5
LOCATION OF EIGHT GEO-ARCHEOLOGICAL TEST UNITS

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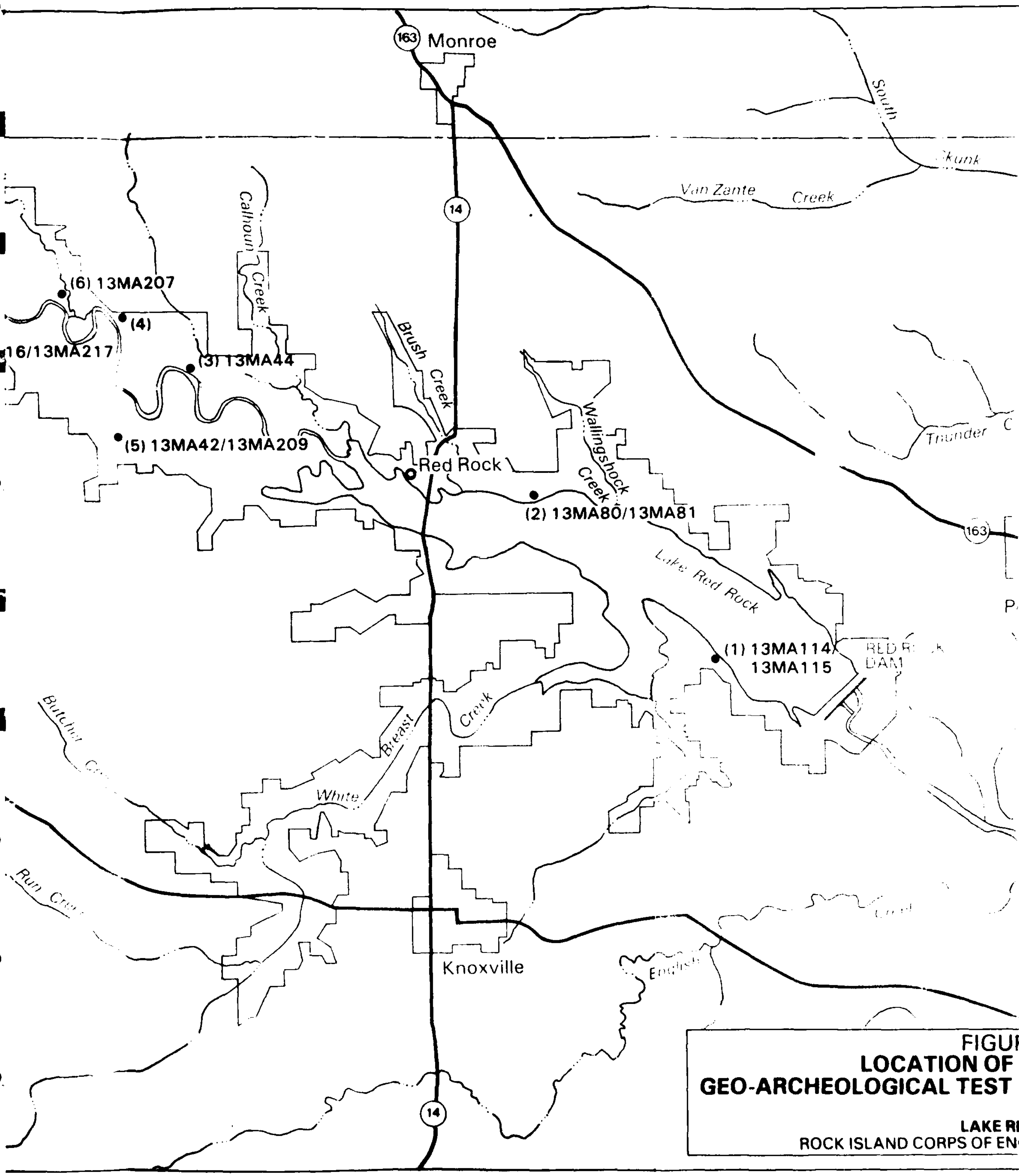

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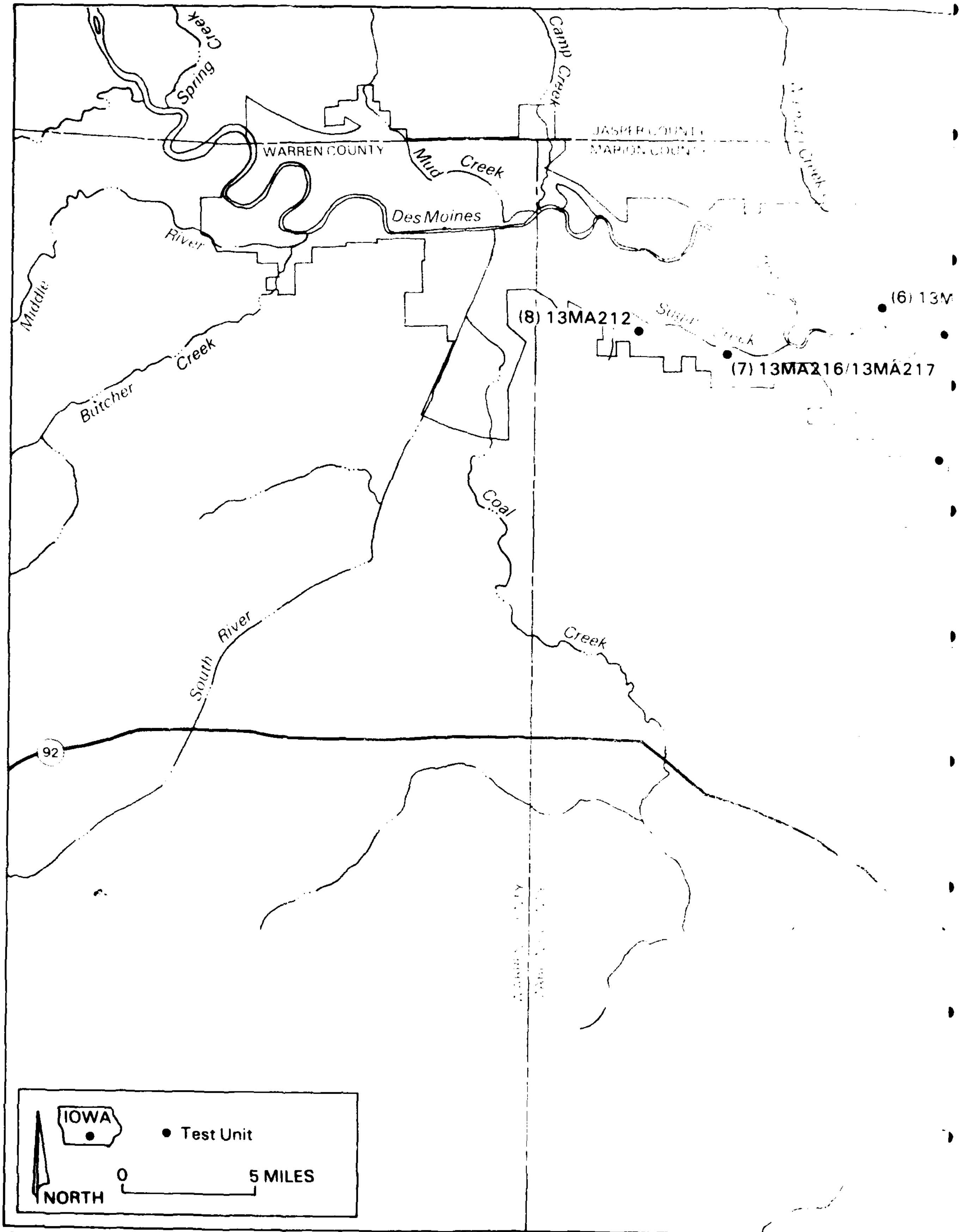

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TABLE 5-6

SUMMARY OF GEOARCHEOLOGICAL ACTIVITIES
(see Figure 5-5 for locations)

Location	Geomorphic and Stratigraphic Context	Elevation (to nearest 10 feet)	Archeological Site and Chief Cultural Component	Research Objectives	Research Methods and Activities
1	Uplands at interfluve step carved by progressive slope retreat; eroded loess matrix.	830' 780'	13MA114 - indeterminate 13MA115 - indeterminate	Definition of principal stratigraphic units represented across project area (Figure 3-2). Resolution of uplands archeo-stratigraphy (site 13MA115) and documentation of B-horizon weathering in loess.	Mapping of cross valley profiles, surface-slope profiles, inspection of assemblage disposition, and detailed examination of loess-till matrices and stratigraphic relations.
2	Uplands along interfluve grading to steep shale bedrock scarp; slope transported loess and beach deposits.	750' 780'	13MA80 - mixed 13MA81 - MW, LW, Oneota	Slope of thin mantled loess sediments on steep bedrock unconformity; inspection of lakeshore wave cutting (site 13MA80). Reconstruction of contemporary site disturbance process through examination of micro-topography, slope sediments and differential artifact distribution (site 13MA81).	Mapping of surface-slope profiles from bluff-crest to cliff edge (sites 13MA80 and 13MA81). Resolution of site micro-stratigraphy by isolation of lateral and vertical stratigraphic contacts (coring) and incorporation of artifact provenance; measurement of changing slope-artifact density correlations along three collection transects (site 13MA81).
3	Alluvial terrace graded steeply to upland and featuring treads and risers above site level; silty clay alluvium.	760'	13MA44 - MW, LW, Great Oasis, Oneota	Articulation of alluvial stratigraphy and placement of terrace in morphogenetic context. Study of archeo-stratigraphic sequence and depositional history along slope.	Detailed stratigraphic profile and systematic documentation of sediment composition of principal strata. Topographic transect from upland slope to terrace to register changing matrix composition. Reference section for calibrating Holocene terrace chronology to valley morphogenesis.
4	Uplands to terrace-floodplain traverse exposing various slope profiles; capping loess on uplands grade down to strand lines cut through bedrock shales and then to level of floodplain; upland loesses, mid-slope bedrock, floodplain sites accumulated on buried B-horizons.	760'	-	Examination of weathering regime in loess and documentation of surface slope changes. Alluvial settings feature prime example of buried B-horizon/relict terrace association. Correlation of paired terraces that do not display similar subsurface stratigraphy.	Profiles of weathered loess-bedrock sequence on uplands with examination of sediment changes. Examination of floodplain terrace and bank profiles that show complex and singular inter-digitations of sedimentation and soil forming intervals. Baseline section for reconstruction of alluvial history.

TABLE 5-6 (Cont.)

SUMMARY OF GEOARCHEOLOGICAL ACTIVITIES
(see Figure 5-5 for locations)

Location	Geomorphic and Stratigraphic Context	Elevation (to nearest 10 feet)	Archeological Site and Chief Cultural Component	Research Objectives	Research Methods and Activities
5	Terrace-fan formations graded gently to floodplain; fine sands laterally interdigitated with alluvial silts and clays.	750'	13MA209 - Oneota 13MA42 - Oneota	Identification and documentation of fan landscapes at tributary confluence and their relation to floodplain scenarios (site 13MA209). Surface definition of deflated archeological site and its assemblage resolution.	Profile of weak alluvial fan (site 13MA209) and assessment of stratigraphic relations by coring. Surface slope profiles of archeological setting (site 13MA42).
6	Terrace outcrop, recently over-silted, associated with series of channel scars; deep clays of former oxbow in substrate.	740'	13MA207 - Oneota	Documentation of subsurface stratigraphy and recognition of buried sediments as they relate to meandering stream behavior and/or Holocene paleosol.	Examination of landform morphology and surface grades. One core into substrate to identify contact of surficial fine sand veneer with older clays of ancient channel. Reference section for sedimentation regime reconstruction.
7	Sandy floodplain ridges are former channel levees and define "high alluvial bottoms"; medium sands grade to coarse sands and gravels in substrate.	740'	13MA216 - mixed 13MA217 - indeterminate	Dating and morpho-stratigraphic affiliations of both sand ridges and basal sediments. Latter could be Holocene point bars or earlier outwash (Pleistocene?).	Core borings (4) placed along key topographic transitions in undulating ridge-swale setting.
8	Lobate terrace fan at minor tributary confluence; alluvial silts and clays.	750'	13MA212 - Oneota	Composition of alluvium near bluff edge at undifferentiated floodplain setting.	Core boring (1) into substrate.

tion Service office (Knoxville, Iowa). Most beneficial were comparisons of flyovers from 1938 and 1967 that preceded dam construction with a recent reconnaissance (1976) that enabled assessments of the impact of the lake building and subsequent lake level fluctuations on the surrounding landscapes. Preparation of the map proceeded in conjunction with ground truthing visits and field investigations, thereby providing in-field direction for the study. Preliminary landform mapping disclosed, for example, unusual surfaces and terrace outcrops which were investigated in the field and superposed on the map and ultimately integrated into the developmental model for landscape evolution outlined in Chapter 8.

The individual site-specific investigations are presented in sequence and their relative significance is subsequently evaluated.

1 - Sites 13MA114 and 115

Both sites are located on loess covered interfluves that are being actively eroded by slope wearing that has cut benches into the more cohesive weathering profiles and caused collapse of looser side slopes. In the vicinity of site 13MA114 relatively firm tree and prairie grass mats impede rates of slope degradation to some degree and are responsible for maintenance of extant archeological site surfaces. Figure 3-2 identifies the general site setting at site 13MA115 overlooking a 1 km expanse of Lake Red Rock. This location served as a reference section for schematic reconstruction of the subsurface stratigraphy of the project area. The section was most informative for recording the erosional levels of the uplands and the general succession of the Pleistocene. Valley bottom topography is, of course, obscured by the lake waters, but the geomorphological map (Figure 8-2) shows that the former channel of the Des Moines River was extremely active in this area, a function of the upstream constriction of the channel flow due to bedrock lithology (near the former town of Red Rock). High amplitude meandering is registered by a network of channel scars and two prominent oxbows, along which the now flooded sites of 13MA106 and 13MA103 were located. The magnitude of meandering is attested to by the longitudinal point bar distributions aligning the inside bends of the channel (Figure 8-2). Both upland sites have vistas overlooking these valley bottom locales.

The principal work conducted at sites 13MA114 and 13MA115 involved resolution of the site contexts on the eroding interfluve steps and careful articulation of the stratigraphy with an emphasis on the latter. Site integrity was strongly compromised by differential slope retreat and since no occupational or activity locus could be pinpointed it is probable that deflation and progressive degradation of the vegetation mat determined the degree of post-occupational transformation of the site surface. Site 13MA115 defined an extremely complex geomorphic setting that featured a series of wave cut benches, known as treads and risers (Figure 5-6), that were incised into the already stepped interfluve bench. Accordingly the assemblage here, which comprised a significant lithic scatter could not be tied to a fixed locus and there was no precise way of calibrating the rate and manner of site modification; multiple geomorphic processes, and downslope sediment surges produced a heterogeneous distribution of pieces. Given the geomorphic dynamism of loess covered hillslopes (Ruhe 1969), their trends to periodic stability, and variable effects of wave activity

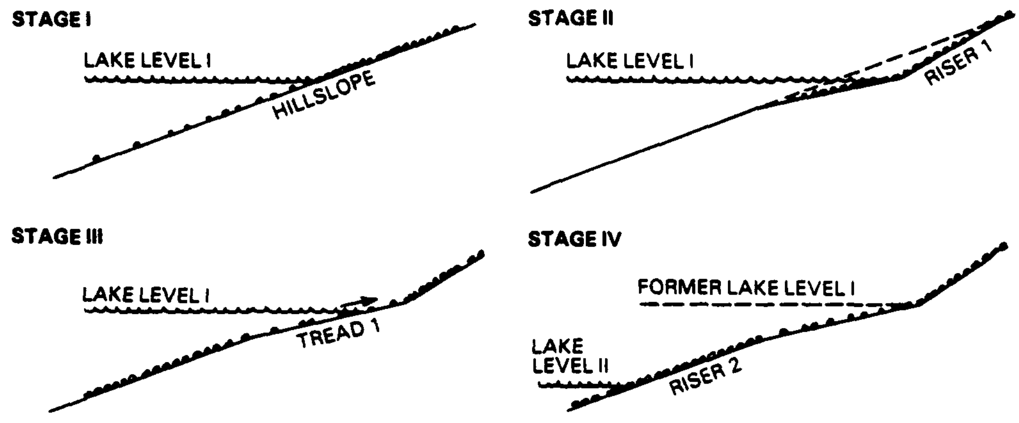

FIGURE 5-6
STAGES IN THE DEVELOPMENT OF TREAD RISER SURFACES ALONG A HILLSLOPE

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(see discussion below), it is impossible to plot site disturbance gradients downslope in the absence of dependent and grouped artifact clustering along the slope. Such studies have been conducted at select slope settings with only mixed success even when artifact patterning could be sorted out along surface gradients (see Rick 1976; Davidson 1976; Butzer 1982). Attention was then focused on outlining the detailed stratigraphy exposed along the steep lake bluff at site 13MA115 (Figure 3-2). Initial probes in the site vicinity disclosed that artifacts rested on a truncated outcrop of a weathered B-horizon which formed on the loess parent material. Loess initially accumulated on a locally extensive but discontinuous lacustrine erosional surface, represented schematically on the north shore of the lake but outcropping slightly to the west of the archeological site as well. These orthogenic deposits are up to 2 m thick and define a sharp and abrupt vertical contact with the Yarmouth-Sangamon soil that developed in the Kansan till. The sedimentological and stratigraphic properties of the principal units are summarized in Table 5-7. It is noted that the top of the sequence is offset by the exhumed paleosol so that there is no A-horizon. Figure 3-2 shows that the stabilized slope setting is preserved on the vegetated upland crest for reasons noted earlier. Depths listed are schematic and vary with even mild topographic changes.

Basically four stratigraphic units have been recognized: the weathered loess (II B_{2t}), the basal loess (II B_3/C), proglacial lacustrine or ponding sediments (III C), and the weathered Kansan till (IV C). Of these units, the upper two, representing episodic late Wiconsinan deflations of the suspended loads deposited along the ancient Des Moines floodplain, register the regionally prevalent loess weathering profile characterized by typical oxidation and leaching indicators. What has been referred to as proglacial or ponding sediments have no immediate chrono-stratigraphic correlate. Ruhe (1969:49)

TABLE 5-7

SUMMARY OF REGIONAL SEDIMENTOLOGICAL PROPERTIES AND STRATIGRAPHY AT SITE 13MA115

Stratigraphic Unit and Soil Horizon	Depth (cm)	Description	Distribution and Comments
IIB_{2t}	0-15	Truncated illuvial zone of the weathered loess. Sediment matrix is 5YR4/4 silty clay with medium angular blocky structures and moderate development; compound peds break into fine angular blocks. Matrix incorporates high organic matter content combining decayed vegetal matter and contemporary root mat growing into slope. Mottling is common and fine with clear boundaries. Few subangular small and gritty stones are uniformly dispersed. Voids and pores are abundant and very fine. Sediment is slightly cemented with high stickiness and plasticity indices. Carbonate content is moderate/low and major sedimentary inclusions are concentrated, angular shaped manganese nodules. Argillic and sesquioxide cutans proliferate around ped faces and inclusions; they are continuous and prominent. Lower contact is clear and irregular.	Horizon displays irregular depth laterally, as it is being continuously incised and eroded by contemporary slope wearing and retreat along the interfluve edges. Intricate fissure network reveals strongly weathered fabric of matrix as does extensive and well developed cutan network. Structure has been weakened by continuous exposure; only the base of the horizon is generally preserved. Extensive Mn^{+} distributions suggest impeded drainage in the past.
IIB_3/C	15-125	Base of the weathered loess is a thick unit grading into parent material. 10YR6/6 clay-silt features medium-coarse prisms that are well developed and break into medium angular blocks. High organic matter presence with abundant mottles, both well and poorly defined. Few subangular and gritty stones. Very abundant voids and fissures. Stickiness and plasticity indices only moderate to slight. Very high root concentration with all size grades. Concretions are round clay balls, well dispersed. Abundant argillic cutans surround ped faces. Strong ferro-manganese presence around roots. Lower boundary is gradual and diffuse but discontinuous; it is occasionally defined by a mineralized limonitic band (2-4 cm thick) at B_3 to C interface.	This is the most extensive loess facies across Lake Red Rock project area. It is the classic massive silt regionally recognized. Matrix has irregular but very deep rooting network that suggests cyclical deposition and stabilization of land surfaces.
IIIC	125-250	Proglacial lacustrine or ponding deposits with laterally discontinuous distribution. 10YR5/2 clays and silts, very poorly sorted and displaying fine (2-5 mm) laminar bedding structures. They have platy structures and moderate to strong ped development. Low organic concentrations but abundant mottling with a variety of shapes and contrast grades. Rounded to subrounded stones are common and often occur in discrete lenses within matrix. Voids are common and fine grade (.5-2 mm); stickiness and plasticity is moderate. Root presence is minimal, but there are abundant carbonate infillings and concretions in root casts, as well as prolific concentrations of hydrographic nodules; ferricretions as well as tufaceous sheaths are common. Lower contact is sharp but smooth.	Laminar structures are indicative of intermittent stream flow from influents associated with higher base level drainages. Gravel morphology is consistent with ancient shoreline settings. Proglacial lake may have had several fluctuating levels depending on climatic balance of late Pleistocene. Shallow accumulation of sediments is indicated by platy structures which also argue for seasonal sedimentation or lake edge setting. Mineralization and tufaceous sedimentation are evidence for spring and running water activity at feeders.
IVC	250- >370	Yarmouth-Sangamon erosional surface disclosed by weathered till. Matrix is poorly sorted 7.5YR5/8 silt-clay with abundant gravel-sized (6-60 mm) stones dispersed; these are of all shapes and include erratics. Structure of sediment is medium-coarse prismatic and ped development is strong with macro peds breaking into medium angular prisms. Abundant mottles have sharp boundaries and are medium-coarse (5- >15 mm). Low consistence but moderate stickiness and plasticity. Roots are rare but abundant and anomalous concretions surround larger (pebble, gravel) clasts; many of these are ferric. Sandy-silt cutans are common around ped faces.	High concentration of erratics and heterogeneous matrix compositions reveal strong till fabric. Clayey matrix and pebble populations become more strongly mixed with depth as sediment is less weathered.

does, however, describe a morphologically analogous substrate of the loess as deoxidized and suggestive of gleying, or protracted chemical reduction in a water-saturated environment. An argument has been advanced that these substrates were subsurface zones of water perched on the underlying clayey paleosol (i.e., weathered Kansan till/Yarmouth-Sangamon) and created closed drainage basins in the past (Ruhe and Scholtes 1955; Ruhe, Daniels, and Cady 1967), most probably "13,000 to 14,000 years ago. . .(when) glacier ice. . .indicated a cooler and relatively more moist climate" (Ruhe 1969:53).

This hypothesis falls short, however, of pinpointing the paleogeographic scenario. As Figure 3-2 and the descriptive sedimentology suggest, the position of these "gleys" beneath the weathered loess may implicate a pre-loess deposition; the high clay content of unit IIIC below the weathering horizon (III B_3C), and the platy versus columnar structures, point to sedimentary rather than pedogenic origins. Certainly, the location of the site, and the study area in general, near the terminus of the Bemis Moraine would be consistent with the existence of a proglacial lake or extensive pond feature around 14,000 B.P., when cyclic advances and retreats of the lobe created both short- and long-term basins. If this were the case the loess accumulated subsequent to that time, a possibility entertained by Ruhe (1969). It is also possible, however, that these deposits, if they are indeed lacustrine, may be associated with a pre-Wisconsin interstade. In the absence of firm radiometric evidence such chrono- stratigraphic hypotheses remain speculative. The present analysis does, however, propose that this unit be considered accretionary, rather than pedogenic.

The basal stratum (IV C) defines the Yarmouth-Sangamon surface, which as discussed earlier (Chapter 3) and depicted in Figure 3-2, is at least 24,000 years old. Field observations disclosed that in a thickness of 1.2 m the weathering gradient began to diminish and give way to the till matrix. The relatively shallow soil may imply that either the profile dates to the very late Pleistocene, or that the passage to moist-warming trends generally attributed to explain paleosol genesis may not have been as abrupt or as intensive as generally assumed. In this case it is also necessary to procure datable materials to address the paleoenvironmental and chrono-stratigraphic implications of the upper (weathered) till profile.

A final consideration in tracing the morphogenesis of the landscape in the uplands near sites 13MA114 and 13MA115 is the creation of the staircase gradients generated by wave cutting into the interfluve benches. Protracted wave advances and retreats have weakened the subsurface matrix consistency resulting in slumping, headward retreat, and displacement of the archeological assemblages as noted earlier. The stepped formations themselves reflect lake level oscillations over the past 13 years or since the initiation of lake operations. In addition to sculpting the upland benches, periodic oscillations have created beach settings and strand lines along lower elevations. The effects of the oscillations for archeological purposes is most striking in the changing disposition of surfaces and in the patterned sorting of clasts along the surfaces defined by the staircase. Figure 5-6 illustrates the developmental stages in the formation of the staircase with the waves sequentially undercutting the original slope surface to produce distinct slope components referred to as treads and risers. Primary transformations occur along the treads where, as waves retreat, they wash out and redistribute the larger clasts downslope at the tread base of riser surfaces in the direction of a new water level. This selective sorting of slope materials has critical implications for surface archeological distributions and in the case of 13MA115, as noted, the composite effects of wave sorting and interfluve edge erosion made it impossible to reconstruct the pre-disturbance origins of the original lithic assemblage. Systematic analyses of tread-riser gradients and their effects on artifact distributions are discussed for site 13MA81 below.

At both 13MA114 and 13MA115 the principal geoarcheological efforts revealed the key stratigraphic units and their diagnostic signatures for upland locales across the Lake Red Rock project area. Fine scale analysis documented graded transitions within, as well as between, principal late Pleistocene strata and the depositional and chrono-stratigraphic correlates of these units were examined. Landscape impacts generated by Lake Red Rock were assessed and were shown to have greatly affected both site integrity and the consequent interpretive potential of the artifact distributions.

2 - Sites 13MA80 and 13MA81

Sites 13MA80 and 13MA81 are situated on the west and east flanks of a steep ravine of the north side of Lake Red Rock, and both feature interfluve edge occupations analogous to those at sites 13MA114 and 13MA115. Of the two sites, 13MA81 contains an identifiable late prehistoric succession with articulated Middle and Late Woodland components as well as an Oneota occupation; the assemblage, as discussed previously, includes both diagnostic tools, cores, and abundant debitage. Site 13MA80 is less distinctive and houses a mixed assemblage. The articulation of a multicomponent upland site demanded systematic reconstruction of the site sedimentary and landform relations.

As mentioned, the site settings straddle the same physiographic milieus and stratigraphic sequences as the sites on the south side of the lake. Valley bottom morphology is somewhat different, however, as significant paleochannel landforms are not present at these locations and, accordingly, submerged site complexes have not been reported for this stretch of the floodplain. Upland profiles are standard with only the proglacial lacustrine deposits displaying more extensive distributions and thicker accumulations (to the north), while both Kansan till and weathered loess profiles are similarly stratified above the Pennsylvanian bedrock shales.

The emphasis of the site-specific study addressed effects of wave cutting and the relation of tread and riser gradients to the sequential redistribution of surface artifacts along the interfluve grade at site 13MA81.

Because of the clear-cut stratigraphy at these locations, detailed profile examinations are not reported at these sites and reference is made to the north shore profile of the type-section for the uplands (Figure 3-2). Subsurface coring was conducted along the surface grade to depths of 100 cm to isolate micro-stratigraphic changes associated with slope movements and differential erosion. The site of 13MA81 was the major locus investigated, but slope studies were also conducted along the 13MA80 interfluve to calibrate the scope of wave cutting and to serve as a control profile. Measurements made along the tread-riser surface at that site confirmed the regional significance of the slope breaks described below.

Figure 5-7 shows the surface slope and underlying sediment matrix at 13MA81. Superposed on the profile are three artifact collection transects running east-west across the site. As indicated, each transect crosses a distinct surface type that is defined by two principal variables:

1. The texture and composition of the substrate;

2. The wave-cutting activity of the oscillating lake front.

When problematic sediment matrices or facies variants were encountered the augur cores were taken down to the diagnostic contacts. Not surprisingly, the principal units defined were the capping lake and beach sediments, basal loess, the Yarmouth-Sangamon paleosol, and the bedrock shale, all stratified in a manner consistent with the vertical relations documented regionally. A subtle exception was the contact between the edge of the paleosol and the bedrock shales, since the latter have weathered into a clayey regolith and the transition is difficult to pinpoint. Since the contact along the slope is gradual, the paleosol (and not the basal till matrix) registered the stratigraphic break. Noteworthy as well is the fact that since the loess cap along the northern slope is very thin (ca. 1 m) and the distribution does not extend far downslope, the beach sediments and consequent wave cuts only encroach up to the mid-slope exposed at the Yarmouth-Sangamon paleosol surface. The sediments have thus deposited a thin veneer blanketing the paleosol and regolith exposures and have not cut into the loess cap.

Transect 1 crosses the loess cap and was therefore never impacted by wave activity. Transect 2 spans the highest detectable surface attained by lake waters and, in accordance with the tread-riser model shown in Figure 5-6, it also represents the most stable level affected by lake water advances. This hypothesis is verified by the fact that the tread of Transect 2 is not covered by beach deposits, suggesting that its elevation is sufficiently above the level of any but the most active inundations. Figure 5-7 illustrates that the Transect 2 level is underlain by the Yarmouth-Sangamon soil surface that maintains a high clay consistency and is relatively resistant to both surface and subaerial erosion. Transect 3 is the only collection unit mantled by recent lake sediments and it is situated on a tread between two steep risers. The abrupt slope changes and periodically reworked water-laid deposits suggest that the transect surface is most susceptible to progressive slope degradation.

To test the effects of lake-level oscillations and wave cutting along the changing slope settings, controlled surface collections of debitage were made over each transect and the recovered pieces were grouped according to size grade by transect. The objective of the analysis was to isolate and quantify the manner by which wave action and stepping resulted in progressive erosion of the surface and the artifacts on them. Central to the study is the model of tread-riser evolution presented in Figure 5-6. According to Bowman's (1971) study of lake terrace development, protracted wave undercutting will tend to form a tread. Oscillations will then remove coarser materials from the bench or tread down the riser. In a staircase situated with several tread-risers the lowest tread should have the highest relative proportion of coarse clastics. In the test case at 13MA81 the debitage corresponds to the coarse clastic population and

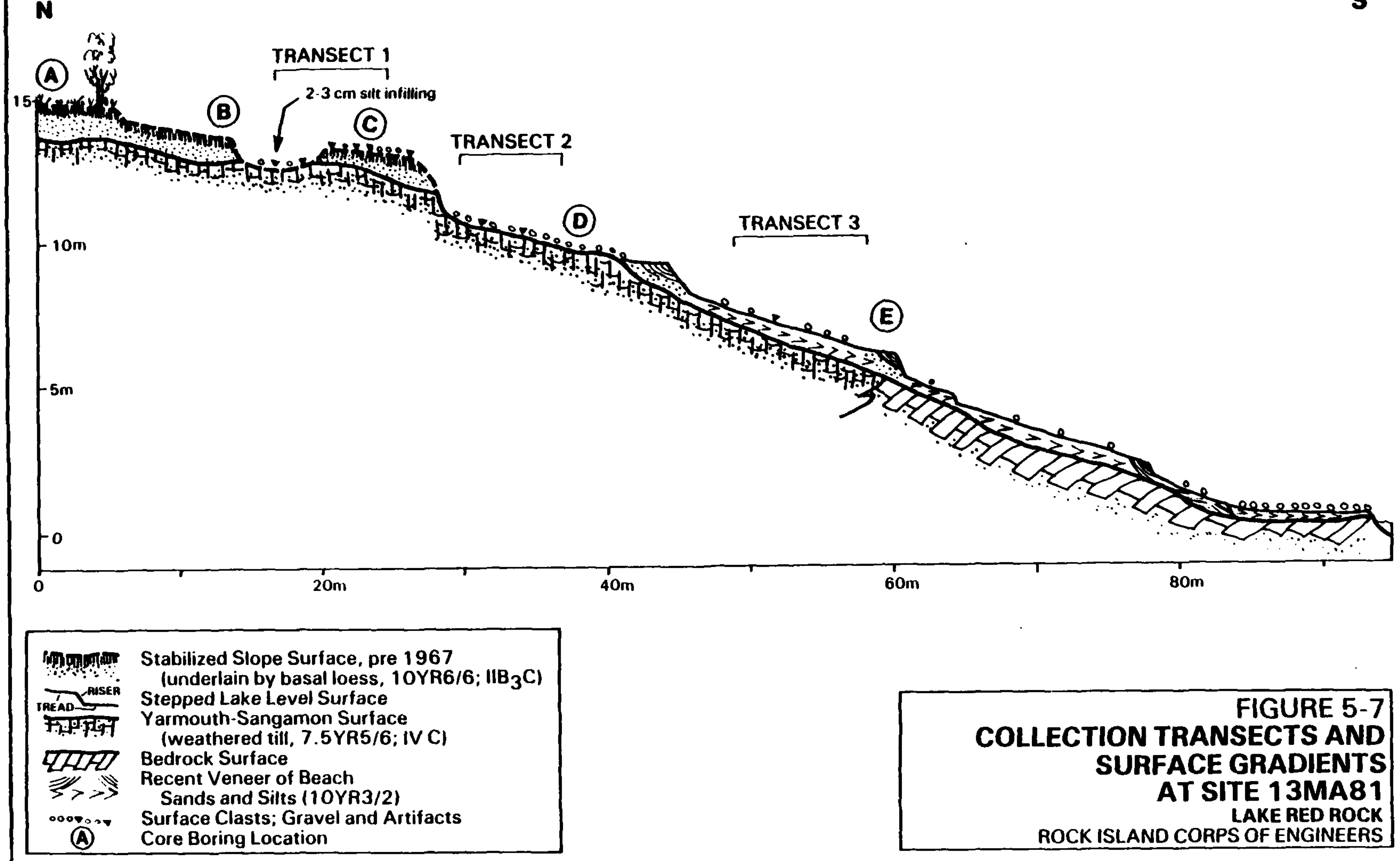

FIGURE 5-7
COLLECTION TRANSECTS AND SURFACE GRADIENTS AT SITE 13MA81
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the following size-grade categories were recognized: 1/8 to 1/4 inch, 1/4 to 1/2 inch, 1/2 to 1 inch, and 1 to 2 inches.

Figure 5-8 is a graphic representation of size-grade breakdowns plotted by cumulative frequency percentage for each transect. Results must be interpreted with due consideration to the initial contexts of the distributions. Transect 1 is the most pristine lithic scatter as it is contained on a stabilized surface reinforced by a forest-grass vegetation mat and not subject to erosion by lake level shifts. The curve shows that this is the most poorly sorted distribution and only 28 percent of the sample population falls in the coarser size grades (i.e., 1/2 to 2 inches). While the upslope distribution cannot be considered random - it clearly reflects cultural and/or low-energy, postdepositional transforms (see Schiffer 1975) - its heterogeneous disposition is a not unexpected signature for a lithic scatter where no clear organizational parameter can be invoked to explain sorting. By contrast, both Transects 2 and 3 do display pronounced sorting in direct correspondence to both downslope location and frequency of exposure to wave action. Transect 2, situated on a high-level riser and subject to only infrequent inundation, has 36 percent of its debitage in the 1/2 to 2 inch size class, while transect 3, on a lower riser and associated with active beach deposits, has 55 percent.

Conversely, for all three transects the lowest relative frequency for the lightest size grade varies directly as increasing exposure to wave activity. Thus, the lowest transect, 3, features only 3 percent of its total assemblage in the 1/8 to 1/4 inch size class. The implications of this distribution are not clear, but it may suggest that lighter pieces are winnowing out along the steepened slope face of the tread and are being preserved along edges, since gravitational forces do not come into play strongly until wave retreat has created sufficient kinetic energy for fall down the riser. Results of the transect-debitage study are summarized in Table 5-8.

It is not proposed that these particular graded distributions apply to all lake scenarios. Clearly the distinct surfaces and slope angles of each setting were significant variables in regulating the rates and modes of slope undercutting, stabilization and consequently of downslope artifact transport. It is suggested, however, that models of wave activity on lake terraces be applied to reservoir situations where limnic and shoreline geomorphic processes initiate new sets of impacts on the landscape, the effects of which have been studied in natural lake environments. For archeology, one such application involves the examination of shoreline modifications on surface lithic distributions that correspond to coarse clastic deposits in major lake basins.

3 - Site 13MA44

The site contained perhaps the most complete prehistoric succession recorded across the Lake Red Rock study area, yielding discrete Middle Woodland, Late Woodland, Great Oasis and Oneota components. This was also a prime lowland setting as it is situated atop a raised (2.5 m) terrace remnant at the outlet of a recent erosional gully to the Des Moines valley (Figure 5-9). The gully, which bisects the site, was probably initiated or at least developed as a result of relandscaping that was responsible for the building of a railroad grade that traverses the site and then follows the valley axis along the scarp edge in a northwesterly direction. The landscaping activities associated with the construction have impacted the study area by accelerating local runoff and promoting site erosion.

Morphologically the landform appeared to be a typical alluvial terrace exposed as a result of extensive lateral swinging and incision into the earlier fills. Examination of the valley bottom landform configurations cautioned against this hypothesis for several reasons. First, the higher terrace surfaces (i.e., >750 feet), when regionally preserved, almost invariably articulate with alluvial fan formations, which is clearly not the case at the site 13MA44 outcrop. Second, the channel scars, meander scrolls, and oxbows are only mildly offset topographically from contemporary floodplain elevations and not by relief on the order of several meters. Corollary to this observation also was the fact that the raised terrace surface was not typically concavo-convex. Finally, and perhaps most significantly, the river channel at site 13MA44 is banked against the terrace edge and maintains a straight flow along this edge for half a mile. Given the generally winding course of the Des Moines and the strong tendency for high energy streams to carve their channels through the softest sediments, it became apparent that the river was abutting against the terrace bank due to lithological constraints. Thus, the richness of the site's archeological record as well as its location atop what was clearly an anomalous terrace locale prompted detailed investigations of terrace morphology and subsurface stratigraphy.

A well exposed bank at the river's edge furnished the key profile, and investigations of the substrate proceeded along the shallow terrace grade to the footslope of the bluff with four core probes augered to a depth of >150 cm. Shovel tests and slope profiles were measured up to the bluff-crest to round out the local sequence. The key stratigraphic relationships are presented in Figure 5-9. Table 5-9 summarizes the pedological and sedimentary properties of the key units underlying the terrace surface.

The profile clearly shows that the main constriction acting on the river has been the bedrock. Accordingly, a bench has been carved at the break of the regolith and the hard bedrock where the river truncated the terrace edge laterally. Initial investigations, however, did not adequately reveal the structure of the shales, since the regolith is strongly weathered and grades diffusely upward to the contact with the basal loess. Outcrops of regolith are, in fact, not uncommon in the project area, but in general they are exposed at higher upland profiles which are better defined and offset at identifiable unconformities. The proliferation of anaerobic concretions, ferro-manganese streaks, and nodules attests to perched water tables caused by the impermeable structure of the shale substrate. These explain the weak stratigraphic articulation, but more significantly they account for the poorly drained terrace settings and the generation of circumscribed aquatic biomes along this portion of the river. As illustrated by the clustered site distributions in the vicinity (see Figures 6-2 and 6-3 in Chapter 6), it is precisely such landscapes that attracted prehistoric groups. In large measure, then, it is the shale bedrock stratigraphy that predisposed the local physiography to well differentiated and lush subsistence environments. It must be noted, however, that the microenvironment initially created at site 13MA44 was not fashioned by a fluvial system developed in a series of fills. The terrace is rock-cut and defines a strath surface that was subsequently aggraded

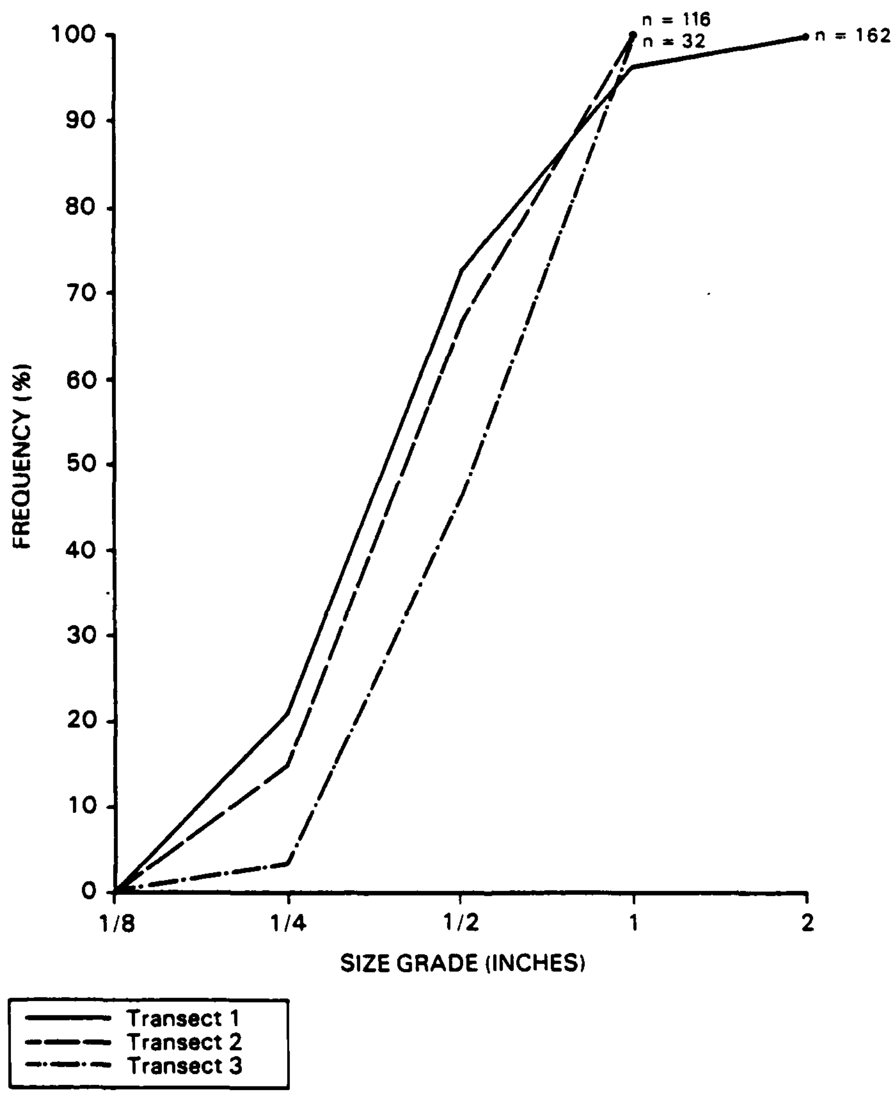


FIGURE 5-8
CUMULATIVE FREQUENCY DISTRIBUTIONS FOR LITHIC DEBITAGE AT 13MA81 BY SIZE GRADE

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

COMMONWEALTH ASSOCIATES, INC

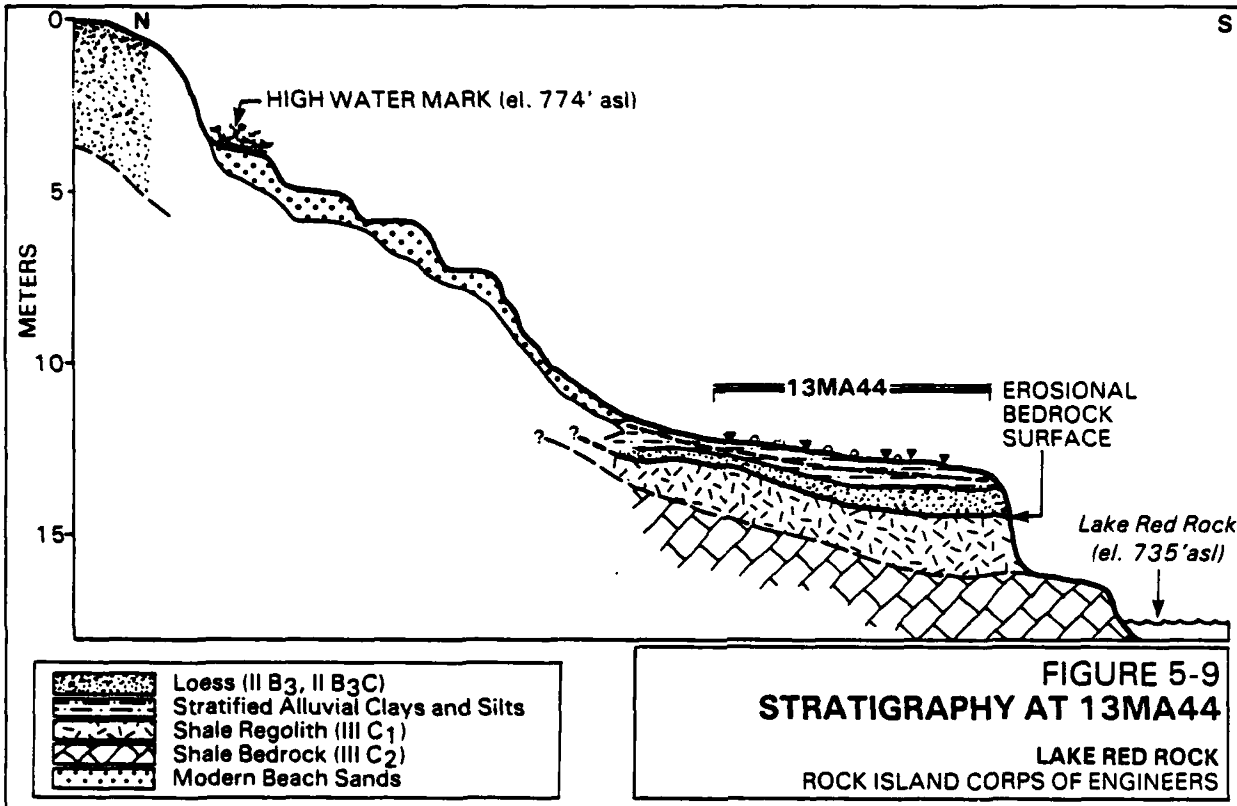


FIGURE 5-9
STRATIGRAPHY AT 13MA44

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

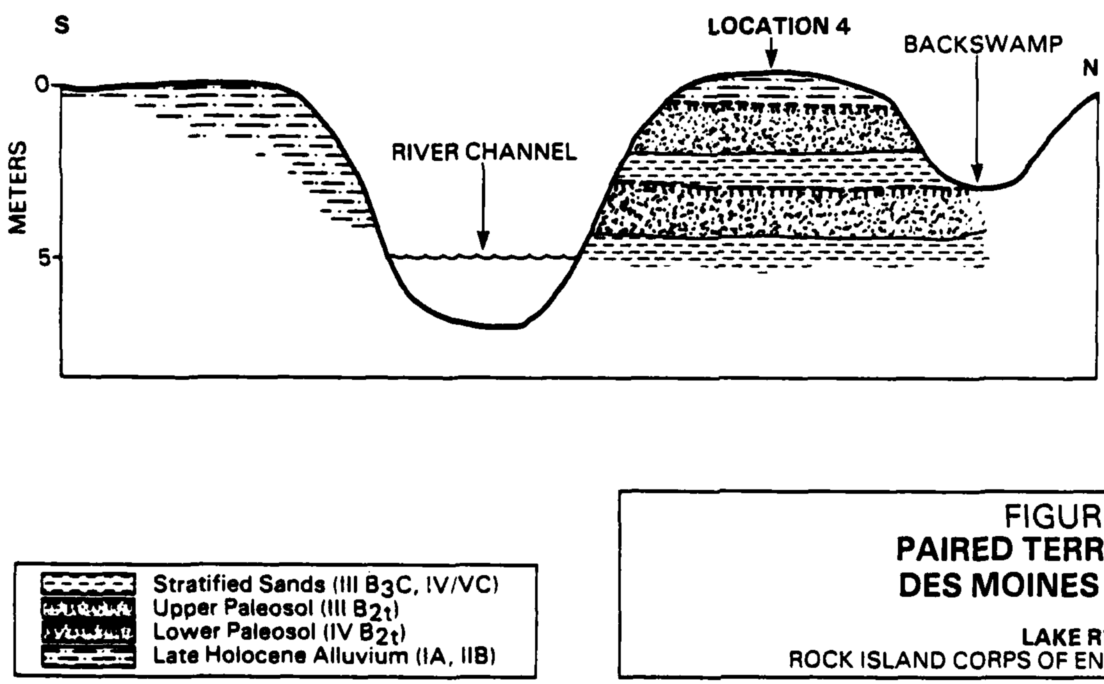


FIGURE 5-10
PAIRED TERRACES, DES MOINES RIVER

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

TABLE 5-8

CORRELATION BETWEEN TRANSECT SETTINGS AND DEBITAGE SIZE GRADES

Transect	Surface Grade	Substrate	Percent Debitage in Coarse Fraction (1/2-2 inches)	Percent Debitage in Light Fraction
1	Stabilized crest	Base of the weathered loess	28	22
2	High tread	Yarmouth-Sangamon paleosol	36	15
3	Low tread	Beach sands	55	3

TABLE 5-9

SEDIMENTOLOGY AND STRATIGRAPHY AT THE 13MA44 TERRACE

Unit	Depth (cm)	Sedimentology and Stratigraphy	Pedologic/Sedimentary Environment
IA_1	0-12	10YR 3/3 fine sandy silts with medium platy structures and weak ped development. High organic presence features micro inclusions. Abundant mottling in fine (1-5 mm) size grade. Prominent, but very fine void network and few roots preserved. Lower contact is abrupt and smooth.	Organic, platy structures that are weakly developed are diagnostic of recent siltation and episodic overbanking.
IIA_{1b}	12-36	10YR 3/1 clay-silt with coarse granular structure and weak ped development. Deposit incorporates extremely high organic presence, soil colloids and abundant organans around ped faces and abundant voids. Sediment is neither sticky nor plastic; roots are infrequent. Burnt clay concretions dispersed throughout matrix. Lower contact is clear and smooth.	Colloids and organans suggest this is a strong Mollisol that probably capped the site over extended time span. Burnt clay concretions may be cultural and associated with one or several occupation phases.
IIB_3	36-65	7.5YR 4/2 clay-silt with coarse angular blocky structures that break into medium-fine angular blocks. Slight organic matter presence in cracks and fissures. Matrix is moderately sticky and plastic. Root presence is minimal. Variety of cutans, argillans and organans are widespread around ped faces. Lower contact is gradual and smooth.	Coarse angular blocks and moderate ped development as well as consistence, color, cutan presence, and articulation with bedrock reg surface indicate that this is a weathered loess, perhaps slightly reworked downslope.
IIB_3C	65-75	10YR 4/1 clay silts, weakly structured in coarse prisms that break into small angular blocks. Negligible organic content and moderate stickiness and plasticity. Argillic cutans are common around ped faces and are continuous. Lower contact is gradual and irregular.	This is the base of the loess featuring less soil development than the weathered subunit (IIB_3). It accumulated on the bedrock unconformity.
$IIIC_1$	75-120	5YR 5/8 cohesive silts contained in firm, coarse angular blocky structures. Abundant mottles, medium-coarse (5->15 mm) with sharp contrasts. Intricate fissure and void network. Matrix is slightly sticky and plastic. There are a variety of polymorphous and compact concretions. Lower contact is clear and smooth.	The regolith has weathered differentially, displaying firmest consistence and structure at the base. Silts and clays have seeped into interstices in the degraded upper fabric, lending it a more heterogeneous texture. Concretions are associated with orthogenic processes of original sedimentary rock.
$IIIC_2$	120- >160	5Y6.5/0 bedrock with massive laminar structures. Some coarse mottles are present and these are distinct with sharp boundaries. There are fine pores and a weak root cast network. Ferro-manganese streaking is common.	The cohesive bedrock is impermeable and water retentive thus giving rise to ferro-manganese streaking. The shales are Pennsylvanian bedrock.

by a river that had readjusted to a developing floodplain in early postglacial times. The sequential development of the surface is discussed below.

The erosional bedrock surface marked in Figure 5-9 is a major unconformity offsetting the ancient (i.e., pre-Pleistocene) channel margins. As discussed earlier, on the regional scale, there are no surficial outcrops of Pleistocene meltwater or outwash deposits that index the base levels or channel regimen of the antecedent Des Moines River. The erosional bedrock surface is capped by stratified aeolian loesses (units IIB_3 and IIB_3C), neither of which incorporate diagnostic oxidation-reduction concretions or streaks in their peds. The sediments would appear to postdate the proglacial lacustrine facies (unit IIIC at site 13MA115), since they are lower in elevation (760 feet versus 780 feet) and are a substantially thinned accumulation exposed to longer term erosion along what was probably a steeper interfluve. The sediment matrices here are neither as firmly structured nor as rich in illuvial clays and cutans as their thicker counterparts downstream. It is entirely possible that they represent a reworked loess transported downslope by colluviation, and fanning out to form a tongue on the bedrock. This process would have been paramount in building the terrace surface. It is stressed that both the absence of water table inclusions in the loess matrices and their downslope dispositions argue strongly that climatic conditions at the time of colluviation were extremely dry. The colluviation episode predates the occupation since no artifacts are incorporated in the matrix and the limited weathering documented for the sediment would have occurred over the course of several thousand years and well prior to the occupations. It is conjectural as to how long these dry conditions persisted, but the stratigraphy at site 13MA44 suggests a hiatus of several thousand years between the termination of loess deposition and the resumption of active sedimentation, since late prehistoric artifacts are associated with the top of the Mollisol only 15 to 20 cm above the loess. While clear archeo-stratigraphic correlation cannot be ascertained between the prehistoric materials and unit IIA_{1b}, a strong potential for the correlation is predicated on the fact that the cover alluvium is almost definitely of very recent age (i.e., post-dam construction) given its sedimentological properties and lateral intergradation with the modern beach sands (Figure 5-9). Table 5-9 shows that the matrix preserves its delicate platy structures and contains abundant mottles in response to a dynamically shifting hydrographic situation.

It would appear, that the 24 cm thick Mollisol registers the rejuvenation of the alluvial system of the Des Moines River in the Holocene. Interestingly, Benn and Bettis (1981:12) have noted the dominance of Mollisol profiles on high terrace surfaces in the Downstream Corridor that have been dated to ca. 5000 B.P. Whether or not there is a correlation between the two floodplain reaches remains problematic (see discussion in Chapter 8), but the temporal framework, marking the end of the Hypsithermal, would be consistent with both the resumption of active aggradation on Holocene surfaces and pedogenesis in response to moister climatic conditions. Considerably more geomorphological and chrono-stratigraphic evidence is needed, however, before such hypotheses can be tested.

Finally, the deposition of the upper alluvium, unit IA, appears to be relatively recent and attributable to a recent stage of high level stream flow. It may just predate the dam inundation marked by morphogenesis of the tread-riser complex and beach sedimentation along the site mid-slope. The terrace silts and clays have accumulated as a result of episodic overbanking caused by high energy stream flow along its banked stretch at the site locus. Studies of fluvial dynamics have shown dramatic energy dropoffs at inflection points, or around meanders (see Leopold, Wolman, and Miller 1964:162-164) and correspondingly high levels along straight reaches and in bedrock defined channels, so that the overbanking and, in fact, net sedimentation, represents a transition in the hydrographic balance subsequent to the formation of the underlying Mollisol.

On the basis of the reconstructed terrace scenario, its paleogeographic implications for prehistory and lowlands occupation are noteworthy. Initial conditions favorable to settlement along this reach of the bottoms are attributable to the differential drainage conditions created by the disposition of and impermeable, water retentive capacities of the bedrock shales. At site 13MA44 major signs of waterlogging or aquatic settings are not in evidence since the loess tongue sealed off the shales and would have created more optimal drainage at the site proper. However, the differentiated landform configurations at lower elevations in the site vicinity that include terraces, fans, oxbows, and ridge-swale complexes are strongly suggestive of the intricacy of the hydrographic system and a prime source of this variability is the underlying bedrock. The weathered bedrock is capped by a thin loess that dates the onset of clastic - in this case, aeolian - deposition to the end of the Pleistocene at a time when the climatic regime was characterized by protracted dryness. Holocene environments evolved in renewed alluvial settings registered by very slowly aggrading flood silts and clays and the development of a Mollisol profile. On the basis of the shallow and preserved record of aggradation and the late prehistoric succession at site 13MA44, indications are that the emergence of the Des Moines valley in its present form dates to the last few thousand years of the Holocene.

4 - North Shore, Des Moines River Terrace

Location 4 was examined in some detail when it was recognized that two strata exposed along the bank-cut were moderate to well developed argillic B-horizons. The significance of the location lies in the fact that it was the only lowlands profile characterized by diagnostic weathering substrate, and their occurrence offered strong possibilities for the differential preservation of remnants of earlier Holocene floodplains. As noted, all exposures surveyed in the initial reconnaissance disclosed either strath terraces (i.e., at 13MA44) or relict ridges of local significance and relatively recent origin. The isolation of a buried paleosol and ancient surface has clear implications for reconstruction of the postglacial and possibly the early (pre-Woodland) prehistoric environments along the valley. The general morphology of the weathered horizons suggested sustained development. Such evidence could conceivably fill in the temporal gap of the early to mid-Holocene and might have potential for correlation with the upstream terrace chronology advanced for the Saylorville area.

Figure 8-2 shows the location of the terrace outcrop in the project area. It is only 2.5 km up-valley from 13MA44, but as described below, the stratigraphic and geomorphic settings are extremely diverse. This is especially striking since both locations are at the same approximate elevations (750-760 feet AMSL) and both straddle the outside bends of principal meanders.

Field investigations at location 4 consisted of visual inspection and description of three sections spaced 200 to 300 m apart along the extensive bank exposure to ascertain both the lateral continuity of the paleosol and to disclose the sedimentation patterns underlying the weathered matrices. Figure 5-10 illustrates the terrace stratigraphy and relates the outcrop to an altimetrically paired, but morphogenetically distinct, counterpart on the south side of the channel. Table 5-10 summarizes the sedimentology and stratigraphic units.

Five stratigraphic units were identified the length of the exposure with units III and IV housing truncated paleosol sequences from the stripped surfaces of the deeply weathered B_{2t} horizon down through the interface of alluvial parent materials. Both units therefore registered intact pedo-sedimentary cycles with the exception of the less cohesive organic A-horizons that were stripped with the resumption of active flooding. If regional profiles may be invoked to round out the sequences it is probable that the A-horizons were Mollisols. The tops of the truncated paleosol were encountered at depths of 50 and 150 m, and were separated by a relatively fine-grained alluvium that marked the base of the upper paleosol's solum. Plate 5-3 shows the top of the upper paleosol. On colorimetric and topo-stratigraphic grounds the buried soils are similar to the loess tongue outcropping at 13MA44, but closer examination of pedological features shows richer weathering characteristics for the argillic paleosol. Comparisons between unit IIB_3 at 13MA44 with both $IIIB_{2t}$ and IVB_{2t} at location 4 reveal the following:

1. Both terrace argillic horizons have prismatic structures offset by strong fissure and pore networks. The weathered loess breaks down into comparatively weaker smaller angular blocky peds and the fissures are not as deep nor as wide;

2. Stickiness and plasticity are higher, especially in the lower paleosol;

3. Argillic cutans are prolific, continuous, and line both void and ped interfaces in the paleosol while they are more diffuse and poorly defined in the loess matrix.

It is the relatively strong and well developed peds and cutans that are the strongest indicators of long-term soil formation.

Along the exposure the thickness of the B-horizons was strikingly uniform and consistent as both ranged to depths of 1 to 1.2 m. Similar accumulations were noted by Benn and Bettis (1981:Table 2) for the high terrace (TH) and upper intermediate terrace (TI) levels at the Downstream Corridor. They note that the upper intermediate terrace profiles average 1.0 m and feature discontinuous cutan distributions, while higher terrace outcrops have deeper B-horizons ($\bar{x}$ = 1.4 m) but more continuous cutans. The Red Rock exposures thus display pedogenic profiles that fall in between the high and intermediate levels (i.e., more developed cutans at shallower depths) so that it is tempting to draw chrono-stratigraphic inferences based on these morphological criteria. If the location 4 paleosols date to the interval bridging high and

TABLE 5-10

SEDIMENTOLOGY AND STRATIGRAPHY AT DES MOINES RIVER TERRACE (Location 4)

Unit	Depth (cm)	Sedimentology and Stratigraphy	Pedologic - Sedimentary Environment
IA_1	0-5	10YR 3/3 poorly structured granular clay-silts with weak ped development. They contain abundant fissures and voids in very fine size grades (.5-2 mm). Roots are abundant. Lower contact is clear and smooth.	Overbank flood silts from most recent inundation.
$IIBC_{ox}$	5-50	10YR 4/3 clay-silts with medium-coarse angular blocky structures that break into fine angular blocks of soft consistence. Fine and abundant voids and prisms. There are well defined mottles and Fe-Mn streaks. Matrix is slightly sticky and plastic. Roots are infrequent, but infillings are lined with organic and argillic cutans. Lower contact is gradual and wavy.	Sediment is a slightly oxidized alluvial fill that contains a weak weathering profile. It is the parent material for the upper sequence.
$IIIB_{2t}$	50-115	7.5YR 4/3 clay silts with well structured medium prisms (50-100 mm) that break into coarse angular blocks. Light organic presence (rootlet stains). There are infrequent well-rounded pebbles dispersed throughout. Pores are fine and abundant. Slight stickiness and plasticity. Argillic cutans are continuous and very prominent around ped interfaces. Lower contact is clear and smooth.	This is relatively deep illuvial horizon with argillic structures firming with depth. Zone of translocation is clearly offset. There is a coarsening of particles to base of unit that reveals alluvial origins of deposit.
$IIIB_3C$	115-153	10YR 4/4 clay silts and sands with coarse angular blocky structures, weakly developed. Minimal organic matter but high void and root presence. Argillic cutans present (as above) but with diminished frequencies. Pebble and gravel lenses are present near base of section. Lower contact is clear and smooth.	The base of the weathering profile contains waning pedological and accentuated sedimentary properties. Lenticular depositions document moderate energy stream flow.
IVB_{2t}	153-206	7.5YR 4/4 silt-clay with coarse prismatic structures that break into medium prisms. Fissure and pore networks are intricate and stickiness and plasticity are high. Argillic cutans proliferate and are continuous along void and ped faces. Lower contact is gradual and smooth.	Well developed peds and diagnostic fissure, void and cutan networks define a second generation paleosol that was truncated by subsequent stream activity.
IVB_3C	206-263	7.5YR 4/6 clay-sand with very coarse angular blocky structures. There are common, fine mottles that are diffuse and contrast weakly with main matrix. Fissures and pores are prolific and fine. Argillic cutans are weak with diffuse and irregular distribution. Lower contact is abrupt and smooth.	Base of the lower paleosol grades into a coarser-grade alluvium and the drop-off in weathering features is acute.

TABLE 5-10 (Cont.)

SEDIMENTOLOGY AND STRATIGRAPHY AT DES MOINES RIVER TERRACE (Location 4)

Unit	Depth (cm)	Sedimentology and Stratigraphy	Pedologic - Sedimentary Environment
IV/VC_{ox}	263-313	10YR6/4 alternating bands of medium sands and clayey sands, with minimal cohesiveness and structure. They are strongly mottled and Fe-Mn streaks line face of profile. Size grades are coarser in deeper beds and depositions are more massive. Lower contact is sharp and abrupt.	Unit marks a transition to a high energy fluvial regimen with abrupt and episodic bedload depositions. Stream had high competence and capacitance.
VC_{ox}	>313	10YR6/4 stratified medium sands with foreset bedding structures. Sands are apedal, moderately sorted, and feature organic inclusions as well as common well rounded gravels housed in principal matrix. There are alternating organic and mineral sand laminae.	This is the top of a thick well bedded sandy unit which may grade down to coarser gravel (outwash?) deposits.

intermediate terrace development they could be as old as 4000 B.P. and would therefore provide a benchmark for the middle Holocene period.

There are, however, major stratigraphic considerations that caution against de facto projection of the Red Rock paleosols into the Saylorville Downstream Corridor sequence. First, there is the problematic articulation of two superposed paleosols, both relatively well weathered and separated by only a diffuse contact, the $IIIB_3C$ to IVB_{2t} transition. The diffuse contact can be explained by the fact that progressive weathering of the upper paleosol obscured the identifiable sedimentary features of the initial sediment matrix such as, for example, bedding structures and gross sorting planes. Second, the fact that the two soils are layered immediately above one another is problematic, as this might suggest that the age of the sequence is considerably earlier than 4000 years, given the strong argillic properties documented for each. Birkeland (1974:Figure 8-17), however, has demonstrated that steady state conditions for B_t horizon development in Mollisols are attained between 1000 and 2000 years. In this event, the 4000 year interval would accommodate the overall time frame as well as the superposition of the paleosols. In the absence of more comparative exposures the chronological bracketing of the location 4 succession remains speculative.

Along similar inductive lines the temporal placement and morphogenetic contexts of the banded sands begs resolution. Both units IV/VC_{ox} and VC_{ox} are sole indicators in the project area of high energy fluvial deposition; no analogous outcrops were noted, though it is stressed that numerous gravel pits might have provided correlative possibilities had they not been silted in when fieldwork was in progress. It is certainly significant that most quarrying operations have been concentrated along the floodplain in the Knoxville northwest quad. Unfortunately diagnostic exposures of imbricated gravel beds were not encountered in the field rconnaissance and no comparisons could be made. It is conceivable, of course, that these units may be the downstream correlates of the late Pleistocene Beaver Creek outwash defining the valley margins in the Saylorville area. These possibilities await future field testing.

A final concern involves the very complex landform relations uncovered by the limited geomorphologic research at location 4. Figure 5-10 illustrates the complex terrace stratigraphy summarized above, but also calls attention to the paired outcrop across the channel which actually recounts a radically different and simpler morphogenesis, appearances to the contrary. Superficial probes along the exposed bank on the south side of the river showed that the paired terrace was a product of a completely different sedimentation suite, and that only a relatively recent phase of downcutting can possibly explain the morphological similarities between the two landforms as synchronous erosional remnants. Fluvial geomorphologists have long cautioned against the simple application of surface continuity and altimetric criteria to reconstruct the complex dynamics of floodplain evolution (Morisawa 1968; Leopold, Wolman, and Miller 1964). The geomorphologic map (Figure 8-2) indicates that this locality has been the site of extreme lateral swinging by the river, given the numerous meander scrolls and oxbows plotted. The recent channel dynamism coupled with the extensive network of terrace remnants suggests high frequency periodicity of cut and fill cycles locally. These observations mandate systematic investigation of the floodplain geomorphology to account for the disparate sediment histories revealed in the terrace profiles.

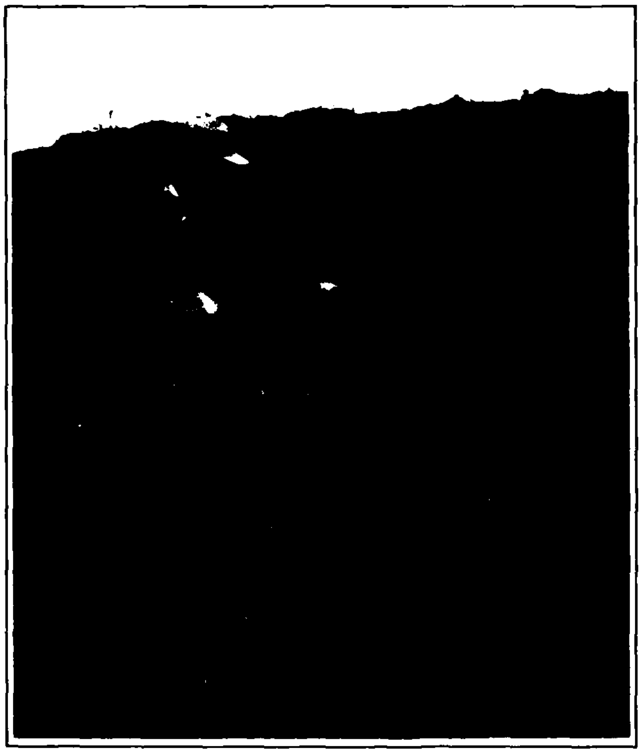


PLATE 5-3
STRATIGRAPHIC SECTION EXPOSING BURIED PALEOSOL (UNIT III B_{2t}) AT LOCATION 4, DES MOINES RIVER TERRACE BANK

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

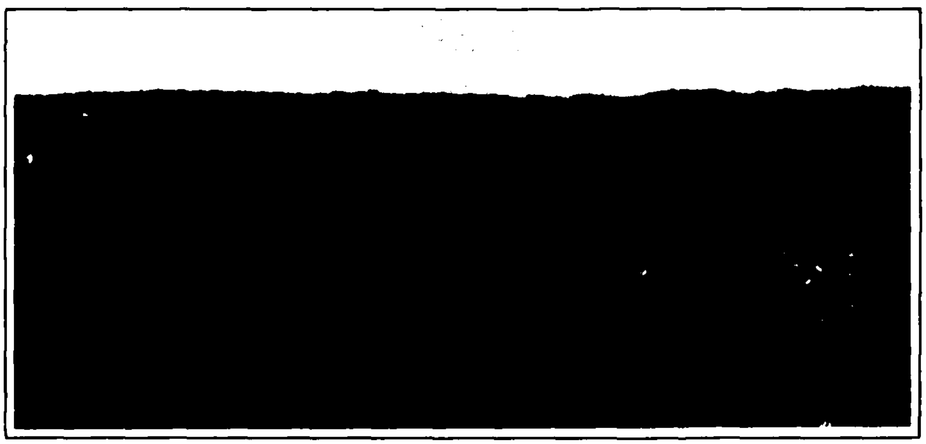


PLATE 5-4
TERRACE-FAN SETTING AT 13MA209

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

5 - Sites 13MA42 and 13MA209

Both sites are located on an extensive alluvial terrace on the southern bluff footslope. The terrace is at the mouth of Wildcat Creek and is not exclusively a depositional feature of the Des Moines River. The lobate disposition of the landform actually comprises an alluvial fan that has splayed out as a result of northward progradation. This type of sedimentation is generated by the shifting hydrographic balances of the feeder and principal streams, the Wildcat Creek and Des Moines River, respectively. Periodic readjustments in stream flow and sedimentation regimes have produced an interdigitated fan terrace stratigraphy as well as subtly changing slope and landform gradients. It is on such a relatively dynamic surface that several late prehistoric sites were located. A principal reason for the selection of fan terrace locales is that alluvial fan veneers are generally fine sands and silts, and, as capping terrace deposits they produce optimally drained, as well as gently graded settings that strike a favorable balance for intensive soil cultivation.

Major Oneota components, perhaps associated with long-term occupance, were registered at these locations by previous, as well as the present survey, and geoarcheological investigations were aimed at documenting the depositional environments. These are exemplified in Plate 5-4, which is a north facing vista from 13MA209 of the fan surface downgrade at a 3^{o} angle northward in the direction of the river. The light and exposed ground patches trace the eroded surface of fan sands. Darker sediments are backed up silts deposited from the most recent inundation.

Subsurface coring was conducted at 13MA209 to isolate the scope and magnitude of sediment interfingering of fan and terrace depositions. The most sensitive location for calibrating stratigraphic and facies changes was at the fan head which morphologically overlaps the edge of the terrace proper. The column extracted in the auger boring yielded the stratigraphy reported below:

Unit	Depth (cm)	Description
I	0-10	Alluvial fan veneer of 10YR6/3 fine-medium sandy silts. These are currently being deflated.
II	10-23	Organically enriched 10YR2/1 clay silts with medium subangular blocky structures, ùnmottled.
III	23-45	10YR3/2 silt-clays with small subangular blocky structures, unmottled.
IV	45-80	10YR3/3 silts with some silt and sandy cutans. Matrix grades to clayey consistence.
V	60-94	10YR4/4 silt-clay with some sandy cutans.

The borings provide evidence that both terrace aggradation and fan progradation processes are ongoing. Units I and IV appear to register cyclic fan inputs into the system, while the heavier silt and clay matrices of II, III, and V document ongoing floodplain build-up caused by overbanking of the Des Moines River. The fan units represent more abrupt surges as they record a threshold deposition at the Wildcat Creek confluence. It is impossible to gauge the rates at which sedimentation from each source is taking place, but the absence of prominent bedding structures and the subtle surface gradients suggest that protracted durations are the rule. The distributions of the prehistoric materials could be helpful in articulating the stability of the landscape as well. It is probable that the floodplain was in a cycle of mild aggradation at the time of occupance, a condition optimal for replenishing the nutrient soil component. It is, however, impossible to determine what the relative contributions of the fan or floodplain sediment sources were at such a low energy setting in the absence of firmer archeo-stratigraphic and/or occupational contexts.

The setting at site 13MA42 is analogous to that of 13MA209, but the integrity of the alluvial fan lobe is optimally preserved and this landform may date to an earlier cycle of fan formation.

6 - Site 13MA207

The site is located atop an erosional terrace remnant along the outer bank of both the present channel and a scar of an abandoned meander loop. This was the most dynamic fluvial setting investigated in the Lake Red Rock area, as it is the lowest (740 feet AMSL) and is surrounded by the most diverse landform configurations including two meander loops, an incipient fan (abutting the outer channel flank at the mouth of Walnut Creek), oxbows circumscribed by the abandoned flow lines, and a series of discontinuous terrace remnants that are being eroded progressively by lateral channel migration. The oxbows are also aligned with gravel pits along their outer swings. The actual site setting is similar to that described for 13MA209, with the exception that there is no major fan aggradation and in its stead a veneer of river silts almost permanently caps the site surface. This is a result of higher frequency and intensity inundations in the lower elevations.

The purpose of the testing at this location was to examine the depositional settings of the oxbows that are often rimmed by exhumed ridge-terrace features containing prehistoric sites. Oxbows are classically developed by infilling with backswamp materials, generally silts and clays during floodwater recession, that form clay plugs highly resistant to shear. They are of limited depth as they have essentially over-ridden stabilized floodplain surfaces. Coring at the oxbow location probed the depth of the clay plug, but did not reach the stratigraphic break with older sandy-gravel alluvium that could have defined an outwash contact. The core did reveal incremental changes associated with backswamp sedimentation and it is summarized below:

Depth (cm)	Description
0-35	10YR2/1 organic silty clays;
35-65	10YR3/2 organic clay silts with progressive organan development to depth;
65-80	10YR4/3 clay silts with Fe-Mn flecks, very strongly mottled, and sorted in 2 mm thick laminar beds;
80-100	10YR5/3 mottled clay with heavy and massive consistence.

Changing sedimentation modes are registered by the core, with the laminar deposition marking a detectable break from low-energy alluviation to the initiation of an infilling or siltation phase. The aerial photographs suggest that the channel cut-offs in this area occurred over the past 50 years so that it is probable that the upper 65 cm accreted during that time. It is not possible to date the longevity of the channel flow in the abandoned loop prior to that time, but the alignment of the terrace flank and the Oneota site suggest that it was the primary channel in late prehistoric times.

7 - Sites 13MA216 and 13MA217

The settings at these sites on the south side of the river have been referred to as "high bottoms," not so much for their topographic placement, but because of their distinctive articulation with the floodplain. In fact, the landforms occur at the lowest elevations actually overlooking the alluvial basin (ca. 740 feet AMSL), but they are elongate ridges sufficiently distant from the channel to comprise an offset microenvironment. There are no primary channel scars or scrolls in the vicinity, but there are abandoned drainage lines of secondary influents that drained ancient feeder streams. The landform flanking the sites to the southwest is an extensive coalescent bench comprised of minor alluvial fans aggraded on an exhumed terrace surface. The terrace may be underlain by reworked loess or older alluvium, probably the latter. Site 13MA217 is actually an erosional knoll that does not articulate with the bench and appeared to be of more recent alluvial origin. It is flanked to the north by a meander of old Sugar Creek which has been infilled and can no longer be recognized except for the lush vegetation rim along the edge of the site. Site 13MA216 is lower on the floodplain along the ridge nose.

To test the morphogenetic associations of the site landforms 4 cores were placed at crest elevation and documented a 2 m deep sequence. A representative core disclosed the following sequence:

Unit	Depth (cm)	Description
I	0-75	10YR2/1 organically enriched medium and coarse sands
II	75-120	7.5YR4/4 medium coarse sands
III	120-140	7.5YR5/6 clayey fine sands with Mn^{++} reduction flecks
IV	140-200	7.5YR4/6 fine-medium sands with some clay
V	200- 210	10YR4/3 coarse sands and gravels (to 10 mm, long axis)

The sedimentation regime is one of the most singular encountered in the project area. Units II, III, and IV feature redder (7.5YR) hues than any documented in stratified alluvium along this stretch of the Des Moines River. That they are alluvial units, and not terrace paleosols, is disclosed by their loose and coarsely textured matrices, as well as diagnostic signs of subaerial reduction and waterlogging revealed by unit III. Given the proximity of the site to the bluff edge, it is possible that these accumulations represent mixed bedloads consisting of colluviated loesses that were worked downslope into the valley bottoms and then incorporated into alluvium. Unit V here, as elsewhere, may be an outwash deposit, but given the surficial contexts of the upper (unit I) sands, it may in fact define a topographic high of the former floodplain. The unusually coarse textures of the upper deposits suggest that the elongate ridges may constitute relict sand bars.

The archeological materials are of limited utility in sorting out site chrono-stratigraphy since they are not diagnostic. The mixed or indeterminate cultural affiliations are consistent with what appears to have been a high energy alluvial scenario that may have accelerated post-occupational disturbance and/or site destruction.

8 - 13MA212

This is an Oneota site that is situated at a lobe formed near the edge of the coalescent bench 2.5 km west of 13MA217. The site environment is almost identical to that profiled in the description for 13MA209 with alluvial silt and sand veneers grading gently downslope to the alluvial terrace edge, and forming an extensive well drained surface. A single core was placed in the center of the site and was taken down to a depth of 1.1 m. The stratigraphy consisted of a series of weakly bedded silts and clays with colors ranging from 10YR2/1 (top) to 10YR4/4 (base). No major stratigraphic breaks were noted, and the consistence of the substrate indicates that the core was placed sufficiently away from the fan edge to record floodplain sedimentation exclusively. Apparently the prehistoric site was settled closer to the river setting.

Conclusion

The eight locations investigated for geoarcheological purposes cross the range of prehistoric, as well as geomorphologic milieus represented in the Lake Red Rock project area. The tasks performed and objectives pursued at each varied in accordance with the interpretive potential afforded (see Table 5-6). In general, a regional perspective was adopted to address such problems as patterns and rates of landform formation and transformation, differential site location, and contemporary impacts on the ancient environments. The outgrowth of the regional approach is the development of a geoarcheological synthesis that would accommodate patterning in man-land systems and ultimately generate a site prediction paradigm that should serve as a cultural resource planning tool. The regional geoarcheological synthesis is presented in Chapter 8.

CHAPTER 6

A SYNTHESIS OF THE PREHISTORIC ARCHEOLOGY

An important objective, indeed, a major purpose, of the cultural resources reconnaissance at Lake Red Rock is to produce a synthesis of the archeological resources of the lake. Specifically, it will be important for this synthesis to not only describe the current state of knowledge in the area, but also to identify data gaps and important research domains and research questions for continued archeological investigations in the central Des Moines River valley.

The orienting framework for this synthesis is the relevant subset of the study units defined in the 1982 draft of the Resource Protection Planning Process (RP3) document for Iowa (E. Henning 1982). The eight prehistoric units relevant to Lake Red Rock include Pre-Clovis, Paleo-Indian, Early/Middle Archaic, Late Archaic, Southern Iowa Woodland, Mississippi Basin Woodland, Great Oasis, and Moingona-Burlington. Each unit is here separately discussed, except for the Southern Iowa Woodland and Mississippi Basin Woodland which are considered together. A final portion of the synthesis will discuss research themes that are independent of time and space and which are applicable to the Lake Red Rock area.

PRE-CLOVIS

The demonstration of a pre-Clovis (sometimes also called pre-Llano or pre-Paleo-Indian) occupation in the Western Hemisphere has yet to be made to the satisfaction of many investigators. Nevertheless, the evidence from sites such as Dutton, Selby, and Lamb Spring in Colorado (Stanford 1979; Stanford, Wedel, and Scott 1981), Shriver in Missouri (Reagan et al. 1981), and Meadowcroft in Pennsylvania (Carlisle and Adovasio 1982) has been sufficiently publicized and has been accepted by just enough prominent archeologists that it has become practically de rigueur to define this taxonomic unit in archeological overviews.

Any sites assigned to this unit would predate 12,000 B.P., but what the diagnostic artifacts would be is entirely unknown. The Iowa RP3 considers the entire state to have the potential to yield data for this period (E. Henning 1982:20-22), but to date, no sites from the Lake Red Rock area or anywhere else in Iowa are proposed to have pre-Clovis components. The basic research question for this period remains the very basic was there a pre-Clovis occupation and, if so, how is it to be identified?

PALEO-INDIAN

The Paleo-Indian period in Iowa is marked by the presence of lanceolate points of the three major Paleo-Indian traditions of North America: Clovis (or Llano), Folsom, and Plano (Alex 1980:113-114). This period is considered to begin around 12,000 B.P. and is variously dated as ending by about 8500 B.P. (Anderson, Shutler, and Wendland 1980:263) or 8000 B.P. (E. Henning

1982:23). This dating seems likely to be revised or rethought in the future, however. Anderson, Shutler, and Wendland (1980:257) in summarizing the work at the Cherokee Sewer site, where a Plano tradition horizon is dated about 8600 B.P., describe their implicit assumption that lanceolate points equate with the hunting of big game, while the later side-notched points represent a more generalized Archaic hunting and gathering pattern. They go on, however, to conclude that almost the only culturally significant change between "Late Paleo-Indian" and "Archaic" is a change in projectile point hafting technique and that this "appears to be a stylistic consideration of little relevance in understanding the adaptation of hunter-gatherer groups to the prairies."

Central and western Iowa is likely to be an important area for understanding the transition from Paleo-Indian, conceived as centered on the hunting of large, now-extinct mammals, to Archaic, conceived as having practiced a more generalized hunting and gathering economy. In the first place, the conception of Paleo-Indian large game hunting, while definitely valid for the High Plains (Frison 1978) may or may not be an accurate assessment of eastern Paleo-Indian economy. In any event, Paleo-Indian, at least if equated with lanceolate points, ends by 10,500 B.P. or a little later (depending in part on whether Dalton is considered Paleo-Indian or Archaic) in the east, but is considered to last until about 8000 B.P., or even later on the High Plains (cf. Frison 1978:22-40). Eastern Iowa seems to produce a Paleo-Indian and Archaic sequence similar to that of the eastern United States in general, while western Iowa more nearly reflects the Plains sequence.

Central Iowa is poorly known, however. Gradwohl (1974:93) and Gourley (1983:12-13) both report occasional surface evidence of Paleo-Indian occupation in the central Des Moines River valley, but no "fully documented" (Gourley 1983:12) sites are recorded, nor are any in situ components currently identified. Location of Paleo-Indian sites is the immediate research priority for this study unit. Especially needed are sites which will provide information useful for establishing Paleo-Indian chronology, documenting the nature of assemblages, and formulating initial settlement models.

Addressing these research needs cannot be accomplished independently of the evaluation of a geomorphic interpretation of alluvial processes and upland erosion. Primary or semi-primary Paleo-Indian sites clearly cannot be recorded within sedimentary units formed after the Paleo-Indian period, nor is it likely that they will be preserved in areas subjected to erosion during the Holocene. The search for Paleo-Indian components or the verdict that such could not possibly be rewarded can only be accomplished after a dated Holocene landscape evolution model is available.

EARLY/MIDDLE ARCHAIC

The traditional eastern United States taxonomy divides the long Archaic period into Early, Middle, and Late periods and dates the entire period from 10,000 to 2500 years ago (Phillips 1983:1). The distinction between early and middle periods has not been made in Iowa, probably in large part because of the scarcity of investigated sites of these periods, and, as described in the Paleo-Indian discussion, the division between Paleo-Indian and Archaic is not clear either.

Ironically, some of the earliest described Archaic sites in the eastern Plains are sites from western Iowa and include the Hill, Lungren, Turin, and Simonsen sites. These sites all date between about 8500 and 6000 B.P. (except Turin, where a bone date of 4720±250 B.P. seems late). Side-notched projectile points constitute the primary diagnostic artifact within the assemblages. Similar manifestations with similar dates have long been known in Minnesota and Nebraska and are now well-documented in Missouri and Illinois as well. Here, however, side-notched points are considered diagnostic of Middle Archaic occupations and are coextensive with the Hypsithermal climatic interval. They are preceded by Dalton, corner-notched, and bifurcated-base forms considered diagnostic of Early Archaic occupation and manifesting definite stylistic continuities with the southeastern United States. This stylistic shift does not appear as markedly in Iowa. Side-notched points follow lanceolate forms in the Cherokee Sewer site sequence (Anderson, Shutler, and Wendland 1980) and presumably at other sites in western Iowa as well, while forms typical of such eastern Archaic sequences as Modoc Rockshelter (Illinois) are known in eastern Iowa but from surface context only (Alex 1980:120).

The evidence for Early and Middle Archaic occupation of central Iowa is very poor. Gradwohl's (1974:93) synthesis of central Des Moines River valley prehistory describes no materials of this period, nor do any previous reports of investigations at Lake Red Rock. Gourley (1983) also describes no materials from the eight county region studied during the CIRALG survey. She additionally reports that only 28 of 882 (3.2 percent, or 28 of 426 = 6.6 percent of sites with identifiable components) recorded central Iowa sites were reported to have yielded Archaic materials (Gourley 1983:14). This meager total presumably includes Late Archaic as well as Early/Middle Archaic remains.

Commonwealth's September 1983 reconnaissance produced two projectile points that may be Middle Archaic side-notched specimens, however, it is to be emphasized that the identification is tentative. Both specimens are fragmentary and both are from multicomponent sites (Figure 6-1). If correctly identified, they provide slim, although suggestive evidence of Early/Middle Archaic remains in the Red Rock area.

Research priorities for the Early/Middle Archaic study unit are virtually identical to those described for the Paleo-Indian unit. Location of in situ deposits is the immediate need; without them all other domains become academic. From these sites, however, are needed data on chronology and paleoenvironments. It will only be after the Archaic sequence is defined and dated and its environmental milieu established that other research questions can be productively addressed.

The prior need, however, will be the availability of a dated Holocene landscape evolution model. Alluvial process will affect the entire archeological record in the central Des Moines River valley (the recent work of Benn and Harris (1983) shows that even Oneota sites may be obscured) but become more critical for older sites. It is suggested that a properly planned search for early sites will be predicated on knowledge of alluvial sequences and upland erosion patterns.

LATE ARCHAIC

The Late Archaic is normally considered to follow the close of the Hypsithermal climatic episode and to represent a period of increased regional differentiation. The end of the Hypsithermal is time-transgressive but an average date for the beginnings of the Late Archaic period is often given as about 4000 B.P.

Four different traditions are identified as subunits within the Iowa Late Archaic study unit: Prairie/Plains, Prairie Lakes, Old Copper, and Eastern (E. Henning 1982:32). The Red Rock area lies within an area where the Eastern Late Archaic tradition is represented.

In point of fact, the Late Archaic of the Red Rock area is essentially unknown. Gradwohl (1974:93) mentions Nebo Hill materials and occasional site forms also list Nebo Hill points as having been found. If this were the case, then the Red Rock area would be better placed within the Prairie/Plains Archaic. It seems likely, however, that Nebo Hill is not really particularly well represented in the Des Moines River valley. Nebo Hill material does appear in southwestern Iowa (Reid 1983:12) but largely as scattered finds. Indeed, points identifiable as Nebo Hill are known as far east as central Illinois (Roper 1978:15) and are scattered through northern Missouri. However, they are often misidentified, particularly in the older literature. For example, Caldwell (1961:92) suggested that lanceolate points from a site in Coralville Lake were Nebo Hill, but an examination of the photographs shows that they certainly do not belong in that type. At the time, however, Nebo Hill was the only, or at least best known non-Paleo-Indian lanceolate form described in the Midwest. Additional Late Archaic lanceolate forms are now described (e.g., Cook 1976) and better comparative data are available.

If the Red Rock area material more favorably compared with forms such as Etley or Wadlow (cf. Cook 1976), then it would place central Iowa more securely within the eastern Late Archaic tradition. However, one additional factor should operate to make the Late Archaic either difficult to define or immediately recognizable. Much of the highly distinctive Late Archaic material of the eastern tradition is large and, as shown in Chapter 5, the technology of the central Des Moines valley had to adapt to the availability of only small pieces of raw material. On the other hand, the Late Archaic diagnostic artifacts are almost invariably manufactured of distinctive white chert from the Burlington Formation, the closest exposure of which is about 60 miles downstream from Red Rock Dam. Therefore, either the Late Archaic of central Iowa will be marked by smaller forms of perhaps local style, or the large size and imported chert will be immediately recognizable.

No Late Achaic remains were identified in the present collections. This is somewhat surprising since the Late Archaic is often regarded as a period with a drastically increased number of sites. It is obvious that the research priority for this unit will again have to be placed on the development of recognition criteria and of the chronology. Only then can other research questions be addressed. Combining the search for Late Archaic sites with continued geomorphic investigations remains important.

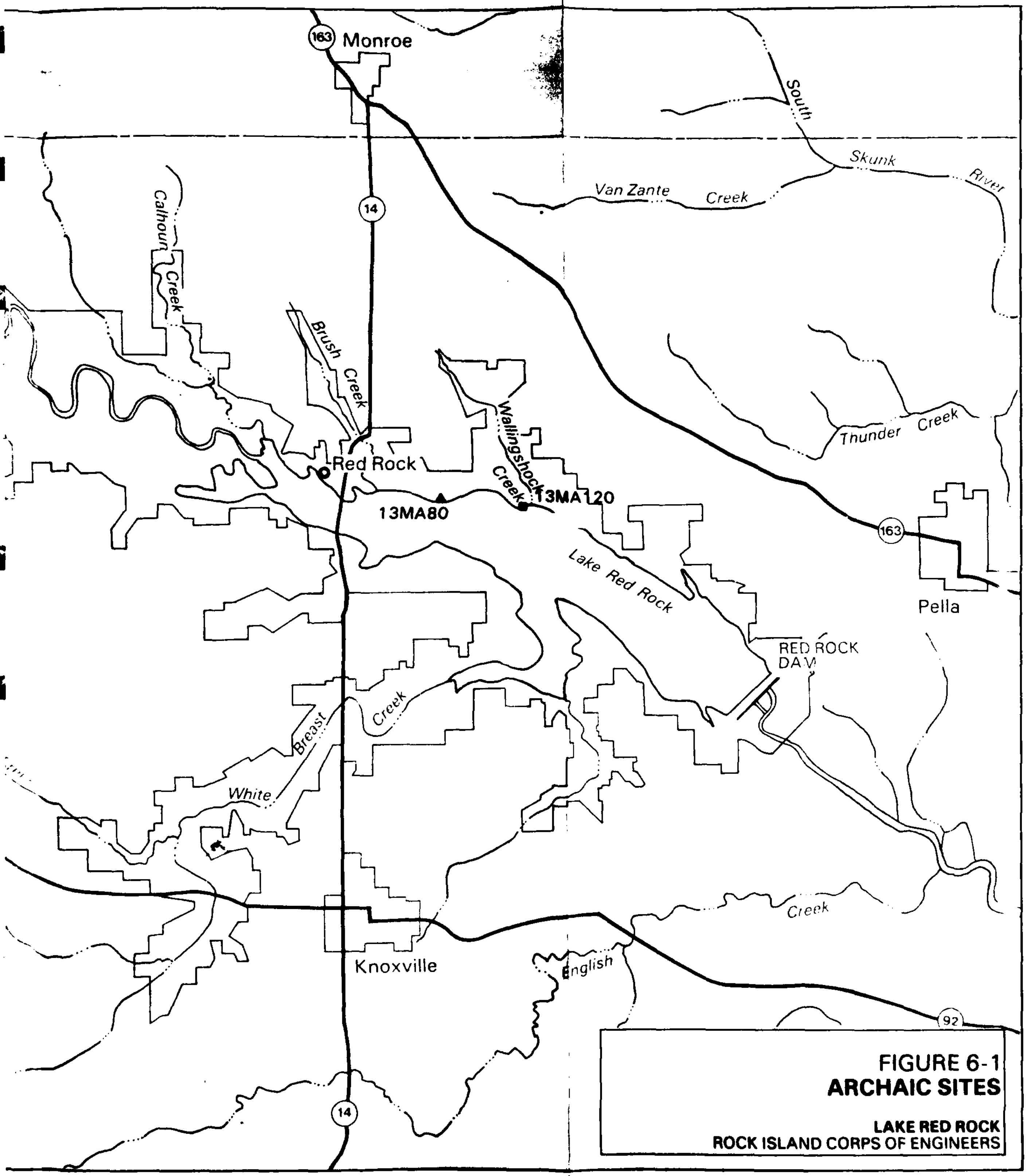
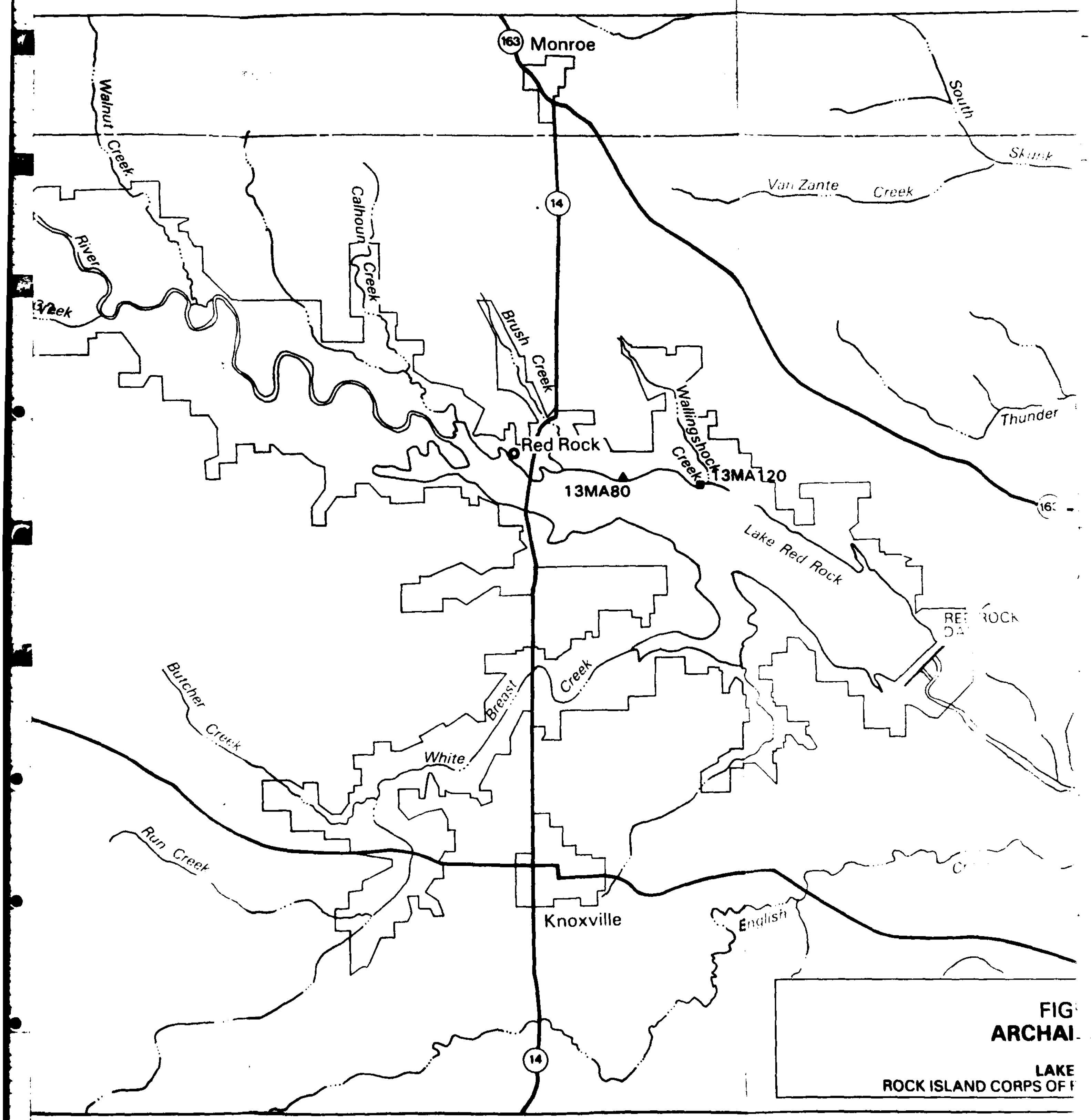
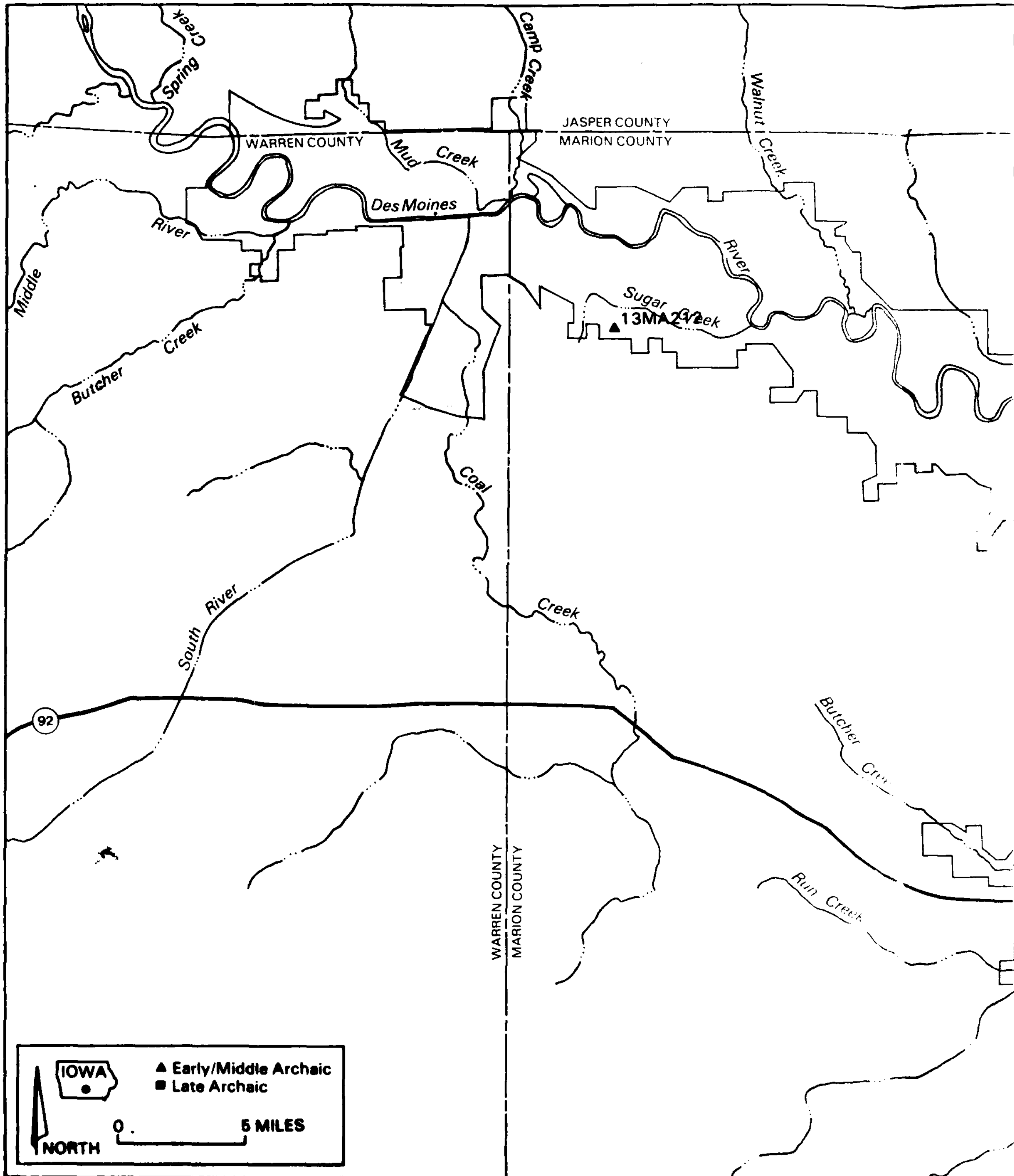


FIGURE 6-1
ARCHAIC SITES

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS



163
Monroe
South
Skunk
Van Zante
Creek
Walnut Creek
14
Calhoun Creek
River
Brush Creek
Wallingshock Creek
Thunder
Red Rock
13MA120
13MA80
163
Lake Red Rock
Butcher Creek
Breast
Creek
White
Run Creek
Knoxville
English
14
FIG
ARCHAI
LAKE
ROCK ISLAND CORPS OF



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SOUTHERN IOWA WOODLAND - MISSISSIPPI BASIN WOODLAND

The Woodland period in the eastern United States is normally, if somewhat inaccurately, marked by the appearance of ceramics in the material culture assemblages. This event is variously dated from as early as 4000 B.P. in the coastal southeast to nearer the time of Christ in many parts of the Midwest. It is this latter date that is more applicable to Iowa.

The trend toward regional differentiation begun during the Archaic continues and intensifies throughout the Woodland. Paradoxically, a portion of the period is marked in the Midwest by some widespread regional commonalities, but these now seem to be overlays on basic regional traditions. The Woodland of Iowa is divided into four separate study units in the RP3 document: Plains Woodland, North Central Woodland, Southern Iowa Woodland, and Mississippi Basin Woodland. The latter two are considered to both be present in the Red Rock area. The Southern Iowa Woodland is very poorly known and is described as reflecting "a development parallel with the Woodland periods which have been defined for the Missouri River trench" (E. Henning 1982:40). Mississippi Basin Woodland, on the other hand, is described as "a manifestation reflective of those defined in the Middle Mississippi Basin and typified by components in the lower Illinois River valley" (E. Henning 1982:42). Since the two units are both considered to be present in the Red Rock area and since it is difficult to differentiate between the two, they are here considered simultaneously.

The basic ceramic sequence of the Mississippi Basin Woodland has long been known and is particularly well defined for the central and lower Illinois River valley (Griffin, Flanders, and Titterington 1970:1-10), although its dating is not as secure as would be desirable. The equivalent for eastern Iowa is now becoming equally as well developed, largely through the early work of Logan (1976) and the more recent work of Benn (1978b, 1979, 1980; Benn and Thompson 1977) along various eastern Iowa streams draining into the Mississippi.

Logan's Woodland ceramic sequence for northeastern Iowa was originally presented in a 1958 Ph.D. dissertation (Logan 1958) and was heavily influenced by Griffin's (1952) Illinois Woodland pottery typology with local types added. It begins with Marion Thick, Black Sand, Morton in the Early and early Middle Woodland, goes to a series of Havana ware and local Spring Hollow types in the Middle Woodland, continues through the local Levsen and Lane Farm types to the variety of cord-impressed types grouped as Lake Michigan Ware in the Late Woodland (Logan 1976:128). A series of cultural taxonomic units using the Midwest Taxonomic System were then defined (Logan 1976:130).

Benn (1979) has continued to use Logan's taxa, although he has redefined most of them into phases. As constituted by Benn, therefore, the major taxa become Ryan complex - McGregor Phase - Allamakee Phase - and Keyes Phase, correlating roughly with the Early Woodland, Middle Woodland, Intermediate period (cf. also Benn 1980:211), and Late Woodland.

Ceramic wares also generally correlate with these taxa and periods. Types such as Marion Thick and Black Sand Incised are diagnostic of the Early Woodland Ryan Complex. Materials referable to this complex are present in small quantity in northeast Iowa, where they were defined (Logan 1976), in the Iowa River valley (A. Anderson 1971), and in the Mississippi River valley (e.g., Van Dyke and Behm 1981), but they are scarce in the interior valleys. Indeed, Gradwohl (1974:94) reports that only "a small group" of pottery from the Saylorville area was either Black Sand Incised or Spring Hollow Incised, and only a single sherd is in the 1983 Commonwealth surface collections. It is described in this report as Spring Hollow Incised.

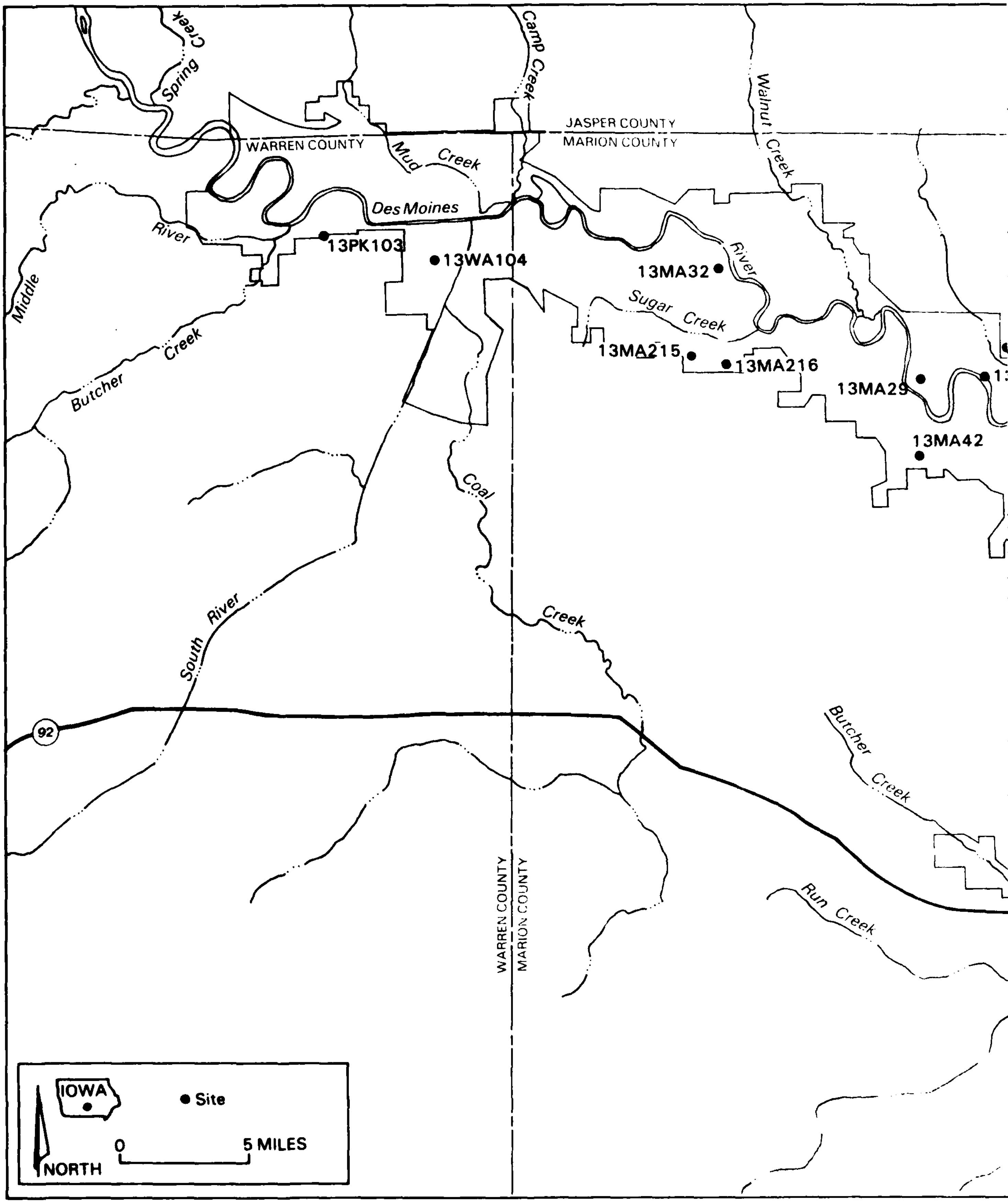
The McGregor Phase was defined in northeastern Iowa as the local manifestation of the Havana tradition defined in west-central Illinois. Its characteristic pottery is the series of types, such as Naples, Havana, and Neteler that were defined for Illinois (Griffin 1952). However, Benn (1978b; Benn and Thompson 1977) has recently argued against the wholesale importation of the Havana typology to eastern Iowa. His analysis of ceramics from the FTD site in Allamakee County showed differences between that site's collection and the ceramic collections from sites in Illinois (Benn 1978b). His analysis of ceramics from the Young site in Linn County (Benn and Thompson 1977) showed the same thing. Differences include the peculiarity to Iowa of various motifs and combinations, the reduced diversity of Havana types in Iowa, and the differences in type frequencies (Benn and Thompson 1977:21). The interior Iowa equivalent of Havana Ware is therefore termed Cedar Ware (the Young site is on a tributary of the Cedar River) to emphasize its local manufacture (Benn and Thompson 1977:7).

Havana-Cedar Ware is represented in the central Des Moines River valley. Gradwohl (1974:94) describes Havana ceramics from the Boone Mound and associated Gracie Paulson sites in Saylorville Reservoir. Benn and Thompson (1977:21), however, regard this as a site unit intrusion, presumably either preferring to regard other Havana-like materials as Cedar Ware or unaware of other such materials in the area. The single sherd in the present collection is a Hummel Dentate motif (i.e., a slightly curved stamp) which is considered uncommon in Iowa. It is for several reasons that we have here equivocated and referred to the material as Havana-Cedar.

The Intermediate period (A.D. 300-650) is considered transitional between Middle and Late Woodland. It is represented by a variety of ceramic types grouped under Linn Ware, including Levsen Punctated and Lane Farm Cord-Impressed. The succeeding Late Woodland period is distinguished by fabric-impressed Madison Ware, described in some detail by Benn (1980:52-72).

The Red Rock reports mention very little cord-impressed or fabric-impressed pottery and Gradwohl (1974:95) reports only that "occasional sherds are similar to Madison Cord-impressed (sic)." This is rather interesting since cord- or fabric-impressed ceramics represent the largest single Woodland ceramic group in the Commonwealth collections. Many of these sherds are sufficiently fragmentary that we have not attempted to differentiate between Lane Farm and Madison wares.

The discussion of RP3 study units and the Lake Red Rock project area has finally reached a unit for which it is not necessary to establish the location of sites and the development of diagnostic criteria as a research priority. Certainly the known number of sites is not overwhelming; 19 sites examined by Commonwealth yielded Woodland materials and additional sites are reported in the state files (Figure 6-2). Nevertheless, the majority of sites with identified cultural affiliation are datable to the Woodland or contain Woodland



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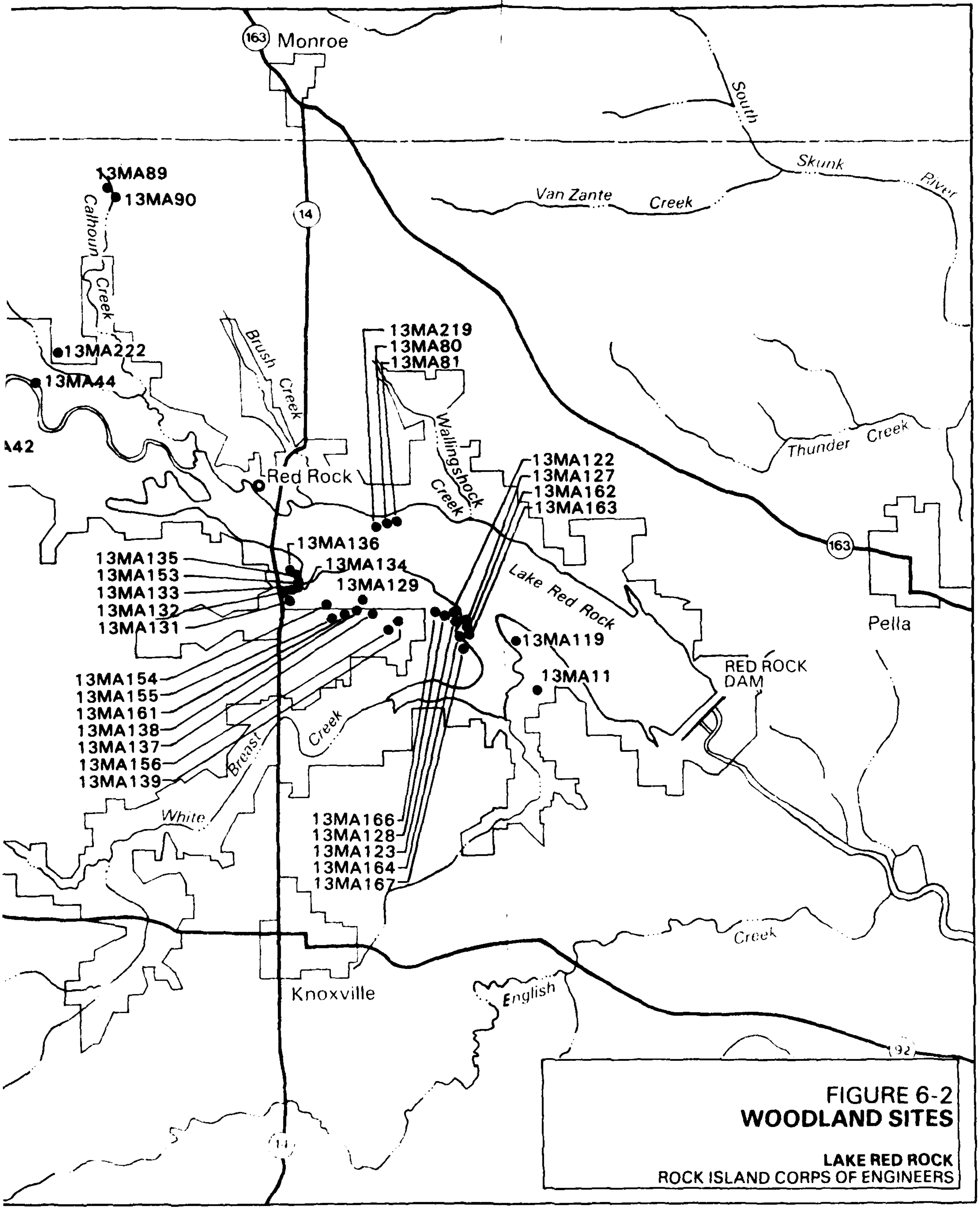


FIGURE 6-2
WOODLAND SITES

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

components. This finding is consistent with Gourley's (1983:17) report that 73.9 percent of identified components in the CIRALG study area are Woodland.

The identification of Woodland sites in the Red Rock area and the further identification of taxa within the Woodland period suggest that a variety of research concerns can be defined with some assurance that data can be obtained to address the problems. These questions fall within several domains.

First, of course, it will be necessary to more firmly establish which complexes are represented in the valley. The Early and Middle Woodland periods are represented by only one or two sherds each (discounting the possibility that some of the undecorated body sherds could be from vessels of the same ware) and the aggregate of cord- or fabric-impressed wares cannot be divided among the various types. Thus, the present interpretations are suggestive only and need to be supported by additional studies of ceramics and stratigraphic sequences if they are to be found. Establishing the chronology of the subsequent occupations would also be of value since the present Woodland chronology for the area is obtainable only from a sparse set of dates, some of which are ambiguous.

If the various ceramic complexes can be established, then other more specific questions may be addressable. For example, the temporal position of Spring Hollow Incised pottery is problematic and data to help resolve the problem are needed. The affiliations of the Havana-Cedar Ware are also in need of clarification. The cord- or fabric-impressed wares also seem far from the area for which they are defined and in which they appear centered (see Benn 1980:97). The question then is whether the range should be extended or whether the central Des Moines River valley material is representative of another cord-impressed tradition.

Studies of settlement patterns and subsistence practices will also be feasible. No systematic study has been made of Woodland settlement patterns in the central Des Moines River valley, and indeed, little work has been done on Woodland settlement patterns in eastern Iowa in general. Gourley's (1983) study of the CIRALG survey results and Schermer's (1982) study of Woodland site location in the Iowa River valley constitute the major exceptions. Systematic study of settlement patterns will provide an important means of assessing variability in the Woodland period in the Midwest, since similar studies have been conducted for Woodland occupations in other portions of the Prairie Peninsula.

Complementary to the study of settlement patterns would be the study of settlement systems. Similar studies for Woodland sites in portions of Illinois, for example, have established functional variability among sites, predictable regularities in the distribution of the various types of sites, and models of changes in the division and use of territories through the period (e.g., Struever 1968; Roper 1979; Styles 1981). Modeling the adaptations to the central Iowa landscape will provide important continuity and provide the basis for systematic comparisons among regions within the Prairie Peninsula. Specifically, it might be asked whether Woodland settlement systems reflect a clear differentiation of base camps and hunting camps, as do Illinois Woodland settlement systems, or if a greater degree of mobility is implied. Territorial arrangements could also be examined. Does the Late Woodland appear to reflect an increasing population and an intensification of the division of territory? Overall, then, do Woodland settlement systems shift in reflection of changing demographic arrangements and changed subsistence practices?

GREAT OASIS

Great Oasis was initially defined in Minnesota by Wilford (1945:33) who ascribed it to the Mississippi pattern in the Midwest Taxonomic System, later revising his classification of Minnesota archeology and placing the Great Oasis in the Plains Phase, aspect unnamed, of the Mississippi pattern (Wilford 1955:138). Great Oasis is now recognized in southwest Minnesota, northwest Iowa, and in the Missouri River valley in northeast Nebraska and southeast South Dakota (Henning 1971). In central Iowa, Great Oasis and Moingona Phase Oneota sites have been thought to have a mutually exclusive distribution - Great Oasis being present above Des Moines and Oneota occurring only south of the city (Gradwohl 1974:96-97; Henning 1971:129). Recent investigations have shown that some overlap does occur. Benn and Harris (1983) describe Oneota remains from the Downstream Saylorville Corridor and 13MA44 in Red Rock appears to have at least a small amount of Great Oasis material.

The important question for research on Great Oasis in the Red Rock area is actually the significance of its appearance. Is the inference of mutually exclusive distribution in error? Or is the relative amount of Great Oasis material minor? What does the presence of this material signify? Are Great Oasis village sites present in Red Rock? Or might the sparse material simply represent forays into an area outside the normal range of Great Oasis peoples? How are Great Oasis and Oneota related chronologically? Are they contemporaneous occupants of the valley? Or are they sequential? Other research questions could be posed for Great Oasis, including its role vis-a-vis the Mississippian peoples to the east and Plains village peoples (especially Mill Creek) to the west, but the potential of the Red Rock area to provide data useful for addressing these questions must first be established.

MOINGONA-BURLINGTON

The final prehistoric study unit recognized in the Red Rock area is the Oneota age Moingona Phase. It was shown in Chapter 2 that Oneota manifestations in the central Des Moines River valley were recognized in the earliest syntheses of Iowa prehistory (Keyes 1927:222) and were employed by Mott (1938) in her important study of the relations between historic Indian groups and prehistoric manifestations in Iowa.

Oneota is in general the archeological manifestation of a Mississippian pattern, village-dwelling, horticultural group or groups whose distribution is coextensive with the Prairie Peninsula. Their origir and relation to Middle Mississippian manifestations such as that at Cahokia is problematic and has been debated for some time in the literature. It is not the purpose of this report to review this literature; succinct summaries and more complete references are presented by Henning (1970:5-8) and Harvey (1979), among others. The literature of the taxonomy and interrelationships of Oneota manifestations is also voluminous and reflects an ongoing debate about the cultural dynamics of the Oneota occupation. A recent overview is presented by Harvey (1979:182-219).

What is well established is that Oneota represents the archeological manifestation of the tribes known collectively as speakers of Chiwere Siouan dialects. These include the Ioway, Oto, Missouri, and Winnebago. This suggestion was made by Keyes and substantiated principally by the work of Griffin (1937; 1960) and Mott (1938). Many Oneota manifestations are definitely prehistoric, with most dates early in the second millennium A.D.

Henning (1961:31) examined Oneota ceramics from the Red Rock area and found them to have similarities to Oneota material from both northeastern and northwestern Iowa. Gradwohl (1967b) later defined the Moingona Phase of Oneota for the central Des Moines River valley manifestations using data from salvage excavations conducted at Lake Red Rock. A total of 16 radiocarbon dates have been assayed for Moingona Phase sites (Table 2-3). Some of these dates are clearly too early or too late, but a solid core of dates, especially from the Clarkson site, would place the Moingona Phase in the late twelfth and the thirteenth centuries.

Moingona Phase Oneota is represented by at least 20 known sites in Lake Red Rock (Figure 6-3) and at least one identified component in the Saylorville Lake Downstream Corridor (Benn and Harris 1983). It is probably the best studied archeological manifestation in the lake area. The implications are simply that more specific and more detailed research questions can be phrased and matters beyond recognition criterion, taxonomy, and chronology become research priorities.

An important research question is the definition of the Oneota settlement system. Current knowledge of Oneota in the central Des Moines River valley is based largely on investigations at the large village sites such as Howard Goodhue (13PK1) and Clarkson (13WA2). Yet smaller Oneota components are known and were recognized during the Commonwealth investigations at such sites as 13MA44, 13MA130, and 13MA36. The function of these sites is virtually unknown, and the range of Oneota manifestations entirely unstudied.

The relations of the Moingona Phase to other Oneota manifestations in Iowa are also uncertain. Henning's assessment of the ceramics has already been noted; Harvey (1979:196) similarly suggested that Moingona Phase pottery was unlike any other known Oneota pottery. An attribute analysis of the Moingona Phase material and quantitative comparison with styles of the Orr and Correctionville-Blue Earth foci would make a positive contribution to the study of cultural dynamics and possibly population movements during the early part of the second millennium A.D.

CROSSCUTTING RESEARCH THEMES

The RP3 process is organized around the definition of study units that in turn are defined by temporal and content criteria. Relevant research themes can be defined for each unit, but additional themes can be defined which are independent of units.

An important crosscutting research theme is the study of lithic technology. The discussion of the lithic analysis emphasized the paucity of chippable chert in the study area and the response adapted by the prehistoric inhabitants of the Red Rock area. These observations were somewhat impressionistically derived, although supported by quantitative data. It was argued, however, that the lithic technology has important ramifications for assemblage contents. Systematic lithic studies should be undertaken to better substantiate the impressions. Analysis should also consider variability in the lithic technology of the various cultural complexes.

The interactions of the archeological and geomorphological records are also important. This importance transcends the study of human adaptations to the central Des Moines River valley and focuses on the more basic problem of site preservation and discovery potential. It has been emphasized several times that contexts appropriate for discovery of Paleo-Indian, Archaic, and even later sites must be mapped to establish the feasibility of recording sites. The ramifications for examination of cultural dynamics in the area are major. In fact consideration of changing patterns of adaptation would be muted for the early part of the sequence if it were to be shown that contexts of the proper ages were absent.

Finally, we may identify the matter of the effects of reservoir inundation on the archeological resources. It has been suggested that inundation has produced size-sorting of lithics and differential ceramic preservation at 13MA81 and that portions of other sites have been scoured and differentially preserved. Since the effects of reservoir inundation are still uncertain (e.g., Lenihan et al. 1977) it will continue to be important to evaluate the effects of wave action and shoreline erosion on specific sites. The site-specific geomorphic interpretations presented in Chapter 5 have shown that the Red Rock sites have the potential to provide data on the effects of inundation.

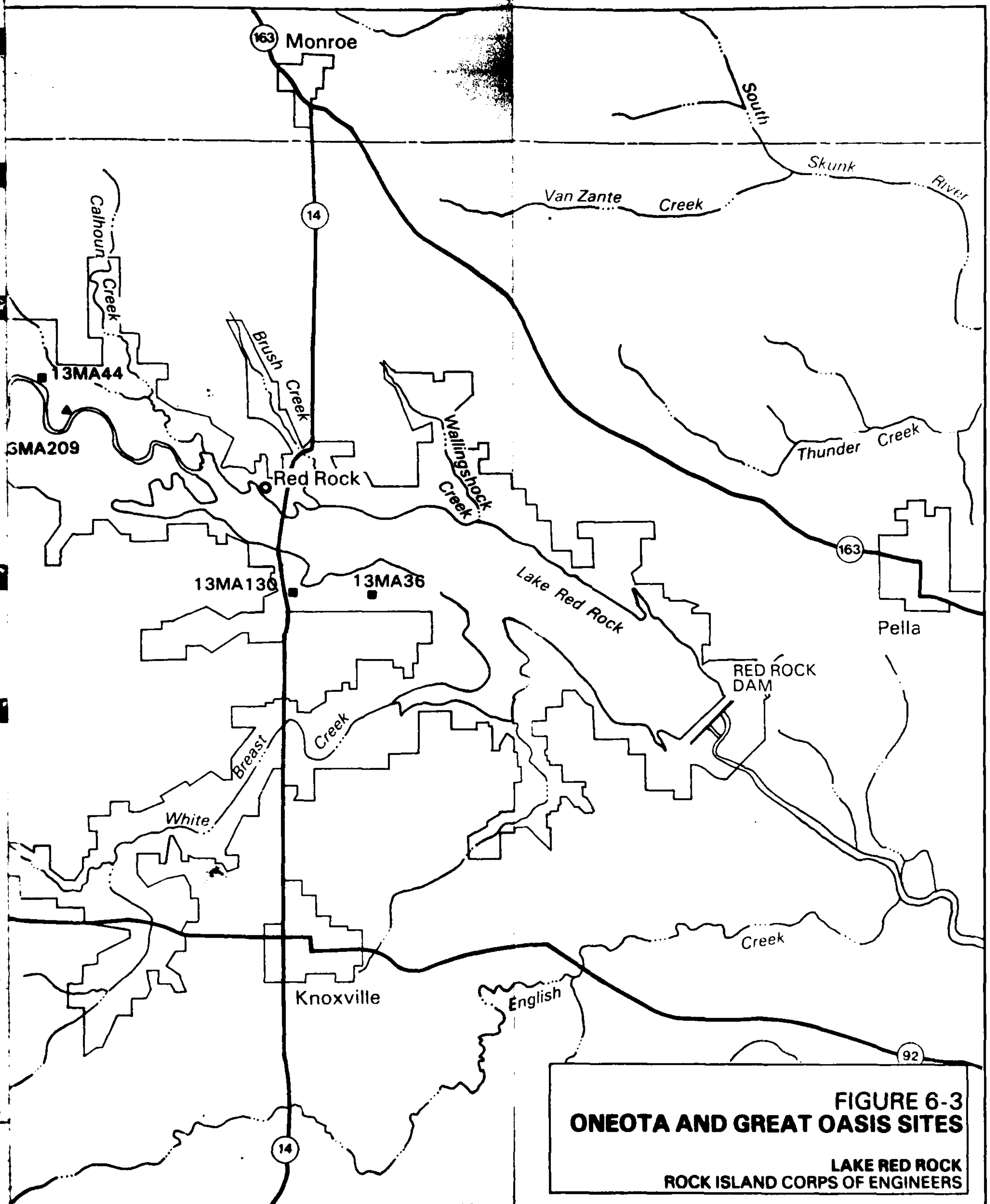
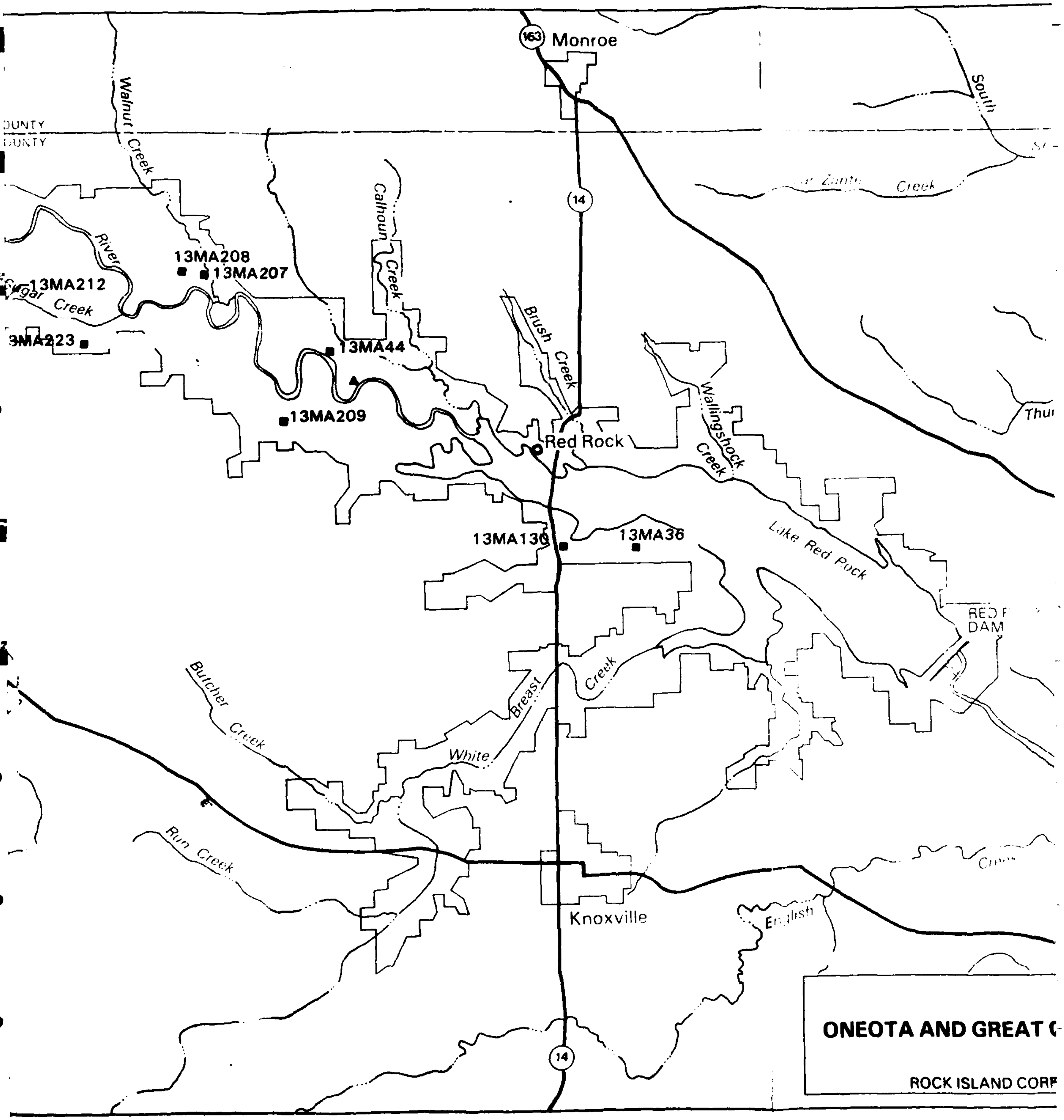
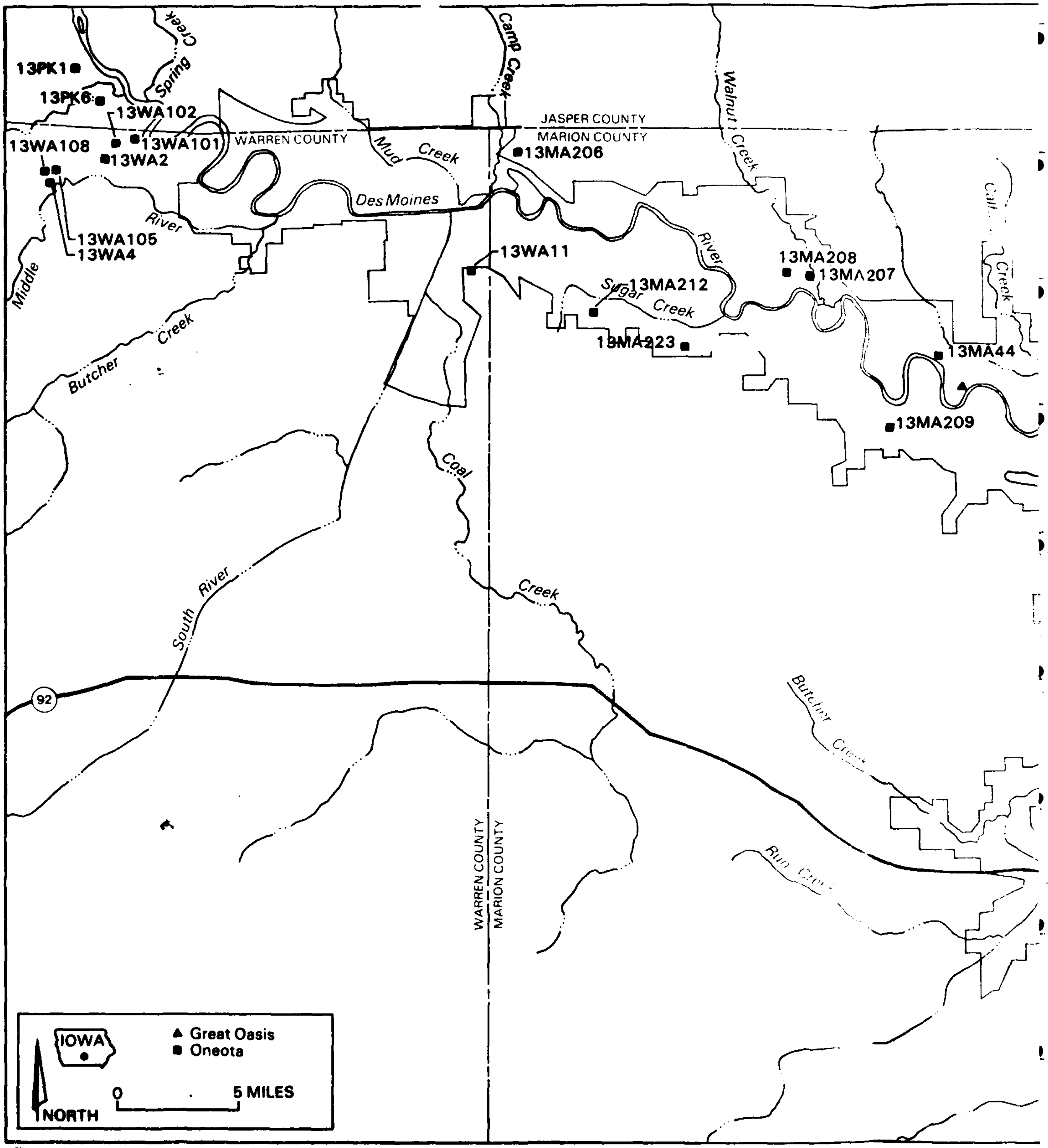


FIGURE 6-3
ONEOTA AND GREAT OASIS SITES

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS



Monroe
163
14
South
Creek
Walnut Creek
Calhoun Creek
River
13MA208
13MA207
13MA212
Sugar Creek
3MA223
13MA44
13MA209
Brush Creek
Wallingshock Creek
Red Rock
13MA130
13MA36
Lake Red Rock
Butcher Creek
Breast Creek
White
Run Creek
Knoxville
English
ONEOTA AND GREAT
ROCK ISLAND CORP



COMMONWEALTH ASSOCIATES, INC.

CHAPTER 7

HISTORIC ANALYSIS AND SYNTHESIS

HISTORICAL BACKGROUND

Research Methods

Between 1978 and 1980, the Central Iowa Regional Association of Local Governments, a now defunct regional planning agency, conducted surveys of architecturally and historically significant sites in central Iowa. The eight-county region included the central Des Moines River valley. A thorough literature search of libraries at Central College, the University of Iowa, Iowa State University, Iowa Library Commission and Iowa Historical Library was part of the historical survey, and these bibliographic records have been used for this land use history. The county and community histories from the CIRALG survey also have been consulted. The CIRALG survey provided a starting point that has been bolstered by use of the referenced research materials.

Also consulted were Lowell Soike, Jack Lufkin, and Kathy Gourley of the Office of Historic Preservation. The state's historical archeological files yielded no additional sites or information beyond that compiled for the CIRALG survey.

At the request of the Office of Historic Preservation, the current *draft of Iowa "Historic Period" RP3 Study Units* has been used as a foundation for the work to replace the earlier Henning RP3 draft. The study units relevant to the central Des Moines River valley (Marion, Polk, and Warren counties) are addressed in the text.

The Land Explored and Occupied

A scant number of Euro-Americans entered the central Des Moines River valley before 1845 and even fewer could be described as permanent settlers. It appears that the earliest known white presence dated from 1735 when a group of 84 French soldiers and 200 allied Indians pursued the Sauk and Fox tribes into central Iowa and found a camp of 55 lodges on the banks of the Des Moines River. One hundred years later, the next Euro-American arrival of consequence was also military. Beginning in 1834 four expeditions of U.S. Army troops traveled the river valley. They established Fort Des Moines No. 1 at a river site below the central river valley, but in 1843 pushed farther north to establish Fort Des Moines No. 2 at the confluence of the Des Moines and Raccoon Rivers. The soldiers' role was to maintain peace among Indian tribes forced to occupy the same territory and also to restrict Euro-American settlement (VanderZee 1916:124; Long 1983:1).

Through a succession of wars and treaties dating from the 1830s, Euro-Americans pushed the Sauk and Fox tribes westward, forcing them to cede vast tracts of virgin land in Illinois and in eastern Iowa. The treaty signed in 1842 established the Red Rock Line (Figure 7-1) as the boundary between Indian

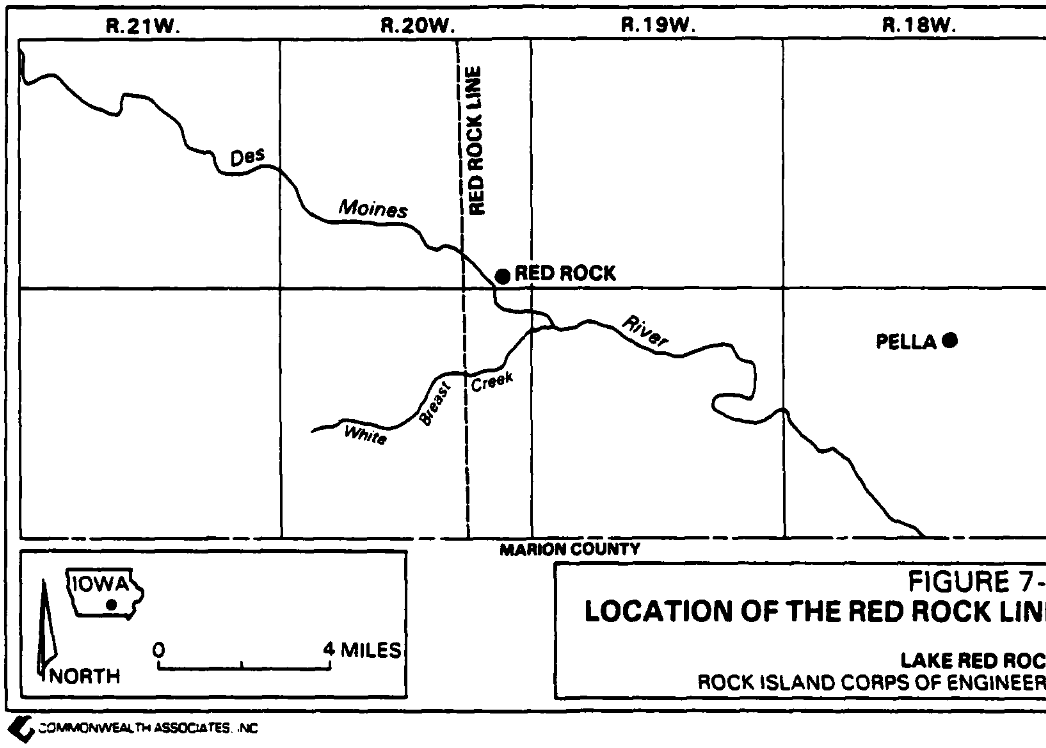


FIGURE 7-1
LOCATION OF THE RED ROCK LINE
LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

lands and white settlement. To forestall boundary disputes, surveyors were charged with erecting "mounds or stone monuments at given intervals." The Red Rock Line bisected 33 future counties in Territorial Iowa, including Jasper and Marion Counties in central Iowa, and separated the first wave of settlement that began on May 1, 1843 from the second and far larger one that began on October 11, 1845 (Union Historical Company 1881:277-278, 297).

Captain James Allen headed the military encampment at the Raccoon Forks for its duration, 1843-1846. He authorized a limited number of civilian settlers, ones who could provide basic necessities at this frontier outpost. Among them were three groups of Polk County traders: Peter Newcomer, who built the first bridge across Four Mile Creek on the main road to Fort Des Moines; Thomas Mitchell, another bridge builder and innkeeper; and the Ewing brothers. Other early inhabitants were John Parmalee, Warren County's first settler and builder of a sawmill on Middle River, and Mr. Butcher, who repaired and made roads in Marion County. Still others who arrived in the 1840s did so without formal approval from the military authorities. In the early spring of 1843, Kentucky-born John D. Bedell and Lewis Leplant, a Frenchman familiar with native American languages, opened an unsanctioned outpost on the banks of the Des Moines River and just east of the Red Rock Line (Union Historical Company 1881:339; Donnel 1872:167-169). They named it Red Rock in honor of the nearby roan-hued sandstone bluffs. Sites along the Des Moines River were deemed highly desirable with the prospects of steamboat and keelboat travel, and the river was an early magnet for settlement.

Formal political organization with boundaries approximating current county lines coincided with the first rush of settlement in central Iowa. Marion was the first of the three counties along the central Des Moines River to receive approval to become a separate county, being established on June 10, 1845. Its location and pre-1843 settlement hastened its formal organization. As was typically the case, a small group of area residents met, gathered signatures, and presented a petition to the Legislature. Some twenty interested residents, including Lysander Babbitt, attorney John W. Alley, David T. Durham, and Isaac N. Crum, met at Nathan Bass' home in section 19 of Lake Prairie Township. The Territorial Legislature approved their request and appointed a nonresident commission to select a county seat site. The men chose a centrally-located patch of prairie rather than existing settlements, another typical occurrence, and one that was repeated in adjacent Warren County in 1846 (Union Historical Company 1881:339, 348-351, 359).

Despite its standing as the county's political center, Knoxville did not grow rapidly in its early years. The existence of a competing town, Pella, and heavy initial settlement in the county north of the Des Moines River hindered the relatively isolated county seat's development. By 1870 Knoxville had but 800 residents while Pella, to which rail connections were established in 1866, had a population of 2,334. The presence of good transportation facilities appeared more important than governmental designations. When rail service was finally established to Knoxville in 1875, its population rose dramatically to 2,577 in 1880, surpassing Pella's 2,430 people (U.S. Bureau of the Census 1872;1882).

Like Marion County, Polk County received legislative approval to organize in 1845, its settlement hastened by the presence of the Army outpost. The succeeding year, the former fort gained the coveted county seat designation through a clever ploy. Local politicians managed to temporarily appropriate the top tier of townships from Warren County, which gave Fort Des Moines the central location considered important for a county seat site (Berry and Schultz 1953:32).

Transportation

Frontier and pioneer arrivals in central Iowa used both river and road as transportation routes, though neither was reliable or satisfactory. As early as 1846 steamboats made occasional runs to Fort Des Moines. The 1850s, a period of unusually high water levels, were the peak years for steamboat travel in the central Des Moines River valley, and settlers dreamed of an improved waterway. To this end, alternate sections of land along the river were set aside for an ill-fated attempt to make the river navigable with a system of locks and dams. Little work was ever done, but the Des Moines River improvement grants figured prominently in bringing the first railroad through the area (Dixon 1876:112; Register & Leader November 13, 1910).

A number of river towns, most of brief duration and all small, sprang up along the then-important route. Red Rock, the frontier outpost established in 1843 and platted in 1845, ranked as the first permanent river town. Other river stops and ferry points in Marion County were Bennington (1848), Perryville (a paper town), Rousseau (1850), Amsterdam (1848), and Coalport (1857). The latter, along with Red Rock, were the more popular steamboat landings. In Polk County Adelphi (1856), Lafayette (1848) and Carlton were early river towns, and Jeremiah Church's Dudley in Warren County also dated from the period of steamboat travel and proposed river improvement (Union Historical Company 1881; Lufkin and Long 1980).

When the river improvement plans came to naught and the railroad lines replaced the river as the transportation mode of the future, the purpose of the river towns ended as well. Some, such as Rousseau, continued to serve as ferry points for decades. Another Marion County ferry was Horn's Ferry, which lay on the main road between Pella and Knoxville. That it was a key location was underscored in the early 1880s when it became the site of the county's first bridge. The Des Moines River quite successfully cut up Marion County, making unusually shaped townships and separating northeastern township residents from the rest of the county; the benefits of changing county boundaries to conform to geographical realities were at one time considered, a reflection of the communication problems posed by the river (Union Historical Company 1881:394-395, 801).

Central Iowans recognized the need for cheap and reliable transportation to ensure economic growth for their region. To this end, they sought an improved river route, state roads, and railroads. Even in the early 1850s residents of Polk and Marion Counties met and subscribed funds for rail connections, but it was not until 1866 that this vital link with Eastern markets reached the central river valley. Using the Des Moines River improvement land grants for financing, the Des Moines Valley Railroad arrived in Des Moines in 1866 with a route through Marion County (Union Historical Company 1881:428; Brigham 1911:I, 110).

The second and third lines to cross Marion County arrived in Knoxville in 1875 and opened up the southern two-thirds of the county for increased settlement, commerce, mining, and commercial farming (Figure 7-2). The Chicago, Burlington, and Quincy Railroad connected the county seat with the increasingly important Mississippi River towns of Burlington and Davenport, which rapidly surpassed Keokuk as important economic ports. The third line extended southward in Marion County through coal mining areas. The Minneapolis, Des Moines and Kansas City Railroad built the final rail route through the southwest part of the county in 1912 to take advantage of coal deposits (Lufkin and Long 1980).

Railroad connections, or the lack of them, affected town location and growth. Des Moines, in particular, developed from town to urban center and became Iowa's largest city and the state center for retail and wholesale sales, finance, insurance, and politics. In the central Des Moines River valley, new towns, including Harvey, Percy, Tracy, Melcher, Cordova, and Otley in Marion County and Runnels and Avon Station in Polk County, owed their genesis to the railroad. Residents recognized the significance of rail connections, often physically moving an older town to a site trackside. For example, the mill and other structures were removed from Red Rock to Otley. Bellefontaine residents (Mahaska County) moved from their 1846 ferry town to the 1875 railroad town of Tracy in Marion County (Mikesell n.d.:2; Wright 1915:I, 127; Lufkin and Long 1980).

Development of roadways in central Iowa was further evidence of increased settlement, and the Legislature authorized a series of state roads. Fort Des Moines received a boost in 1845-1846 when a state road was planned

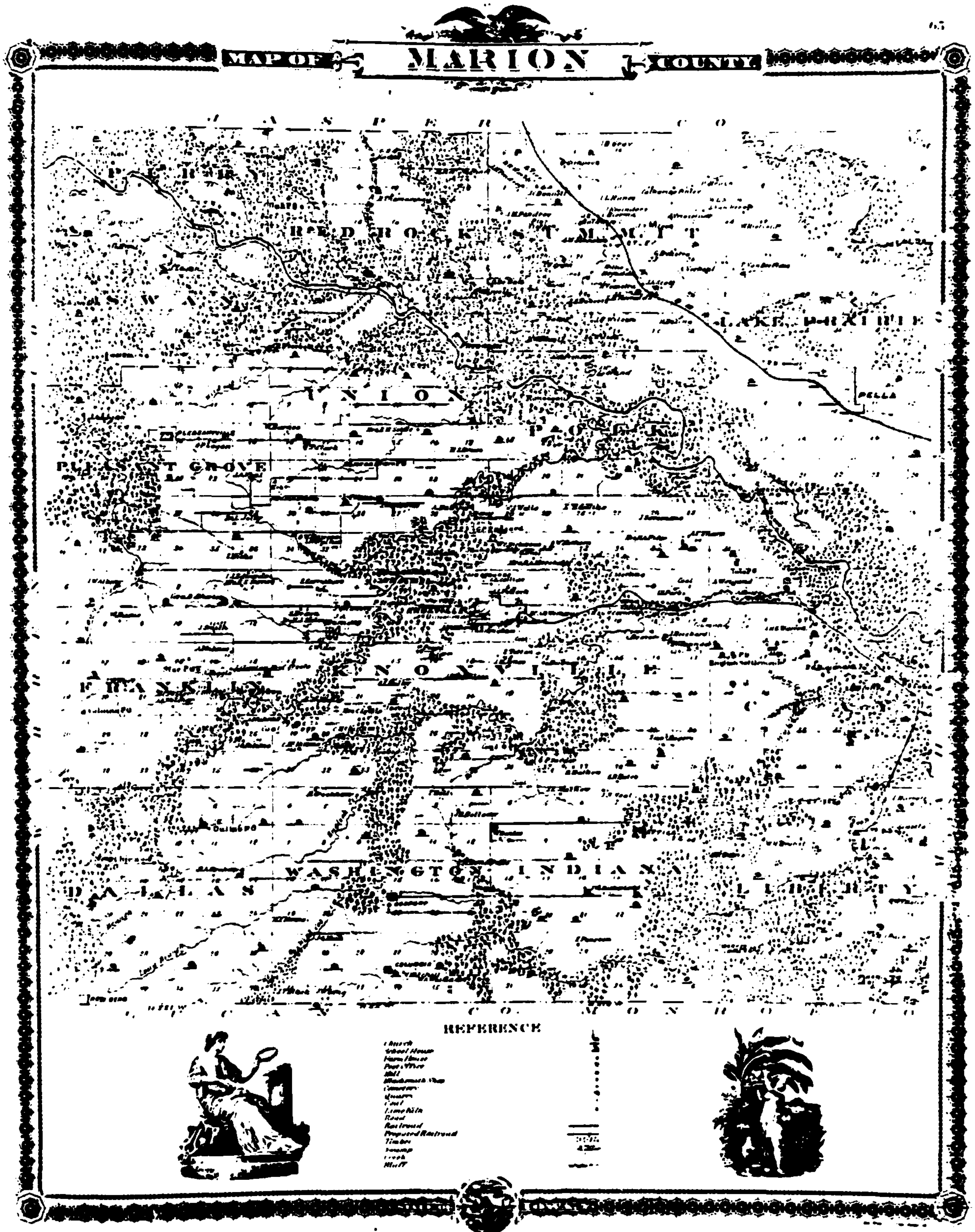


FIGURE 7-2
1875 MAP OF MARION COUNTY

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

connecting it with the state capital, Iowa City. The 1850s brought a spate of state roads, and with Des Moines' increasing importance as a county seat and then as the state capital in 1857, many roads lead there. In Marion County, important early roads connected Pella and Knoxville via Red Rock, and ran southeast through rural English Settlement and Attica, northwest through Wheeling and Pleasantville toward Des Moines, and connected the Warren and Mahaska county seats. Small settlements, most destined to remain that way, developed along the regularly traveled roads, many as stagecoach stops. In the central river valley, they included Avon (1856) in Polk County and Sandyville (1851) in Warren County. The trail along the Des Moines River valley connected Des Moines and Red Rock with points east and was another well-traveled route (Kirkpatrick 1975:93; Andreas 1875).

In 1845 Marion County residents built their first county road, connecting Knoxville to Red Rock. By 1875 a considerable network of roads covered the central Des Moines River valley. Despite considerable wooded portions along the many creeks in Marion County, at least one road crossed or bordered most of the sections. Most were aligned with the cardinal directions, with a notable diagonal in the northeast part following the Des Moines Valley Railroad route (Andreas 1875; Donnel 1872:31).

The railroad allowed central Iowans access to national and international markets, while the roads allowed for daily travel. The heavily traveled ones were those the Territorial and State Legislatures established long ago and which developed into major regional routes. Improving these dirt roads, which were frozen ruts in winter and gooey muck in rainy weather, was a constant need in the late nineteenth century. For example, in 1892 Des Moines boosters formed a Good Roads Committee, but it was not until 1911 that a state law passed requiring the counties to drag roads after every rainstorm. By then Marion County featured several recognized highways. One connected Oskaloosa, Knoxville, Pleasantville, and Des Moines. Another ran between the traditional rivals, Knoxville and Pella, while a third followed the 1866 rail route through Oskaloosa, Pella and Otley (Greater Des Moines Chamber of Commerce Federation 1976; Heusinkveld 1958:177).

With the increasing number of motor vehicles (Iowa led the nation in 1915 and through the 1920s in the ratio of population to registered motor vehicles), Iowans desired paved rural roads. In 1927 the state embarked upon such a program. By 1950 Marion County had three additional routes: the north-south Highway 14 through Knoxville, Highway 60 which ran southeast through Attica, and an extended Highway 92, now an east-west county seat connector (Heusinkveld 1958:256).

Agriculture

Wheat has traditionally been considered the primary crop of choice for pioneer farmers. Indeed, in 1870 Iowa ranked second nationally in wheat production. However, farming in the central Des Moines River valley was early and long based on hogs and corn. Farmers raised corn to feed their hogs and cattle. Marion and Polk Counties ranked in the first and second quartiles, respectively, for state corn production in 1849 and in the second quintile thirty years later. They stood in the third and fourth quartiles for wheat production in

1849, four to six years after the area was open to settlement. In addition, Marion County hog production consistently remained in the first quartile or quintile ranking for these years while Polk County's fell from the second quartile in 1849 to the third quintile in 1879 (Federal Writers' Project 1949:71; Bogue 1963:227).

Marion County farmers engaged in commercial agriculture from an early date and so continued into this century. Pork production increased 91.1 percent and cattle production went up 149.8 percent during the period 1870 to 1910. County population fell from the first quintile to the second in the same period, this despite some increases related to coal mining (Bogue 1963:48, 97, 29).

Bogue's findings show that farming patterns varied with the location and timing of settlement, fluctuations at the market place, and the latest "miracle" crop in vogue. Rapid settlement along the river valley in central Iowa shortened the frontier period there considerably. Corn and livestock production remained dominant in central Iowa after the 1840s, but techniques such as crop rotation, application of manure and use of soil-improving clovers were common practices by the 1870s. Corn planters, harvesters and shellers, and hay mowers were significant advances in the latter half of the nineteenth century. Well before 1870 these farming methods and technological advances aided farmers so that, despite falling prices, increased productivity brought prosperity to some (Bogue 1963:145, 166).

Substantial land holdings, not necessarily contiguous, were not uncommon. By 1880 in Summit Township, Marion County, Otley dry goods dealer and 1845 arrival I. N. Crum also owned 460 acres of land. John A. Scott was an 1846 settler with 440 acres in section 26 of the township, and Dutch-born M. A. Witzenberg owned 525 "well improved" acres in section 36. South of the Des Moines River in Union Township, James Amos operated "a farm of 540 acres" in section 3, and retired farmer Amos Ruckman owned 845 acres in section 11 with his son. D. Stittsworth combined farming with stock raising on a 355-acre farm he bought in 1855. Apparently based on the tax valuation, he was said to have "the finest mansion in his township." Other Union Township residents owned 260, 207, 311, 200, 400 (2), and 2,000 acres of land. The language of the biographical sketches indicated that many of the holdings in the 200-acre range comprised one farm operated as a unit (Union Historical Company 1881:692-702, 746-752).

Despite the presence of farmers owning and often operating good-sized farms, Marion County hosted what appeared to be an unusually large number of small farms. In 1870, 1,963 of the 2,695 farms, or 72.8 percent, contained less than 100 acres. The trend continued into the twentieth century; in 1910 67.5 percent were less than 100 acres, compared to just 44.8 percent statewide. The average Marion County farm had 127 acres in 1910, a figure that rose to 156 in the 1940s. The rough terrain in some parts, floodplains and the extensive creek system may have contributed to the small farm size (Heusinkveld 1958:108).

Rural population figures reflected the large number of small farms and in 1870 Marion County was one of four Iowa counties having a rural population density of over forty persons per square mile. Townships along the

Des Moines River, particularly on the northeast side, formed a belt of the highest concentration (Heusinkveld 1958:30, 28).

With increased personal capital and the increased marketing opportunities available with improved transportation, ever more farmers engaged in commercial agriculture and on a larger scale. Before the Civil War, central Iowa farmers had to drive their corn-finished hogs and cattle to distant markets or transportation points. With the coming of railroad facilities, they needed only to take produce to the nearest depot. In addition, beginning in the 1860s and 1870s, they could sell corn to local merchants, grain elevator operators or commission buyers. Even in the tiny station of Otley (176 people in 1870), J. B. Hendershott, a successful area grain dealer, ran two elevators beginning in 1868 (Union Historical Company 1881:691, Bogue 1963:130).

Mix of Peoples and Culture

Prospective central Iowa settlers reading an 1846 description of the state could learn that Marion County contained three creeks sufficient to support a proper mill, prairies "generally high, dry and undulating," and "an extensive vein of bituminous coal in the bluffs of the Des Moines." Further, "there are many excellent 'claims' yet untaken on the Lower river, English, Whitebreast, and Cedar Creeks," an indication of the importance of a water source to pioneer settlers. The perceived usefulness of the Des Moines River for transport was reflected in the statement that wheat brought 56 cents a bushel, "in cash, when delivered at any point on the Des Moines" (Newhall 1957:45).

During the first eight months of legal settlement in eastern Marion County, some seventy families took up claims. They preferred wooded sites near a stream, especially the "points" or groves formed at stream intersections. Groups clustered together to form the English Creek, Cedar Creek and Whitebreast Creek, Red Rock, and Tong settlements. Site of the first church services in the county, the English settlement was considered "reputable," while the Red Rock settlement was deemed considerably less so. By 1877 the tenth murder was recorded at Red Rock, and the outpost had a bad reputation that dated from its whiskey-selling trade with Native Americans and Euro-Americans alike (Union Historical Company 1881:298, 435, 303, 301, 466).

With the opening of land west of the Red Rock Line in 1845, population increased dramatically in central Iowa. As Bogue (1963) suggests, the counties along the major river valley were sites for initial settlement. Marion County rapidly moved beyond a frontier population density (using Bogue's definition of six persons to the square mile) in 1849 with 3,797 people (6.59 per square mile). In 1870 five of the seven townships touching the Des Moines River had the highest population, 40-52, per square mile in the county. The county's population peaked at 25,111 souls in 1880, and with minor fluctuations, dropped gradually to 24,694 in 1925 (Heusinkveld 1958:9, U.S. Bureau of the Census 1882).

Polk County also grew rapidly during this period, and Des Moines acted as the critical magnet. By 1856, when Polk's county seat stood poised to become the state capital, 3,830 of the county's 9,417 residents lived in or near Des Moines. The county had 39,850 people in 1880 and it continued to grow through the remainder of the century. Adjacent Warren County, in contrast, still ranked as a frontier county in 1850, having but 961 residents. By 1862 its population reached 10,926 and in 1880 stood at 19,578, a figure that remained relatively stable (U.S. Bureau of the Census 1882; Census of the State of Iowa 1925:721; Bogue 1963:233).

Native-born Americans were in the majority in all three counties, but there was noticeable immigrant representation in Polk and Marion Counties. Figures for 1895, 1905, and 1925 reveal that the latter hosted between 7 and 9 percent foreign-born settlers among its residents. In 1905, 29.1 percent of Marion County's populace was either foreign-born or had immigrant parents. The significant Dutch settlement concentrated in Lake Prairie Township and dating from the 1840s accounted for the high foreign-born presence. Pella was 58.42 percent foreign-born or born of immigrants in 1905. Polk County was home to many Scandinavian farmers and Des Moines had large numbers of residents from Germany and Sweden. By 1905, 32.5 percent of the county's population was foreign-born or born of immigrants, compared with just 13.1 percent for Warren County (Census of the State of Iowa 1895;1905;1925).

Bogue (1963) also detected the persistence of a committed core of early arrivals in his studies of Iowa and Illinois, an assertion that seems to hold true in Marion County. Some settlers, including Thomas Tong, and D. T. and F. F. Durham, founded settlements of relatives who remained to farm even after the elder's death. Others, notably Lysander W. Babbitt and Henry Scholte, became influential county leaders. Babbitt served the county and state in several political capacities, as first county clerk, first Knoxville postmaster, and legislator. Scholte, the spiritual and economic leader of a group of immigrant Dutch, founded the city of Pella in 1847 (Union Historical Company 1881:299, 302).

The well-organized and financed settlement activities of Marion County's Dutch residents resulted in early commercial development, agricultural prosperity, town growth and the persistence of ethnic patterns and practices in the northeast part of the county. These activities centered around Pella, the "city of refuge," and Domini Scholte's leadership. With Keokuk mayor John A. Graham, Scholte bought over 15,000 acres of Marion County land for sale to the initial immigrant group of 800 Hollanders. Scholte and Abraham Bousquet actively promoted Pella and supported such ventures as river improvement, construction of a plank road, and securing a rail line. Although it was not the county seat, Pella was the county's principal town until the 1870s when Knoxville finally got rail connections, and even thereafter Pella continued to dominate the northeast part of the county (Lufkin and Long 1980).

Commerce and Industry

The development of commercial agriculture in central Iowa encouraged related advances in the field of commerce. One of the earliest of these ventures was the establishment of mills to provide ground grain and sawed lumber. The physical requirements for milling dictated a creekside location. Despite the presence of a number of suitable creeks, few towns in the central river valley began exclusively as mill sites. Hartford and Summerset in Warren County and Marysville and Dunreath in Marion County had water-powered mills and dated from the late 1840s.

The presence of other natural factors prompted or influenced development of still other communities in the central river valley. Coalport in Marion County was a riverfront steamboat stop because of a large coal outcrop and was also the site of an early pottery opened by William Welch in 1847. In addition to Welch's pottery shop, the tiny community of six families supported a general store, saw and grist mill, and blacksmith and cooper shops. The kiln site has been excavated (Reynolds 1967, 1969, 1970). The principal visual reminder of this early settled area is the Coal Ridge Baptist Church built in 1873 and still in use. Coal Ridge, as might be expected, was located on a hill above Coalport.

The presence of coal in Polk and Marion Counties was noted quite early in their histories, by the 1840s, and simple mining was common, especially along exposed riverbanks (Stoltz and Brooks 1966:334). Polk and Marion Counties lay in the midst of the state's largest band of coal deposits. Systematic, large-scale mining became feasible in the 1870s when the railroads arrived, providing bulk transport and requiring local fuel sources (Long 1983:72).

Mining towns such as Flagler, Everest and Pershing in Marion County and Norwoodville and Carbondale in Polk County briefly served as homes for miners. In other cases, existing towns, including Bussey, Hamilton, Runnells, and Swan, expanded to accommodate mining facilities and miners. Mines often operated only a few years, until the easily reached coal was gone. The mine, in section 17, near Swan, Swan Township, closed in 1888 (Olin 1965:56).

The importance of mining lasted well into the twentieth century in the central river valley. Many early Polk County mines were located along the Raccoon and Des Moines Rivers, and the county was the second largest coal producer in the state for fifty years. An 1875 map (Figure 7-2) is peppered with symbols of coal sites in Marion County, but the areas of actual mining in the 1870s were limited to a few spots along the Des Moines River and especially in Knoxville Township on either side of Whitebreast and English Creeks. However, Marion County never approached the quantity of mining or the quality of coal available in nearby Polk, Monroe, and Mahaska Counties. The county ranked between eleventh and fifth in Iowa coal production between 1898 and 1914, while Polk County ranked second for all these years (Heusinkveld 1958:640; Census of the State of Iowa 1905;1915).

Summary

Following early usage for frontier trails and military encampments, central Des Moines River valley land use shifted to an agriculturally-based economy. Two-stage settlement dating from 1843 and 1845 was rapid, and the area quickly moved from the pattern of sparse frontier settlement to one of high rural population density and from subsistence farming to commercial agriculture centered on corn and livestock. Early settlers chose sites in townships near the river that combined woodlands, open land and water access. The substantial Dutch population in the northeast part of Marion County selected fertile, flatter lands. Counties were organized politically in the mid-1840s, and county and state road development began in that decade. The river provided early transportation and hopes for economic growth. A basic road network was in place probably by the 1860s, and the arrival of railroad lines in 1866 and 1875 further enhanced area development, especially for commercial agriculture and coal mining. Various types of settlements emerged, most with economic foundations, including river towns, stagecoach stops, county seats, railroad towns, and mining camps. The presence of Des Moines, the county seat in 1846 and state capital in 1857, at the head of navigation for the Des Moines River acted as a magnet for development in the economic, social and political spheres. Rural areas retained their agricultural foundation based primarily upon production of corn and hogs.

HISTORICAL RESOURCES

A number of important historical sites are present in Lake Red Rock. These include various towns such as Red Rock, Cordova, Fifield, Coalport, and Rouseau all of which are now permanently inundated. The cooperative salvage program conducted by Iowa State University for the National Park Service included some excavation at historical sites (Reynolds 1967:208). Major efforts were focused on the pottery industry and included excavations at the Coalport town site (Reynolds 1967, 1970), the Coalport kiln (Reynolds 1969) and other kilns (Reynolds 1967:208), and several other sites (Reynolds 1967:208; Osborn 1982:77-84).

The investigations have never systematically considered the less prominent historical sites such as farmsteads that are present within the reservoir area. Several such sites are included among the sites recorded prior to 1983. Several additional sites were observed during the 1983 reconnaissance and historic components were noted on what were thought to be solely prehistoric sites (Figure 7-3). Many of these components are severely disturbed, probably from a combination of the procedures used in removing standing structures during lake construction and erosion from the lake. In the same manner as the account of the prehistoric sites, each observed historical component is described below. The collections made at several of these sites are then described with particular emphasis on determining an approximate occupation date.

Site Descriptions

13MA44. Site 13MA44 is a major multicomponent prehistoric site on the north bank of the Des Moines River. A small but fairly intense scatter of historic debris is present on the west end of the site. Two old fences now lie in ruins on the ground. Historic debris is scattered about on the area between the two fences. No structural remains were observed and none are apparent on the 1967 aerial photograph.

13MA84. The Swim site, 13MA84, is described on the original site form as an "historic stone feature, possible well" in a small meander (now cutoff) of the Des Moines River valley. Pig bones were reported as collected when the site was reported in 1980. The locus was visited in September 1983 at which time no material was observed. The 1980 site sheet describes the present condition as "Located at the toe of a 12-foot cut bank. Eroded from the wall." It appears, therefore, that the integrity of the feature had already been compromised in 1980 and it is probable that any remains have been dispersed in the old channel. Additionally, the location at an elevation of 740 feet AMSL is just above conservation pool level. Siltation is heavy at this location but a large

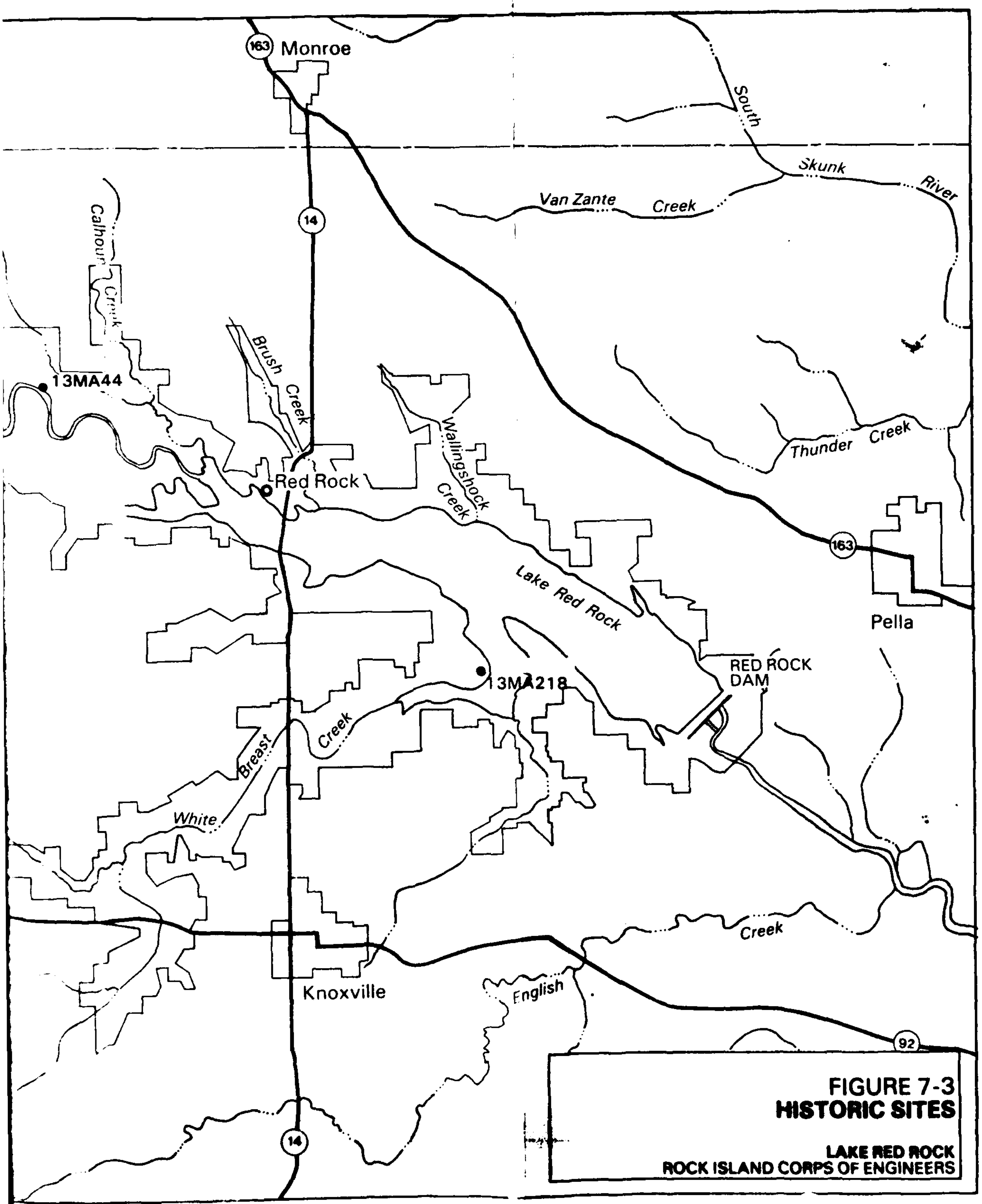
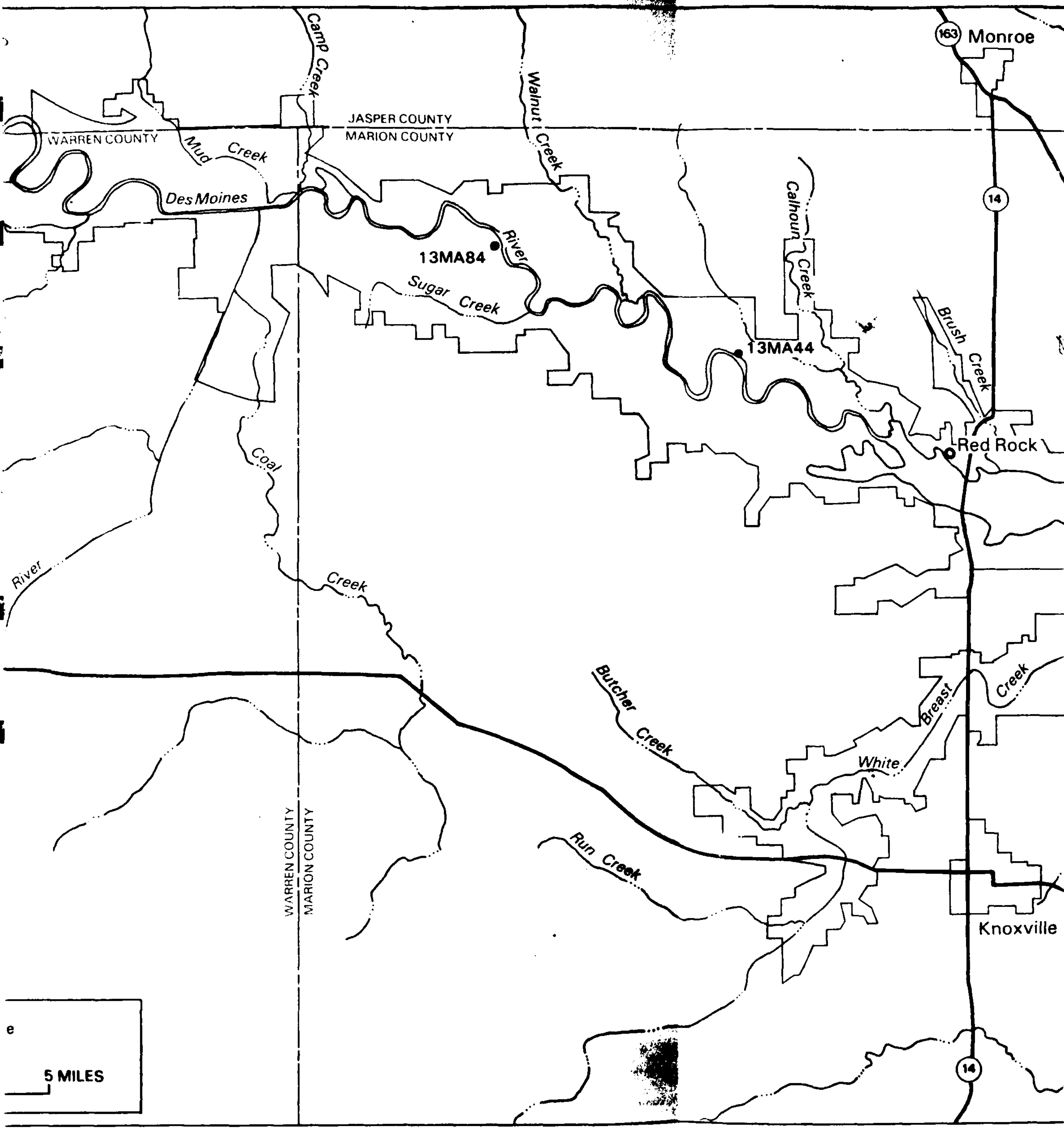
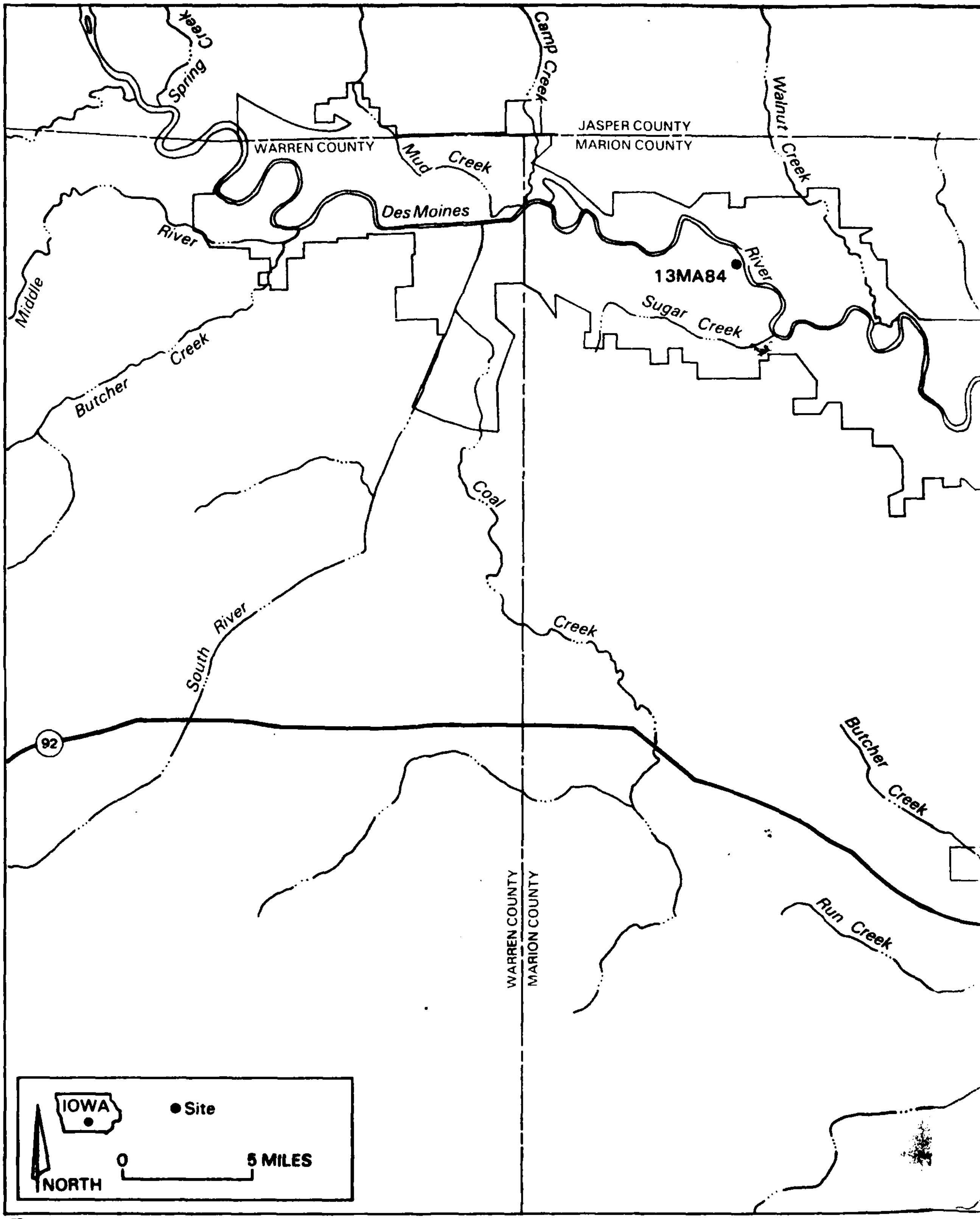


FIGURE 7-3
HISTORIC SITES

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS


Monroe
163
14
JASPER COUNTY
MARION COUNTY
WARREN COUNTY
Camp Creek
Walnut Creek
Mud Creek
Des Moines
River
13MA84
Sugar Creek
Calhoun Creek
13MA44
Brush Creek
Red Rock
Coal Creek
River
Butcher Creek
Breast Creek
White
Run Creek
WARREN COUNTY
MARION COUNTY
Knoxville
5 MILES
14



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tree is the kind of shade tree one might expect with an old residence. No structure appears on the 1967 aerial photograph, but archival research could clarify the situation at this locus.

13MA119. Site 13MA119 is located southeast of the confluence of Whitebreast Creek and the Des Moines River, on the tip of a point of land which has recently been developed into the Whitebreast Recreation Area. Historic material (glass, nails, whiteware) was observed in an area west of the picnic shelter. The 1965 Otley 7.5 minute quadrangle depicts a structure in the site area. This is confirmed on the 1967 aerial photographs, which show a two-track leading to a structure approximately where the site was located. The site area has been largely destroyed by bulldozing for the recreation area development.

13MA164. Also known to have a prehistoric component, 13MA164 was a scatter of glass and historic ceramics on the shoreline of Lake Red Rock along a low terrace at an elevation of about 740 feet AMSL and southwest of the confluence of the Des Moines River and Whitebreast Creek. No indications of a structure were observed in the field nor are any present on the 1967 aerial photographs. The site is washed over and is eroding into Lake Red Rock.

13MA166. Some historic material was observed on 13MA166, previously recorded as a Woodland site. The site is located just east of the first ravine encountered while walking northwest along the shore from a boat ramp in Elk Rock State Park. The site is eroding severely. An old road runs near the site, however, no indications of structures were visible on the 1967 aerial photographs.

13MA209. Site 13MA209 is an important Oneota village site on the Des Moines River floodplain. An historic component appears at the southwest edge of the site. The site appears on the 1967 aerial photograph as a farmstead in a copse of trees next to a dirt road. The site presently consists of a foundation, some pieces of corrugated sheet metal, and a few metal objects. A light scatter of metal, glass, and historic ceramics is confined to the immediate vicinity of the foundation. It seems likely that the majority of the structural and other remains were removed when the structure was dismantled prior to the filling of the lake.

13MA210. The historic component at 13MA210 is confined to the edge of a terrace in the Des Moines River bottoms. Observed remains consist of an old well and pump which is partially knocked over, and a light scatter of bricks, metal, glass, and ceramics. Observation was hampered by heavy ground cover and swarms of voracious mosquitos. The site appears on the 1967 aerial photograph. It seems likely that most of the structural and other remains were removed when the structure was dismantled prior to the filling of the lake.

13MA217. This site is also multicomponent, previously discussed only as a prehistoric site. Historic materials (cement, brick, crockery, whiteware, glass and metal) were scattered over a slight sand knoll at an elevation of about 760 feet AMSL. A dirt road, subject to inundation, runs north-south about 100 m east of the site. No structures were indicated on either the 1965 Pleasantville 7.5 minute quadrangle or the 1967 aerial photographs.

13MA218. Site 13MA218 was newly recorded in September 1983. It is a dense and extensive scatter of historic material and is located on a point of land southwest of the confluence of Whitebreast Creek and the Des Moines River. The site lies to the north of two fences, and the debris is concentrated in two bands along the shoreline about 10 vertical feet apart, and at an elevation of about 745 to 760 feet AMSL. No material was visible on the flat above the scatter, but there appeared to be much silt deposited across the area. The 1967 aerial photograph shows a road approaching the site area from the south and leading to a large tree and a disturbance in a plowed field. There is also a darker disturbance in the field. This may be associated with an occupation removed prior to 1967. No houses or fields were shown at this location on either the 1846 GLO plat or the 1875 map of Marion County (Figure 7-2).

13MA223. This site is a small, light scatter of historic and prehistoric material on a sand ridge south of an old creek channel. The scatter is just east of the drive access into a fallow field, in an area which has been recently used for target shooting. The site area is slightly elevated above the Des Moines River floodplain, but has been inundated and some sedimentation is evident at the site.

Artifact Descriptions

The historic artifact analysis was facilitated by dividing the material into groups each comprised of a variety of classes. The classes represented the materials from which the artifacts were manufactured, which are further broken down into wares and, finally, types (South 1977:92-93). Individual artifacts were placed within classes using morphological and utilitarian criteria. These classes were then combined to form groups based on their use context. This basic approach follows that developed by South (1977) as an heuristic device for discerning patterning in the historical archeological record.

Five groups are represented in the Red Rock collections: kitchen, architecture, hardware, personal, and miscellaneous. The Kitchen Group, as its name implies, is comprised of artifacts that are centered on the preparation of food and includes such classes as ceramics, bottles, glassware, tableware (cutlery), and kitchenware (pots and pans, etc.). The Architecture Group includes classes such as window glass, nails, door parts, and construction hardware (hinges, etc.). The Personal Group is comprised of artifact classes that might have been on a person, such as keys, coins, and buttons. The Hardware Group includes wire fencing, washers, studs, and similar items. These groups are similar to those defined by South (1977:95-96).

13MA44 - Unit 6. From the Kitchen Group of artifacts comes one fragment of light green bottle glass, while a very thin fragment of white plastic represents a Miscellaneous Group category. Both historic artifacts appear to date from a recent period, i.e., mid-twentieth century to present.

13MA44 - Unit 7. The Architecture Group is represented in this unit by one large fragment of window glass. This glass fragment appears recent, from within the twentieth century. The Hardware Group consists of one large iron hook in very good shape. This hook is the kind used in barns and smoke houses for hanging harnesses and meats. It may also date from the twentieth century.

13MA44 - Unit 10. The Kitchen Group in this unit is manifest by 16 fragments of plain whiteware (ca. 1820 to present), 5 fragments of gray salt glazed stoneware with a gray exterior glaze and a brown interior, and one fragment of buff colored stoneware with dark brown interior and exterior glaze. Two fragments of porcelain, one decorated with overglaze gold and one polychrome floral piece, and one small fragment of undecorated porcelain complete the ceramics in the Kitchen Group. Miscellaneous ceramics include one terra cotta fragment, curved, possibly part of a drain pipe, and one small fragment of ceramic tile, such as a bathroom tile. The glass from the Kitchen Group consists of seven fragments of clear, curved glass, two fragments of brown, curved glass, one fragment of slightly opaque, curved glass, and two fragments of manganese bottle glass (one rectangular patent medicine bottle base). The manganese glass dates from the end of the nineteenth century to 1917.

The Architecture Group is represented in this unit by three small fragments of window glass, one long machine-made nail with a machine-made head (ca. 1830s to present), five smaller incomplete machine-made nails, three with machine-made heads, and one large spike.

This site appears to date from the late nineteenth century to a recent date (possibly mid-twentieth century).

13MA44 - Unit 11. The Kitchen Group of this unit contains 20 fragments of plain whiteware, some of which are badly burned and one of which carries a partial maker's mark, one yellow ware fragment, one polychrome stenciled whiteware fragment, and one polychrome stenciled porcelain fragment. Stoneware in the Kitchen Group is represented by ten fragments of gray salt glazed stoneware, two small fragments of a brown lead glazed stoneware, and one fragment of a pinkish buff stoneware with no glaze.

The bottle glass in the Kitchen Group consists of 1 aquamarine glass fragment (large, probably a Mason jar fragment), 11 very light green bottle glass fragments, 1 very dark purple glass fragment (possible wine bottle), 24 clear bottle/jar fragments, and 6 very badly burned, melted glass fragments. Two fragments of opaque white Mason jar lid seal fragments also belong to the Kitchen Group.

Metal belonging to the Kitchen Group is represented by one large cast iron stove part with a bolt still in place and three rusted tin fragments, possibly from a can.

From the Hardware Group comes one fragment of barbed wire, one thick, broken metal washer, and one metal stud.

Thirty-seven nails, in very bad shape, but appearing to be machine-cut nails, and 12 fragments of window glass constitute the Architecture Group in this unit.

Two miscellaneous metal fragments make up the rest of the artifacts from unit 11.

These artifacts appear to date from the late nineteenth through mid-twentieth century.

13MA44 - Unit 12. Five wire nails (ca. 1850s to present), nine spikes, one fragment of window glass, and two brick fragments represent the Architecture Group in this unit. The Kitchen Group consists of five plain whiteware fragments, one plain porcelain fragment, one porcelain fragment decorated with overglaze gold, four fragments of gray salt glazed stoneware, two fragments of opaque white glass Mason jar lid seal (very light), one brown bottle glass fragment, two aquamarine bottle jar glass fragments, and four clear bottle glass fragments.

The Hardware Group is represented by one metal stud. The Personal Group consists of one metal button. The Arms Group is represented by a plastic shotgun shell case. The Miscellaneous Group contains one piece of slag, three rusted metal fragments, and one small plastic cylinder.

13MA81. The historic material from this site consists of one dark brown salt glazed stoneware crock fragment from the Kitchen Group.

13MA134. The Kitchen Group is represented on this site by one opaque white glass Mason jar lid seal fragment.

13MA164. One small fragment of plain whiteware, from the Kitchen Group, is the only historic artifact located on this site.

13MA218. The Personal Group from this site consists of nine ceramic buttons (some decorated with red and green around rims), two plastic buttons, one metal button, one pipe bowl fragment (kaolin), and one pipe stem fragment (kaolin). One 1869 nickel might also be included in the Personal Group.

The Architecture Group is represented by four machine-made nails with machine-made heads.

The Kitchen Group is the largest group represented on this site and contains one metal eating utensil handle, two fragments of manganese glass tableware, one clear glass fragment from a cup or drinking glass, four aquamarine bottle/jar glass fragments, one medium green bottle glass fragment, three salt glazed stoneware butter churn fragments, one dark brown glazed stoneware fragment, one light brown stoneware fragment, one tan stoneware fragment, and one buff colored lightly glazed stoneware teapot/small jar lid fragment. Also included in the Kitchen Group are one fragment of brown banded whiteware, one pink banded whiteware fragment, one pink spongeware fragment, six blue spongeware fragments, five blue transferprinted whiteware fragments, two blue banded whiteware fragments, two blue edged whiteware fragments, one black transferprinted whiteware fragment, one flow blue whiteware fragment, one polychrome stenciled whiteware fragment, one green glaze pearlware fragment and one yellow glaze earthenware fragment. There is also one fragment of ceramic with the glaze burned off.

One piece of melted metal slag makes up the Miscellaneous Group.

This site appears to date from around the 1830s-1850s to the early part of the twentieth century.

CHAPTER 8

PREDICTIVE MODELING

INTRODUCTION

One of the objectives of the present project was the construction of a predictive model for the location of archeological sites in Lake Red Rock. This task is addressed in this chapter.

A broad body of theory of hunter-gatherer and horticulturalist site location has grown up in recent years. While details of these theories vary considerably in detail, most somehow specify the relation of sites to features of the biophysical environment such as water, topography, soils, and vegetation. Prediction of the locations of sites of hunter-gatherers or horticulturalists is thus most appropriately accomplished using environmental variables specified by locational theory.

However, a second environmental consideration is important in predicting the locations of sites and this is their preservation context. Virtually all of the prehistory of North America and, as was shown in Chapter 6, all the known prehistory of central Iowa occurred during the Holocene. The landscape of this period has been dynamic, featuring numerous river channel shifts, erosion and deposition in the bottoms, and erosion on hillslopes. Geomorphic processes are no respector of the integrity of archeological sites. Consequently, prehistoric remains are subject to removal or burial with other comparably aged sediments in certain contexts. The accuracy of prediction of archeological sites is enhanced by awareness of geomorphic processes that have distorted the archeological record. The present analysis begins with a consideration of the dynamics of the Holocene landscape, and then moves to a consideration of the relation of sites to the general landscape.

GEOARCHEOLOGICAL SYNTHESIS

The formulation of the predictive model is derived from the establishment of those behavioral correlates of man-land relationships preserved in the geoarcheological record. To frame the nature of these relationships in a material sense, it is initially necessary to identify site-landform and archeostratigraphic correspondences that differentiate each of the prehistoric periods represented across the project area. In this way both the cultural and landscape components can be viewed as integral to a dynamic human ecology, one that leaves a distinctive signature for each cycle of the Holocene associated with human activity. In some cases where the evidence for prehistoric occupance is conspicuously absent, it is possible to reconstruct the reasons for such gaps by examining patterned geomorphic process and by accounting for differential preservation.

As the site-specific research suggests, a major key to understanding the archeology of the valley is the changing river behavior and the microenvironments created by its shifts. The evidence shows that even subtle hydrographic thresholds may have quantum effects on sedimentation, a fact that would have affected settlement patterning as strongly as it currently regulates differential site preservation. On the bottoms, site selection was governed by locations along rimming landforms near aquatic biomes created by meandering streams, oxbows, river incision and erosion. On the uplands, sites were generally in proximity of tributary feeders that facilitated access to the major floodplain. The habitats frequented on the bluff tops themselves evolved as a result of forest stabilization of surfaces created by deflation and transport of ancient flood silts to the valley margins. Valley slope profiles also are an expression of the geomorphic balance between overflow channel sedimentation and slope runoff. Thus, the generation of all valley environments and attendant settlement loci from ridge-crests to buried bottomland surfaces is in large part a function of differential fluvial dynamism.

River Dynamics and the Paleogeography of Lake Red Rock

A measure of the regional fluvial dynamism of the Des Moines River is shown in Figure 8-1, a plot of the changing channel gradient over a 70 mile span from Saylorville to Red Rock dams. The stretch from Saylorville to the upper Red Rock project limit slopes at 1.9 feet per mile, compared with the 1.4 foot per mile grade for the project area; the 26 percent reduction in slope grade marks a geomorphic knickpoint as the river passes from the rolling glacial terrain of the Des Moines Lobe to the wider floodplain and more graded topography of the Southern Drift Plain. Slope reduction of this magnitude is quite critical in modifying all aspects of river behavior ranging from the actual morphology of the channel to the degree of sedimentation along its banks. Thus, fluvial geomorphologists relate changing slope profiles to the interactions of several stream variables: discharge, load (delivered to channel), size of debris, flow resistance, velocity, width, and depth (Leopold, Wolman, and Miller 1964; Schumm 1977). For geological evaluations additional controls are implicated by the disposition and orientation of land-surfaces (i.e., terraces, fans, meanders). The nature of the interactions between these variables is complex and incompletely understood, but for present purposes four main principles register the major transitions between the upstream and downstream reaches. First, rivers increase in size downstream as tributaries enlarge the contributing drainage area and thus, the discharge. Second, there is a general tendency for downstream bed-size particles to decrease. Third, there is a concomitant tendency for downstream sedimentation rates to increase as discharge rises, the profile flattens, and the floodplain widens. Finally, there is generally a diminution in meandering (or sinuosity) as gradients decrease.

All these trends are manifest in the expression of landform configurations in the Red Rock project area. As noted earlier, the Southern Drift Plain is characterized by a strongly dendritic drainage net that is relatively mature while still expanding as a result of protracted gullying and headward erosion along interfluve edges. Thus, the mature stream profiles have large catchments and intricate feeder systems. When these nets are captured by the Des Moines River they accelerate discharge and sedimentation along the downstream gradient. This pattern contrasts with the younger drainage system at the Downstream Corridor that features incising streams, in addition to higher concentrations of impounded basins. Discharge and sedimentation rates are exponentially lower, but on the other hand, topography is more accentuated.

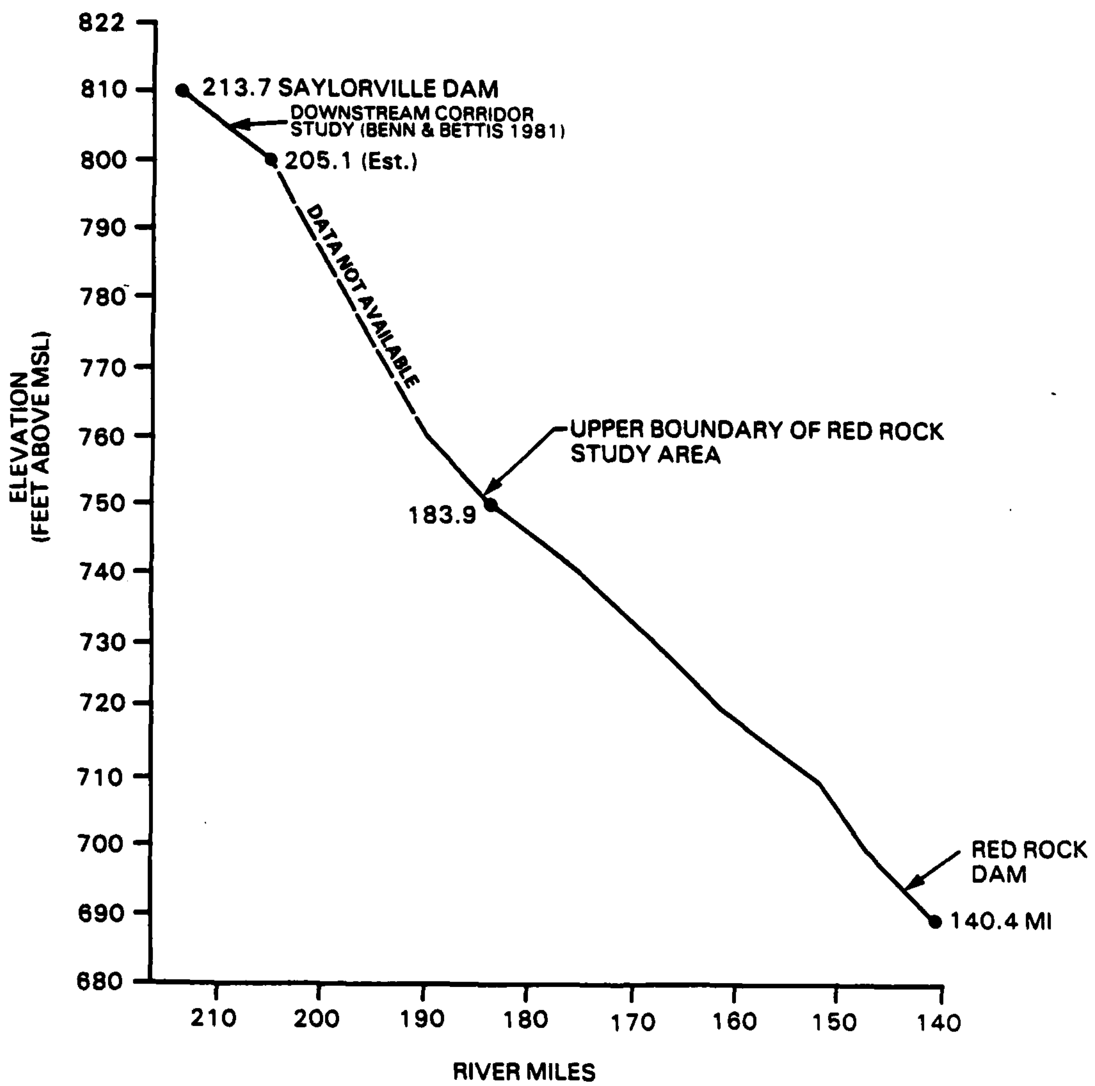


FIGURE 8-1
CHANNEL GRADIENT ALONG THE DES MOINES RIVER
SAYLORVILLE TO RED ROCK DAMS
LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

The steep and downcutting stream profiles of the upper drainage are largely responsible for the preservation of both the late Pleistocene Beaver Creek terrace outcrops, as well as the subtly differentiated High-Intermediate-Low Terrace Holocene levels south of Saylorville. At the Lake Red Rock project area more subdued topography is a function of the mutually reinforcing trends of increased discharge, accelerated sedimentation rates, and a widening floodplain. Benn and Bettis (1981:8) note that over half of the Saylorville corridor valley width is on the order of a mile or less, though there is variability in the central drainage. At Red Rock the valley is uniformly 2 to 3 miles wide and displays only very localized constrictions. Discharge rates have not been adequately sampled over the two reaches, but spot sampling at representative gauging stages shows that rates in the lower drainage are exponentially higher (Schuetz and Matthes 1977), as per Leopold, Wolman, and Miller's (1964:251) correlation between increased discharge and basin area.

The net effect of higher flooding levels is, of course, the accretion of suspended sediment which, in a graded, broad, and expansive alluvial plain such as the central Des Moines, is to blanket the gently undulating topography with clays and silts. Accordingly, in-silting of pre-existing basins, for example, the oxbows at 13MA207, defines a recurrent sedimentation regime and many former features are buried by low energy inundations. At 13MA44 (Table 5-9) and at Location 4 (Table 5-10), brown-black overbank silts account for up to 15 cm of recent deposition in unit IA_1. Protracted overbanking obscures the erosional topography of the floodplain, and it is only with the application of deep-testing methods and careful micro-stratigraphic resolution that sequences can be sorted out from masking surface veneers that homogenize topographic relationships. The paired terrace outcrops at Location 4 are an exemplary case where recent incision exposed two completely different landforms that were morphologically similar, but chrono-stratigraphically independent. The mantling effect of contemporary overbanking along the 28.4 mile stretch north of Lake Red Rock makes it extremely difficult, if not impossible, to reconstruct the regional paleogeography without applying intensive ground-truthing strategies. The identification of Mollisol profiles at well-researched locales (i.e., at 13MA44) shows, further, that low-energy accretion was a predominant sedimentary process in the prehistoric past as well, and that the challenge of chronicling the history of Holocene floodplain development is compounded by the delicate pedological-sedimentation balances typifying the bottomland settings.

Finally, the degree of sinuosity can be taken as a composite index of long-term floodplain dynamism. Channel scars and scrolls, exhumed terrace remnants, and laterally truncated fans all attest to the migrating character of Des Moines River flow. Table 8-1 documents the meandering aspect of the river channel, determined by measuring the channel length and linear valley lengths (along the straight valley axis) and calculating their ratio, the sinuosity index. The number of archeological sites, to within a mile of the river, is noted for each quadrangle map. Leopold, Wolman, and Miller (1964:281) consider channels with a sinuosity value in excess of 1.5 to be meandering while those of lower value are straight to sinuous. Based on these criteria, the most meandering segments of the river are those in the Otley, Knoxville northwest, and Pleasantville quadrangles. These segments are also lined with 123 confirmed archeological sites, or 75 percent of the total site population. As discussed below, the distribution of sites along bottomland reaches is clearly patterned and follows the rims of ancient channel banks, perimeters of terrace flanks, and the heads of alluvial

TABLE 8-1

SINUOSITY OF THE DES MOINES RIVER CHANNEL, LAKE RED ROCK PROJECT AREA (by Quadrangle)

Quadrangle	Valley Length (mi)	Channel Length (mi)	Sinuosity Index	Number of Archeological Sites
Harvey	7.86	9.19	1.16	4
Knoxville	0.57	-	-	-
Otley	6.82	9.85	1.44	75
Knoxville northwest	7.58	12.31	1.63	24
Pleasantville	6.82	11.74	1.72	14
Hartford	3.98	4.26	1.07	5
Rising Sun	6.44	8.90	1.38	27
Total (Red Rock) (Source: this report)	40.07	56.25	1.40	
Downstream Corridor Source: Benn and Bettis 1981)	7.43	9.00	1.21	

fans. Overall, the sinuosity index of the project area is 1.40, or at the interface between a sinuous to meandering system.

Sinuosity of the Saylorville Downstream Corridor was calculated to be 1.21 over its relatively abbreviated 9 mile reach. This index is as expected, given the steeper course of the drainage and the tendency of steep profiles to promote a laterally constricting aspect (Schumm 1977). Research suggests that two major influences, unstable vegetation covers and fine sediment load, will accelerate sinuosity in downstream reaches as is the case at Red Rock (Ackers 1964; Ackers and Charlton 1971). Channels with alternate bars formed along inside bends may be invaded by plant growth, which will solidify the floodplain surface over the short-term and then cause thalweg deepening and lateral shifting in subsequent high flow cycles. Sinuosity is also advanced when massive depositions of soft fill or suspended load accrete along extensive basins creating less resistant obstacles to lateral stream flow; upstream, at Saylorville, sandy-gravel matrices ef- fectively constrict migration and encourage downcutting.

Both influences, vegetation and suspended load accretion, highlight the meandering morphology characteristic of the landscape at Lake Red Rock, but more significantly, they account for the systematic evolution of that landscape since the late Pleistocene. As noted earlier, the lack of prominent late Pleistocene, or even Holocene sandy gravel outcrops, is noticeable across the project area, given the prominent distributions of the two Beaver Creek outwash terraces to the north. Only Location 4 (units IV and V), and sites 13MA216 and 13MA217 provided even questionable pre-Holocene soil/sediment associations and their chrono-stratigraphic origins remain highly speculative. The evidence at every exposure investigated argues strongly for protracted overbanking as the principal sedimentation mode since at least late mid-Holocene times. High sinuosity across the valley bottoms underscores the relative homogeneity of the depositional matrices. More significantly, it signals the complex hydrographic responses of the downstream Des Moines channel to the climatic fluctuations of that time frame. Meandering could have accelerated during the post-Hypsithermal (<5000 B.P.) cool-moist cycles when bottom vegetation communities re-stabilized and affected the consistence of the floodplain substrate. Under such conditions, meander loop networks would have been established that incised through unvegetated tracts and those clay plugs, swales, and slackwater settings prone to shear and tractive erosion. Consequently, it is probable that the longer-term and stabilized floodplain micro-environments developed on optimally drained terrace locales, specifically sandy terrace-fans at elevations slightly above the floodplain that sustained more mesophytic vegetation communities.

Comprehensive assessment of the nature of hydrographic responses to climatic change is beyond the scope of this paper, since the correlations between floodplain sedimentation and fluvial geomorphology with climatic oscillations are incompletely understood. As discussed in Chapter 3, the dating of climatic events of the Holocene are problematic as well, much less their chronological implications for pinpointing landform successions on such fragile settings as differentiated flood basins. It is, nevertheless, possible to generate a generalized geomorphological map of the bottomland, as well as the upland settings as shown in Figure 8-2 and described below.

Site-Landform Correlations and Interpretive Potential

The geomorphological map was prepared in accordance with the methods outlined in Chapter 3. Aerial photographs of the pre-dam (1967) landform configurations were examined stereoscopically and in conjunction with soil survey maps. Subsequent ground-truthing was designed to identify type sections and incorporate the extensive soil and landform associations into a chrono-stratigraphic framework. Landforms were initially transposed onto the series of 7.5 minute U.S.G.S. quandrangle maps covering the project area and were then reduced to the base map size as shown (Figure 8-2). All principal landform types are plotted faithfully, but some detail in the mapping of lesser features including isolated scrolls and minor terrace or fan remnants has been sacrificed in the interest of more systematic coverage of principal landscape components. It is stressed that although the geoarcheological sampling design was geared towards thematic as well as to representative spatial coverage (see Figure 5-5), it was not possible to document every microenvironmental scenario. Neither was fine-grained resolution attainable on the scale of accurate disclosure of multiple terrace sequences. As discussed below, such detailed and focused research strategies must be implemented if the subtle and often masked morpho-stratigraphic units are to be picked up across the differentiated floodplain and linked to the archeological distributions.

Figure 8-2 presents a regional overview of the landscape relations obtaining across the project area. As noted, 9 of 10 landforms are dispersed along the bottomland settings. The upland slopes refer to a variety of interfluve locales that flank the valley margins and are subject to uniform processes but differential rates of evolution as described in appropriate location sections in Chapter 5.

Along the valley axis, attention is initially drawn to the migrating channel of the Des Moines River that is zonally segmented with highest amplitude meanders occurring at the upper and central reaches of the drainage. The complex and superposed loops generated in the vicinity of 13MA207 are especially noteworthy as they are simultaneously aligned with one of the continuous terrace benches straddling the north shore. Terraces occur generally as outcrops and are seldom coalescent. When they do form linear benches paralleling the river axis, they co-occur with intergraded alluvial fans as at 13MA216 and 13MA217. These formations have been classified as "high bottoms" because of their elevations (>760 feet) and subsurface stratigraphies that reveal inputs of both primary stream alluviation and secondary fan progradation (see discussion below). Ridge and swale topographies as well as concave meander scrolls register the migrations of shorter term flows and are subject to abrupt removal and/or infilling. Older scars may be preserved but these are often difficult to isolate, as they are capped with recent flood-silts, or in the case of swales, they may be silted in by periodic surges. Levees and point bars are subject to the same episodic disturbances, but they document the most recent flow patterns of the river and gauge the axes and patterns of inundation and sedimentation most accurately.

With this regional perspective on Des Moines River channel behavior, it is instructive to examine the patterning of the particular site distributions across the landscape by period. Figures 6-1, 6-2, and 6-3, corresponding to Archaic, Woodland, and Oneota/Great Oasis sites respectively, were overlaid on

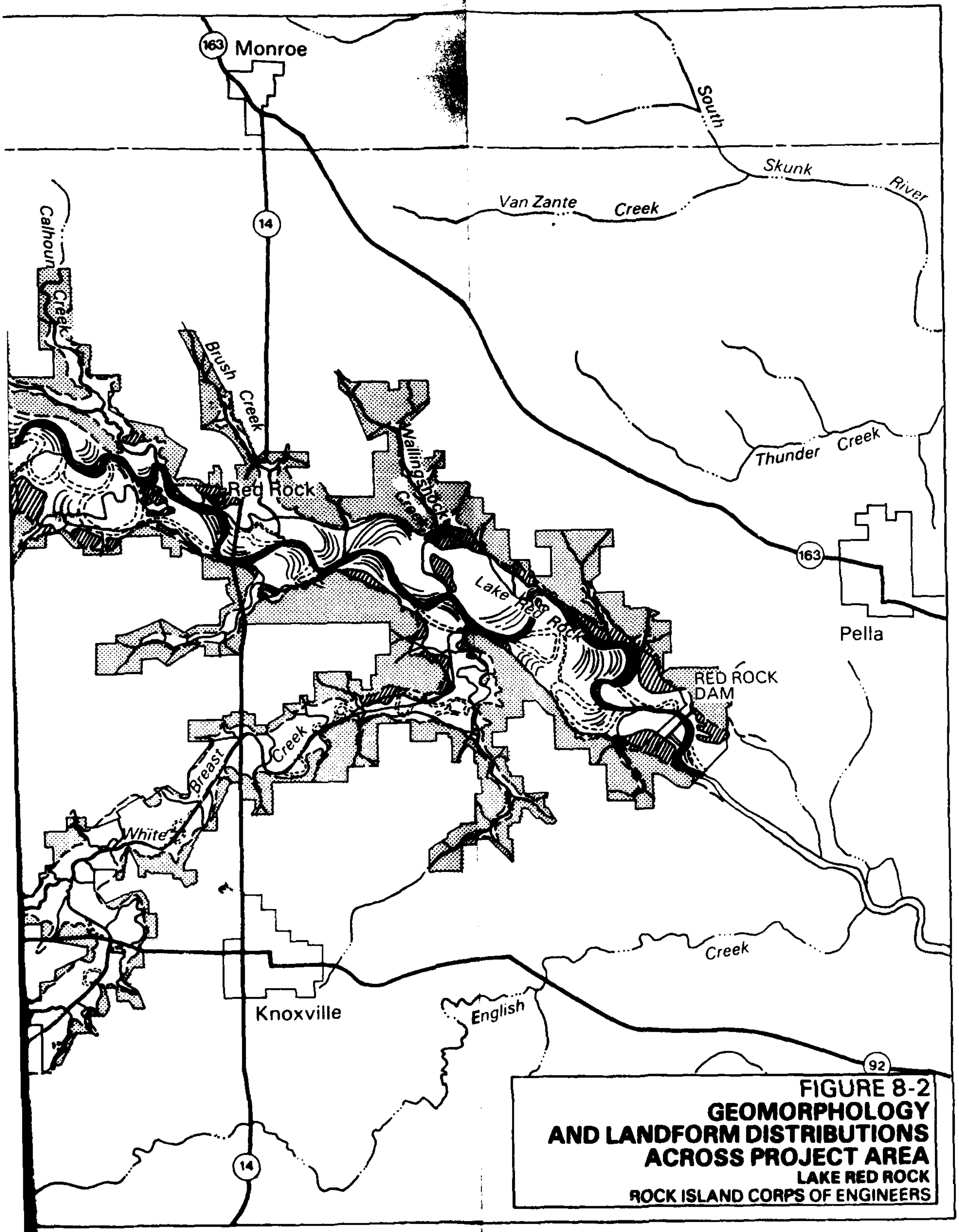
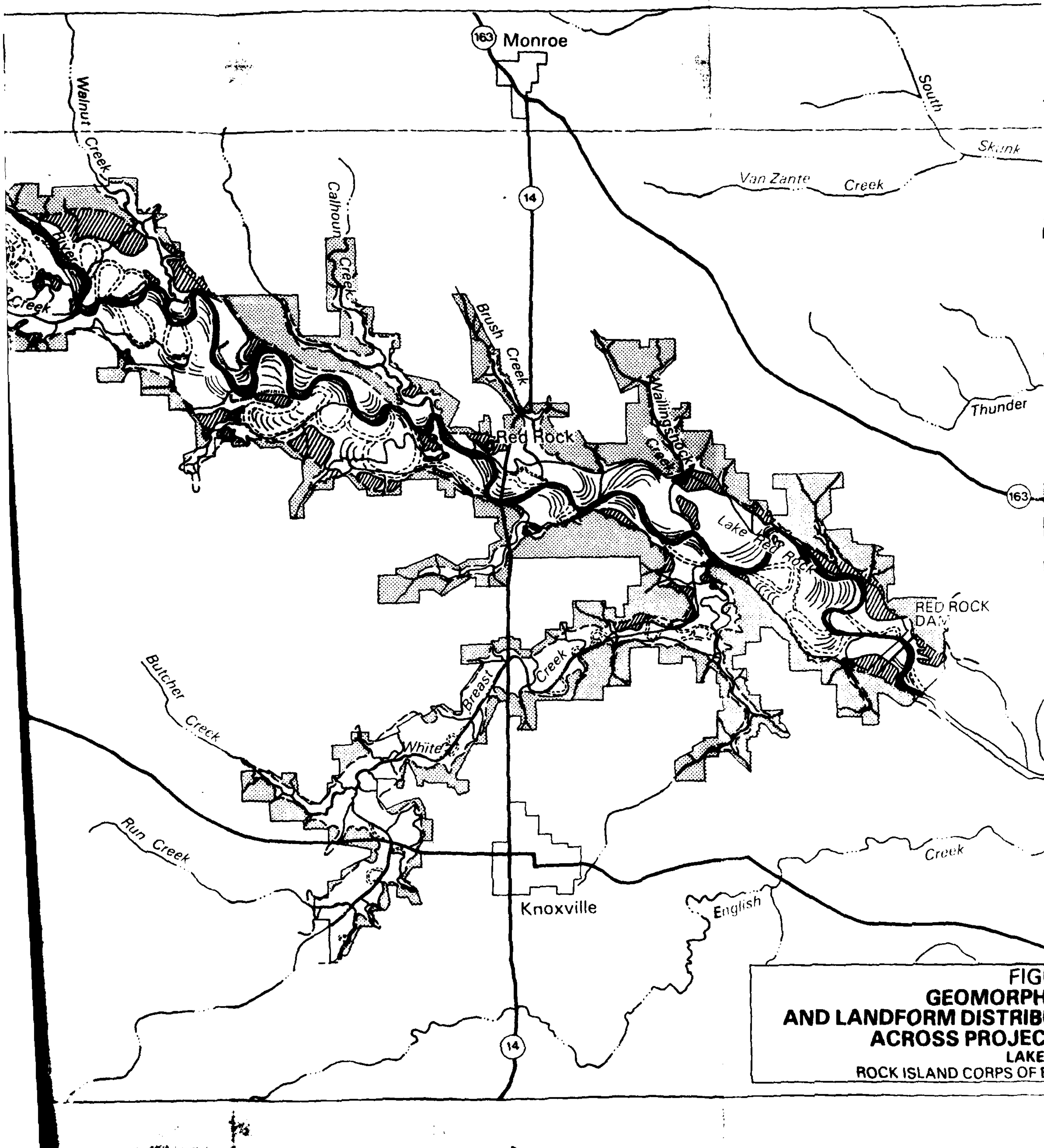


FIGURE 8-2
GEOMORPHOLOGY AND LANDFORM DISTRIBUTIONS ACROSS PROJECT AREA
LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS



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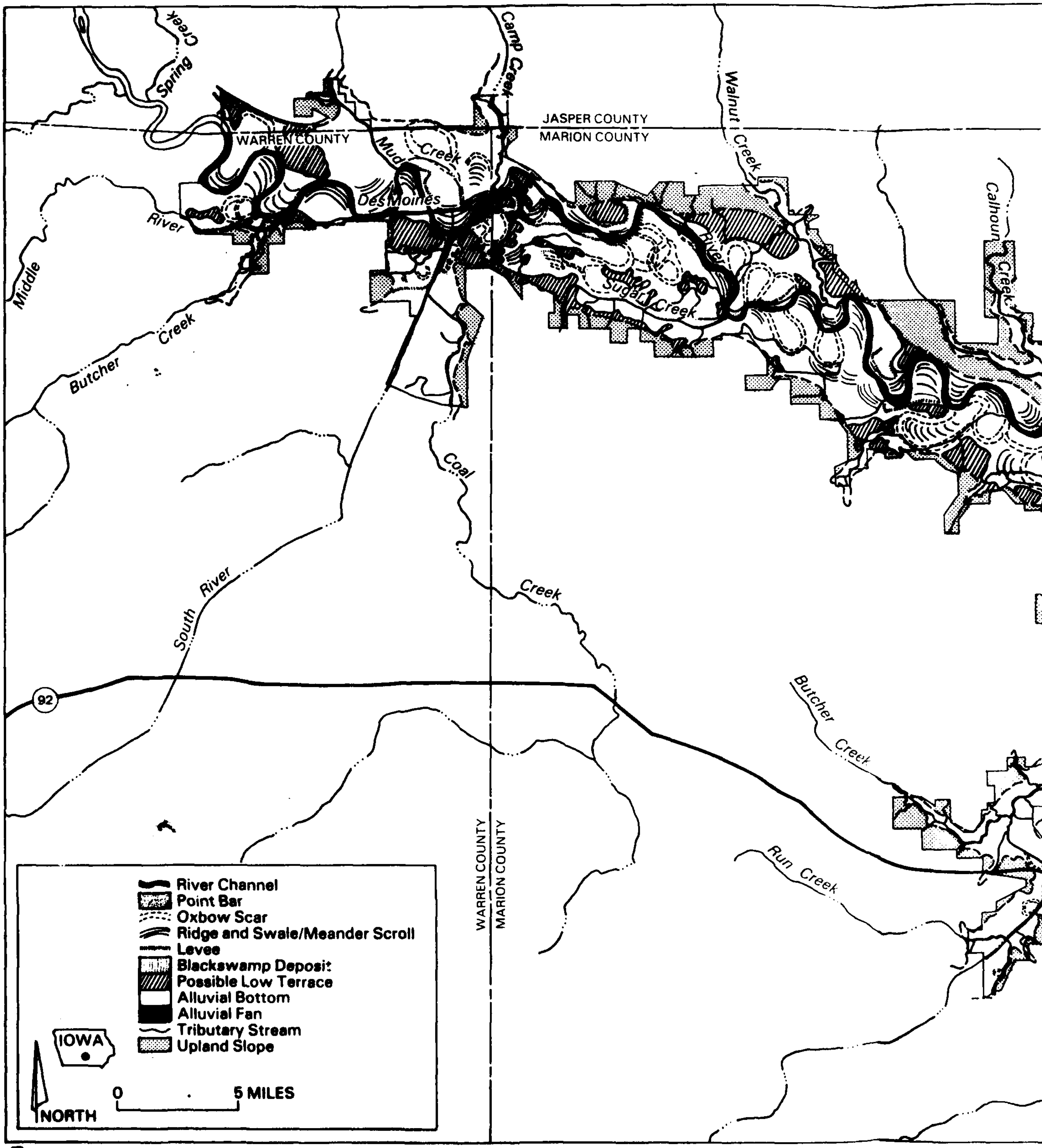

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the geomorphology map to evaluate site-landform correlations. It is cautioned, however, that most of these superpositions represent nearest estimate map plots derived from reported accounts and not tested in the field.

All three Archaic sites are associated with interfluve settings, an observation consistent with the reconstructed floodplain history as dating to the mid-Holocene period at the earliest. Woodland sites, comprising the largest component population, display a wide range of site loci, but distributions are strongly concentrated at high terrace/interfluve edges and often at the mouths of primary confluences. The three most prominent Woodland site clusters are all bracketed within a 10 mile west-east band along the southern lake margin near Elk Rock. Logistically, the sites have a vista overlooking one of the broader and more undifferentiated floodplain expanses. The site surface is an extensive strath terrace cut into shale/sandstone bedrock and discontinuously capped by slope reworked loess. Significantly, only one possible site (13MA32) may articulate directly with the floodplain proper. In over 95 percent of the cases Woodland sites are situated atop "high bottom" surfaces or interfluves.

It is the Oneota/Great Oasis site distributions that may display the highest degree of settlement variability. Locations are positioned either at upland pockets, often substantially distant from the floodplain, or at several bottom microenvironments. Terrace-fan heads are preferential loci since, as typified at 13MA209, they combine optimal terrace-floodplain habitats with the well drained, nutrient rich soils introduced by principal feeder streams. Sites 13MA207 and 13MA208, however, are also positioned along the outside bends of oxbows in the floodplain proper. While these represent slightly raised elevations (at ca. 740 feet), they have been exposed to periodic inundation since the mid-Holocene. Evidence suggests strongly that the well defined loops delineate the primary channel artery functional at the time of the prehistoric occupation. The hypothesis that must be entertained, given the multiple zonation of the latest prehistoric settings is that the inhabitants lived and exploited the range of resource zones available on the floodplain, its lower and upper flanks, and well beyond the valley margins. These culturally distinctive man-land associations are further specified and discussed in the section on site catchment analysis.

Archeo-stratigraphic Resolution: Site Preservation and Potential

A limited sampling of site contexts could be identified in the project area that disclosed a discrete set of preservation conditions diagnostic of geomorphic as well as of cultural processes. Both processes are vital in mapping out feasible recovery and testing strategies, but the former explain the actual recovery potential from a probability standpoint.

Central to the understanding of preservation conditions are the close correlations already cited between archeological distributions and landforms. In upland settings, for example, where a wide variety of sites and locations have been recorded, the erosional dispositions of interfluve edges argue against strong site integrity and the recovery of substantial in situ sites. Hillslope process is accelerated by even subtle changes in edaphic conditions, and mobilization of artifacts and downslope transport is a major consideration. Differential preservation pockets will recur on more reinforced and vegetated surfaces, and highest recovery potential for intact assemblages is afforded at such locales. Slope denudation will, however, expose and rework materials that would otherwise remain buried, so that disturbed provenances remain a strong signature for upland sites.

Along similar lines, differential erosion along the floodplain selectively exposes and seals in sites. In bottomland settings, however, the reconstruction of patterned fluvial dynamism and the recognition of recurrent alluviation regimes and cut and fill cycles affords stronger opportunities for observing and ultimately for predicting contexts. The site-landform correlations, for example, revealed a tendency for Oneota sites to be located along terrace fans in the high bottoms. Since both fan and terrace formation processes are interdigitated, there is a strong likelihood for preservation of such sites. Sediment matrix contexts are largely depositional, and terraces are sufficiently above higher inundation levels to retard erosion under most fluvial conditions.

Sites along the floodplain proper would be in jeopardy given the dynamism of the present Des Moines River system, evidenced by complex fluvial features, the high sinuosity index, and, most significantly, the "blanketing effect" associated with contemporary overbanking that serves not only to obscure topographic gradients, but to bury and/or irrevocably re-sort artifact assemblages.

The field research at Lake Red Rock tested several representative sites that offered insights to the preservation potentials along major physiographic sectors of the project area. The key sites addressed for such purposes included 13MA115, 13MA44, 13MA81, 13MA209, and 13MA207. On the basis of the observations made at these sites, summarized in detail in Chapter 5, critical archeo-stratigraphic patterns were detected that have differential preservation probabilities, and which must be taken into account for the formulation of future cultural resource planning strategies. Results are summarized in Table 8-2. Stratigraphic units are the same as those referenced in the site-specific study (see Figures 3-2, 5-7, 5-9, 5-10 and 5-12) and have been synthesized on a west-east longitudinal profile in Figure 8-3. Unit designations have both upland and bottomland correlates, since the geomorphic and soil-sedimentary processes were contemporaneous, but the cycles occurring in each scenario were different. As shown in Figure 8-3, bottomland surfaces are associated with both higher and lower terraces as discussed below.

The table shows the following general trends regarding the contexts for prehistoric site distribution:

1. Archeological assemblages of all post-Archaic prehistoric periods are likely to be encountered along uplands and interfluves. In general, such sites will be small and will decline in relative integrity downslope as hillslope process accelerates site degradation and reworking;

2. Optimally preserved sites are the larger Oneota sites housed in interdigitated alluvial fan-terrace sediment matrices on the high bottoms;

TABLE 8-2

ARCHEO-STRATIGRAPHIC POTENTIAL AT LAKE RED ROCK

Unit	Geomorphic Setting	Soil-Sediment Properties	Probable Archeological Context
I	a. Upland crests and interfluve edges and steps	a. Upland podzols with organic A-horizons and leached substrate	a. Generally reworked, but occasionally intact assemblages from smaller Woodland, Oneota, or Archaic sites
	b. Floodplain terrace tops of high and low surfaces	b. Overbank silts and clays capping mollisols on lower terraces and interdigitated with fine sands on higher fan-terrace surfaces	b. Reworked assemblages of Woodland-Oneota sites on low bottoms; well preserved Oneota sites on higher fan-terraces
II	a. Upland interfluve edges	a. Truncated Wisconsin loess paleosol	a. Reworked assemblages from Woodland, Oneota, and Archaic
	b. Fan head deposits on higher terrace bottoms and buried silts on lower terrace	b. Alluvial fan silts and sands (upper); mildly weathered silts (lower)	b. Well preserved Oneota materials on high surfaces and reworked undiagnostic (late prehistoric) on buried surface
III	a. Upland interfluve step	a. Proglacial lacustrine deposits	a. Reworked assemblages in secondary context
	b. Buried terrace surface (low terrace only)	b. Argillic paleosol (upper)	b. Uncertain (Late Archaic-Early Woodland?)
IV	a. Upland interfluve step	a. Kansan till deposits	a. Reworked assemblages in secondary context
	b. Buried terrace surface (low terrace only)	b. Argillic paleosol (lower)	b. Uncertain (prior to Late Archaic?)
V	a. Upland bench	a. Pennsylvanian bedrock	a. Generally reworked, occasionally intact assemblages of Woodland period
	b. Buried outwash (low terrace only)	b. Terminal Pleistocene outwash (?)	b. Pre-occupation (?)

3. Archeo-stratigraphic associations of the low bottoms are very poorly understood, since the "blanketing effect" and highly buried settings rend them inaccessible.

The evidence indicates that there is a unique preservation signature to each of the principal settings of the project area: uplands/interfluve edges, high bottoms, low bottoms. The Figure 8-3 schematic highlights settings, their relative elevations and outcrop dispositions across Lake Red Rock, and the principal stratigraphic units documented by the research. On the basis of these patterned archeo-stratigraphic and site-landform correlations, several major predictive statements can be advanced.

Upland/interfluve locales hold a high potential for prehistoric site occurrence, but the landscape history of that physiographic setting precludes encountering significant occurrences of buried or stratified sites. In general, the farther downslope the site is encountered the more likely it is to be in secondary association. An emphasis in uplands survey would be to record as many sites as possible, and to generate an index for site context by noting the nature of its slope setting. Representative artifact collections along slopes may register differential erosional rates.

Higher bottomland locations offer the strongest potential for recovering relatively intact prehistoric remains and may be isolated by locating the major terrace-fan benches on the geomorphologic map. The best preserved, highest yield sites should coincide with the confluences of the principal Des Moines River feeders with the principal channel. The age of the terrace is not certain, but obviously the higher surfaces are late prehistoric. To date the subsurface stratigraphy remains unknown, but it is likely that both prime axis channel sedimentation and fan progradation accelerated build-up so that these landforms are very likely of late Holocene age. They must nevertheless be tested for buried site potential.

In this regard, it is the lower bottoms that furnish the most problematic contextual issues, since they feature paradoxically the most subtle surface exposures and the strongest evidence for exhumed Holocene surfaces in the substrate. Only at Location 4 was a major profile exposed, but the significance of two generations of B-horizon pedogenesis offers the only recognizable prospects for reconstructing a pre-late Holocene landscape model for the central Des Moines River drainage. That the higher bottoms and undifferentiated floodplain sectors are all generally younger than 2000 B.P. is implicit by the paucity of Woodland sites along the floodplain proper and the young Mollisol profiles registered. There is a potential for locating earlier prehistoric sites if and only if the subsurface disposition of the B-horizon and the Location 4 outcrops are mapped. This can only be achieved with a deep site testing program instituted at diagnostic locales.

Finally, from a cultural resource management standpoint, it is necessary to gauge the manner and magnitude at which the Lake Red Rock sites are being eroded, since archeo-stratigraphic relations are being impacted by the present lake activity. These effects can be systematically addressed by applying the tread-riser model and collection strategies outlined in Chapter 5 for site 13MA81. Long-term monitoring of wave-cutting should furnish precise indices

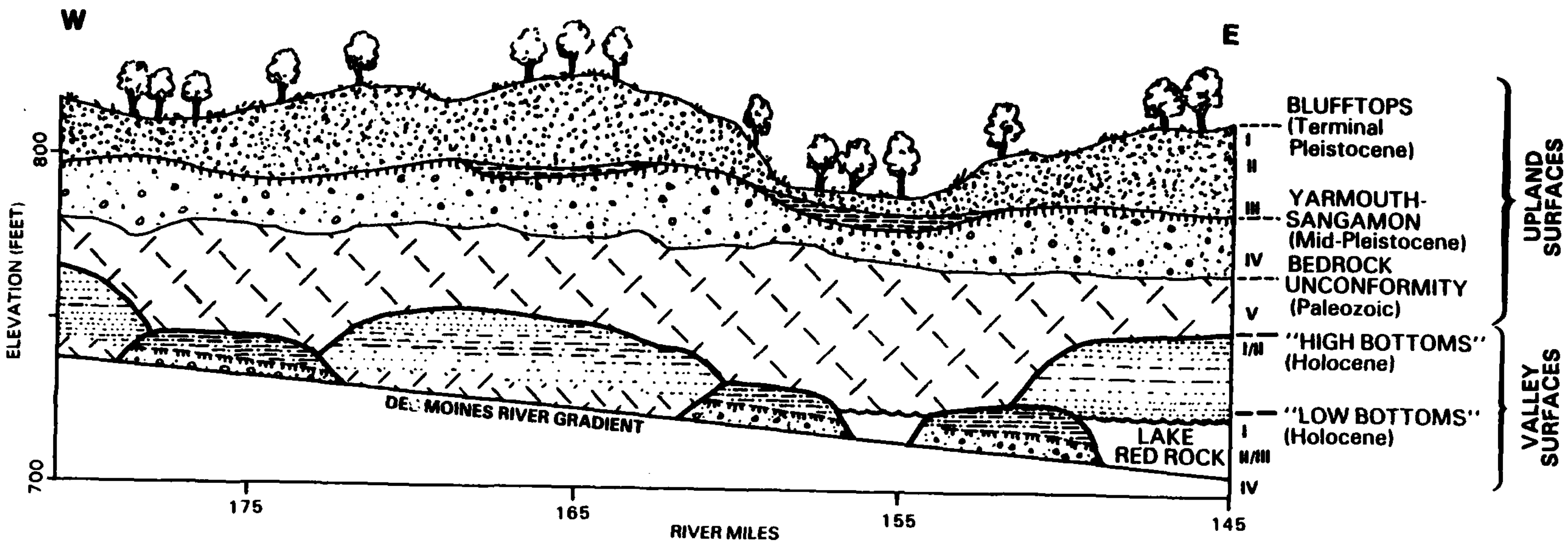

FIGURE 8-3
LONGITUDINAL PROFILE ALONG THE DES MOINES RIVER VALLEY
LAKE RED ROCK PROJECT AREA

LAKE RED ROCK
ROCK ISLAND CORPS OF ENGINEERS

COMMONWEALTH ASSOCIATES, INC

of site destruction and should assist in the implementation of preservation strategies.

SITE CATCHMENT ANALYSIS

An approach to modeling more precisely the locations of known sites is to evaluate their relation to their setting. For this we use the method of site catchment analysis (cf. Roper 1979 for a discussion and example). Concentric circles with radii of 1 and 3 km were superimposed on each site as plotted on topographic and vegetation maps. A series of hydrographic, topographic, and vegetation variables were then coded. Hydrographic variables included distance to water, rank of nearest water source, and rank of largest water source within 1 km and within 2 km. Topographic variables included amounts of bottomlands, slopes, and uplands within 1 km and 2 km. Vegetation was divided into forest and prairie on each of these landforms and amounts of each zone within 1 km and 2 km were measured using a compensating polar planimeter. The data were then analyzed using descriptive statistical routines.

Given a working knowledge of prehistoric settlement patterns in the Midwest, it is apparent that sites pertaining to differing cultural traditions should have been located according to varying criteria. It is appropriate, therefore, to separately analyze the sites of each major tradition. These include here the Woodland and Oneota traditions. Archaic sites are not described since not only are they very few in number but also are only tentatively identified.

Woodland Sites

Complete site data were available for 33 sites identified either during this or previous projects as being productive of Woodland remains. Most of these sites (30) are in Marion County, 1 is in Polk County, and 2 are in Warren County. No typology of the Woodland sites is offered here. It is suspected that at least two types of Woodland sites could be identified in the project area. One of these is the base camp or habitation site typically located on a river terrace. Examples would be sites like 13MA162-13MA167 or 13MA130-13MA135, all on a strath terrace in areas of Elk Rock State Park (South Unit), or 13MA44 and 13MA81 in similar settings (even if on geomorphically distinct units). The second Woodland site type is the limited activity site, recognized from its lithics and with ceramics either scarce or absent. These are more typically located on the river bluff. Examples include 13MA112. Unfortunately, it is not possible to exhaustively place the recorded Woodland sites within one of these two classes on the basis of the present collections and descriptions. Woodland sites are here described as an aggregate therefore.

Hydrological variables are tabulated in Table 8-3. Nearest water source varies considerably, with over two-thirds of the sites along smaller order streams. However, it is apparent that almost all recorded Woodland sites are within 1 km of the Des Moines River.

Descriptive statistics, including mean, standard deviation, and coefficient of variation (CV), are presented for the topography and vegetation variables in Table 8-4. The means reveal that much of the land within 1 km and

TABLE 8-3

RELATION OF WOODLAND SITES TO WATER

Rank	Nearest	Largest-1 km	Largest-3 km
1	9	1	-
2	7	-	-
3	6	1	-
4	1	2	2
River, not Des Moines	-	1	-
Des Moines River	10	28	31

TABLE 8-4

MEANS AND STANDARD DEVIATIONS FOR QUANTITATIVE VARIABLES (WOODLAND SITES)

Variable	Mean	Standard Deviation	CV
Bottomland - 1 km	1.54	0.67	43.57
Slope - 1 km	1.47	0.54	36.94
Uplands - 1 km	0.25	0.25	97.98
Bottomland - 2 km	6.49	1.89	29.06
Slope - 2 km	5.12	1.48	28.81
Uplands - 2 km	1.37	0.90	65.69
Bottomland Prairie - 1 km	0.16	0.35	210.98
Upland Prairie - 1 km	<0.01	0.02	400.00
Bottomland Forest - 1 km	1.38	0.62	44.99
Upland Forest - 1 km	0.23	0.25	105.58
Slope Forest - 1 km	1.16	0.57	48.75
Slope Prairie - 1 km	0.26	0.30	116.08
Bottomland Prairie - 2 km	1.24	1.75	140.58
Upland Prairie - 2 km	0.28	0.36	127.96
Bottomland Forest - 2 km	5.42	2.05	37.77
Upland Forest - 2 km	1.05	0.92	88.04
Slope Forest - 2 km	3.57	0.94	26.19
Slope Prairie - 2 km	1.55	1.16	75.15

2 km radii of the sites is either bottomland or slope, and that the area is fairly evenly divided between the two landforms. The coefficients of variation also are lower for these variables than for the upland variables, implying a more consistent location relative to the bottomland-slope area than to the uplands. This is interpreted to reflect the bluff-base setting which is highly characteristic of Woodland sites throughout the Midwest.

These data, plus field impressions, suggest that many Woodland sites, particularly the larger ones, are in bluff-base locations, but elevated above the floodplain on the first level surface. This location, in theory, permits an optimal location relative to a variety of floral, and presumably also faunal, resources, particularly those of the deciduous forests and low elevation prairie openings. A multivariate analysis of the catchment data may be used to examine the actual relation of sites to vegetation zones.

The 12 vegetation catchment variables were used for this analysis. The data were analyzed using a principal components routine with varimax rotation (Program FACTOR in the ASTAT 83.1 package; Grandon 1983). All factors with eigenvalues greater than 1.0 were extracted; 50 iterations were used to derive the principal components and 50 iterations were used to derive the varimax rotated factor loadings. The final varimax rotated solution is presented in Table 8-5.

Factor 1 is a forest factor. It is bipolar, with upland and slope forest at one end and bottomland forest acting in the opposite direction. This is particularly true of the areas of these zones within 1 km of the site. It is expectable that this should be the first factor extracted. Factor scores were not obtainable with the particular program used for this analysis; however, interpretation is assisted by simple examination of the raw data. Doing so shows that it is characteristic of the Red Rock area that much of the land within 1 km of a Woodland site is forested. It also shows that the relative amounts of bottomland, slope, and upland forest vary from one site to another. Overall, however, this factor specifies an important element of the location of central Des Moines River valley Woodland sites.

The remaining three factors appear to isolate variables that describe the catchments of one or several sites. These sites are those that do not fit the norm that appears to be the situation described by Factor 1. They are not necessarily to be regarded as unique, however; it may simply be the case that they are examples of site types not yet adequately recorded in the Red Rock area.

Factor 2 has its highest loading on slope prairie, within both 1 and 2 km. Examination of raw data shows that little to no slope prairie occurs within 1 km of each site but that the proportion increases within 2 km of the site. Nevertheless, several sites have outstandingly large amounts of slope prairie within their catchments. These include especially 13MA090, 13MA131, and 13MA156. All of these can be seen on the maps (e.g., Figure 6-2) to lie somewhat farther back from the bottoms than the majority of the sites.

Factor 3 is a bottomland prairie factor and also has a moderately high negative loading for bottomland forest within 2 km. Bottomland prairie normally forms a small proportion of the vegetation within 2 km of a site, but

TABLE 8-5

VARIMAX ROTATED FACTOR LOADINGS

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Comm
BP1	-.11	-.08	.89	-.09	.82
UP1	.02	-.16	-.06	.74	.58
BF1	-.78	-.41	-.18	-.09	.81
UF1	.84	.12	-.13	-.08	.74
SF1	.77	-.02	-.22	.14	.67
SP1	-.16	.85	-.04	-.16	.77
BP2	-.38	-.11	.82	-.22	.88
UP2	.07	.27	-.07	.78	.69
BF2	-.51	-.11	-.62	-.22	.70
UF2	.49	-.30	-.04	-.25	.39
SF2	.56	-.26	-.08	.21	.43
SP2	.26	.87	-.13	.31	.94
Percent Variance	35.17	23.20	23.57	18.06	
Cum. Percent Variance	35.17	58.36	81.94	100.00	

several sites have notably larger amounts of bottomland prairie. These include 13MA29, 13MA119, and 13MA216. Site 13WA104, in contrast, is similarly in the bottomlands; however, its catchment contains a higher proportion of bottomland forest within 2 km than is usual.

Factor 4 is an upland prairie factor, both upland prairie within 1 km and within 2 km having high loadings on this factor. Upland prairie does not normally occur within 1 km of a Woodland site and in only a few instances is there much within 2 km. It is undoubtedly this situation that is being described by this factor.

Overall, the analysis does support the suggestion that many Woodland sites, while within forests, are optimally located relative to most zones. Chapter 4 has shown that the resource potentials of the bottomland and slope forests are variable and the analysis shows the relation of sites to both zones. Also, the slope prairie within 2 km especially is adequately represented within the catchment.

Inspection of both the factor matrix and the raw data matrix suggests that the Woodland sites in the Red Rock area are located similarly to Woodland sites in other portions of the Prairie Peninsula. For example, this analysis was conducted using analytic strategies similar to those used by Roper (1974) in a pilot study of Woodland sites in the Sangamon River valley of Illinois. The results are remarkably similar. That they are not simply to be expected in a forest-prairie mosaic was shown by analyzing the Lake Red Rock Oneota sites using the same procedures. The results were very different. The derived configuration seems then to describe most Woodland site locations in the central Des Moines River valley and represent the local variation on the classic Midwest Woodland location pattern.

Two external variables should be added at a later stage of analysis. The first is site function. As stated, an intuitive assessment is that several functional types of Woodland sites are present in the Red Rock area. It was impossible at the present stage of analysis to classify sites by any replicable criteria. Further data will be needed from both controlled surveys and excavations.

The second external variable is time. This analysis has considered sites as simply Woodland sites. The ceramic collections show that both Middle and Late Woodland ceramics are present, but sites of the various taxa were not separated for the analysis. Woodland site location criteria do shift elsewhere in the Prairie Peninsula. It should be possible to refine this analysis once the central Des Moines River Woodland chronology is better understood.

Oneota Sites

Oneota occupation in the central Des Moines River valley is represented by at least 26 sites on Corps of Engineers lands and undoubtedly, by additional components beyond Corps of Engineers boundaries. The progress of investigations and taxonomic status of these sites was reviewed in earlier chapters of this report.

Also discussed in the last chapter was the fact that the settlement system of the Moingona Phase of Oneota is virtually unknown. What is apparent from the work conducted during the course of this project is that the Oneota settlement system is minimally comprised of two elements, village sites, exemplified by such sites as Howard Goodhue (13PK1; Gradwohl 1973) and Clarkson (13WA2; Osborn 1982), and some sort of more restricted use site, exemplified by the Oneota components at sites such as 13MA130 and 13MA44. Systematic investigation has been undertaken at none of the latter. However, ceramics, small, unnotched triangular points, and small quantities of additional debris are associated with the Oneota components. A rough division of the 26 components known on the basis of collections and descriptions would be as follows:

13PK1 -	Village	13MA19 -	Camp
13PK4 -	Village	13MA21 -	Camp
13PK6 -	Camp	13MA24 -	Camp
13PK43 -	Camp	13MA36 -	Camp
13PK439 -	Camp	13MA44 -	Camp
13WA2 -	Village	13MA130 -	Camp
13WA4 -	Village	13MA206 -	Camp
13WA11 -	Village	13MA207 -	Village
13WA101 -	Village	13MA208 -	Village
13WA102 -	Village	13MA209 -	Village
13WA105 -	Village	13MA212 -	Camp
13WA108 -	Village	13MA215 -	Camp
13MA10 -	Camp	13MA223 -	Camp

The analysis of Oneota site locations will employ this dichotomy.

The first observation we may make is somewhat subjective, and that is that the sites classified as Oneota are confined to that portion of the Des Moines River valley, above the area of the conservation pool of Lake Red Rock. The valley here widens perceptibly, although not dramatically, and is wider not only than the portion of the valley within the area of the conservation pool and below Red Rock Dam, but also upstream in the Saylorville area and behind the Bemis moraine in general. This location may be important to understanding the overall Oneota distribution in central Iowa.

More precise locational data were measured for 22 sites, including all 12 village sites and 10 of 14 campsites. The data were then analyzed using bivariate and multivariate procedures to elucidate relationships within the data. The presentation of results begins with the bivariate analyses, for which one of the two variables will always be site type.

The relation of sites to water was examined by measuring the distance to water, the rank of that water source, and the highest ranked stream within 1 and 2 km radii. The analysis shows the village sites to be somewhat farther from water than the campsites: mean distance of village sites from water was measured as 1096 feet, while that of campsites was measured as 950 feet. The nearest water source varied within each category (Table 8-6). Village sites might be near the Des Moines River or a tributary, but many of the

TABLE 8-6

RELATION OF ONEOTA SITES TO WATER

Rank	Nearest Village	Nearest Camp	1 km Village	1 km Camp	2 km Village	2 km Camp
1	5	4	1	2	-	-
3	1	3	-	3	-	-
4	-	1	-	-	-	-
River, not Des Moines	2	-	5	-	2	-
Des Moines River	4	2	6	5	10	10

TABLE 8-7

MEANS, STANDARD DEVIATIONS, AND t-TESTS FOR QUANTITATIVE VARIABLES (ONEOTA SITES)

Variable	Village $\bar{x}$	Village s	Camp $\bar{x}$	Camp s	t	DF	p
Bottomland - 1 km	2.54	0.82	1.53	0.37	3.01	20	.003
Slope - 1 km	0.70	0.74	1.49	0.27	2.54	20	.009
Upland - 1 km	0.00	0.001	0.18	0.05	2.80	20	.005
Bottomland - 2 km	8.91	9.24	6.49	1.32	2.37	20	.013
Slope - 2 km	2.74	5.80	5.13	2.04	2.75	20	.006
Upland - 2 km	1.26	5.14	1.36	2.05	0.12	20	.950
Bottomland Prairie - 1 km	1.64	0.86	0.61	0.37	3.02	20	.003
Upland Prairie - 1 km	0.00	0.00	0.00	0.001	1.65	20	.055
Bottomland Forest - 1 km	0.73	0.19	0.92	0.21	0.72	20	.971
Upland Forest - 1 km	0.00	0.00	0.07	0.02	2.09	20	.024
Slope Forest - 1 km	0.32	0.32	1.20	0.45	3.35	20	.002
Slope Prairie - 1 km	0.48	0.38	0.43	0.55	0.14	20	.942
Bottomland Prairie - 2 km	3.73	4.31	2.36	3.30	1.63	20	.057
Upland Prairie - 2 km	0.08	0.03	0.16	0.08	0.88	20	.805
Bottomland Forest - 2 km	5.14	4.26	4.16	2.99	1.19	20	.123
Upland Forest - 2 km	0.53	0.24	0.51	0.25	0.11	20	.955
Slope Forest - 2 km	2.12	2.88	3.71	2.83	2.20	20	.019
Slope Prairie - 2 km	1.28	3.48	1.90	4.72	0.73	20	.759

campsites were near lower ranked streams. Measurement of distance to stream, however, does not consider the possibility that the river could have changed course considerably since the sites were occupied. A further examination of the data shows that the Oneota village sites with distance farthest from water are those whose closest water source is the Des Moines River, or one of the rivers (South, Middle) feeding it. In any event, most village sites and half of the campsites are less than 1 km from a major stream, and the Des Moines River, or another river, is always the largest stream within 2 km of the site (Table 8-6).

Two factors reduce the potential of the hydrological variables to supply very accurate predictions of site locations. One is the fact that many sites will be within 2 km and often even 1 km because land acquisition boundaries rarely extend farther back from the river. The other is the fact that the river has been so actively changing its channel that relationships between sites and the river now can in no way be assumed to reflect the relations between site and river at the time of site occupation.

Landform and vegetation variables are likely to be of greater utility for examining the relations of sites to the natural landscape and eventually to predict the locations of sites. The present analysis included the same 18 variables, six for landform and 12 for vegetation, used in the Woodland site analysis.

The simplest analysis of these variables is a comparison of the measured values for village sites and for campsites using t-tests of the difference of means. Means, standard deviations, t-tests, and probabilities of the t values occurring by chance were therefore calculated for each variable and are presented in Table 8-7. The results suggest some very real differences in the settings of village sites and campsites. These differences are most marked within 1 km of the sites. The essential difference is that the Oneota village sites are surrounded by considerably more bottomland and consequently by less slope and upland area than are the campsites. However, within the bottoms the major difference between the two groups of sites is the amount of bottomland prairie, which is considerably greater for the village sites. Interestingly, the amount of bottomland forest does not vary as widely as might be expected, and in fact the means do not differ significantly. Presumably, this is because the bottoms are narrower and contain fewer prairie openings in the vicinity of the campsites. In addition to the amount of bottomland prairie, the amount of slope forest also shows an important difference between the two types of sites. Oneota village sites have immediate access to considerably less slope forest than do the campsites.

A multivariate analysis of the Oneota sites data sought to determine whether the settings of Oneota sites could be distinguished from other recorded sites and, if so, how. The analysis employed 55 sites for which complete data were available and used multiple regression of the dummy variable Oneota village site (0 = no, 1 = yes) on the landforms within 1 km and vegetation within 1 and 2 km variables (a total of 15 variables). A stepwise multiple regression routine was employed (Program Stepwise Multiple Regression; Belanger and Boyle 1980) to isolate that set of variables that can best predict that the site will be an Oneota village site.

The analysis returned an equation with a constant and five variables:

$$\hat{Y} = .16 + .50X_1 + .35X_2 - .09X_3 - .07X_4 - .05X_5$$

where:

$\hat{Y}$ = probability of the site being an Oneota village;
X_1 = amount of bottomland prairie within 1 km of the site;
X_2 = amount of slope prairie within 1 km of the site;
X_3 = amount of bottomland prairie within 2 km of the site;
X_4 = amount of slope prairie within 2 km of the site;
X_5 = amount of upland forest within 2 km of the site.

The R^2 of the regression is .60. Other details of the regression are shown in Table 8-8.

The implications of this analysis are similar to those of the bivariate analyses of the descriptive variables. The amount of bottomland prairie within 1 km of the site is the best predictor - the greater the amount, the more likely the site is to be an Oneota village site. Some slope prairie within 1 km of the site increases the likelihood of the site being an Oneota village. Interestingly, too much bottomland and slope prairie within 2 km seems to reduce the likelihood of the site being an Oneota village.

The dependent variable, Oneota village site, was entered as a dichotomous variable. The value $\hat{Y}$, therefore, varies from 0 to 1 (with some variation due to rounding) and can be interpreted as the probability that the site is an Oneota village site. Table 8-9 summarizes the calculated $\hat{Y}$ values for the 55 sites entered into the analysis, indicating not only the probability that the site is an Oneota village, but also whether or not it was actually classified as such.

The tabulation shows that the regression did very well at "predicting" which sites would be Oneota villages. Only two actual Oneota villages were predicted to not be such and only three Oneota non-village sites had probabilities of greater than .5 of being Oneota villages. In other words, 50 of 55 sites (91 percent) were properly classified. In addition, the best known Oneota sites, including the Howard Goodhue (13PK1), Clarkson (13WA2), and Bowers Farm (13WA4) sites, and most prominent sites examined during the 1983 reconnaissance (13MA207 and 13MA209) had probabilities ranging from .72 to 1.0 of being Oneota villages.

It is the case, of course, that this analysis was successful only at separating Oneota village sites from other known sites at Lake Red Rock. A large proportion of the other known sites used in the analysis were in the conservation pool area where the bottoms are narrower than in the area where the Oneota village sites are clustered. Two facts are significant, however. Other sites in the vicinity of the Oneota villages are in settings that are apparently not typical of the Oneota sites and the latter can be distinguished in this area. Also, Oneota village sites are not identified in the area of narrower bottoms, even though a large number of sites are known. Thus, even though only

TABLE 8-8

STATISTICS OF THE MULTIPLE REGRESSION

ANALYSIS OF VARIANCE

Source	Sum of Squares	Mean Square	DF	F	p
Regression (RSS)	5.67	1.13	5	14.97	<.001
Residuals (ESS)	3.71	0.08	49		

COEFFICIENTS

Variable	Coefficient (b)	Cumulative R^2
Bottomland Prairie - 1 km (X_1)	.50	.49
Slope Prairie - 1 km (X_2)	.35	.53
Bottomland Prairie - 2 km (X_3)	-.09	.57
Slope Prairie - 2 km (X_4)	-.07	.59
Upland Forest - 2 km (X_5)	-.06	.60

R^2 = .60 Standard error of estimate = .28

TABLE 8-9

CALCULATED $\hat{Y}$ VALUES FOR ANALYZED SITES

$\hat{Y}$	Oneota Village	Not Oneota Village
.9 - 1.0	2	-
.8 - 0.9	2	-
.7 - 0.8	3	-
.6 - 0.7	1	-
.5 - 0.6	2	3
.4 - 0.5	-	1
.3 - 0.4	-	-
.2 - 0.3	1	3
.1 - 0.2	-	7
.0 - 0.1	1	29

known sites were used, circumstantial evidence suggests that the peculiar setting of the major Oneota sites has been identified. At any rate, the variables isolated by the regression can be regarded as the present best predictors of Oneota village sites.

An analysis similar to that used for Oneota village sites was performed for the campsites. As suspected, the environmental variables are poor predictors of the presence of an Oneota campsite. The multiple R^2 was a mere .27, indicating that the variables selected by the regression routine, while the best combination, are still poor predictors. This result was not surprising. It was obvious that the Oneota materials on these sites represented a minor occupation of multicomponent sites. The kinds of situations in which these will occur clearly cannot presently be detected in the sample.

Mounds

It is not appropriate to incorporate mound sites into analyses of habitation sites. This is the case for two reasons. The most important is that the locations of mounds are responsive to a very different set of criteria than are habitation sites. The second is the more pragmatic reason that the cultural affiliations of all but a few mounds (e.g., Gradwohl 1966) are unknown. Investigators in Illinois, for example, have achieved some success in differentiating Middle and Late Woodland mounds on the basis of form, but this has not yet been attempted in central Iowa. Low conical mounds have long been known in the central Des Moines River area and constitute a proportionally large number of the sites listed in the earliest reports (Wheeler 1949; McKusick and Ries 1962). No systematic consideration of their distribution is available.

The data base for this analysis is not large; it constitutes only 30 mound sites, 21 of which are in Marion County, 2 of which are in Warren County, and 7 of which are in Polk County. It further consists of records of sites, only some of which could be confirmed, others of which cannot be evaluated because of landscape alteration at the reported locus. These sites represent both single mounds (8 sites) and mound groups (22 sites). Mound groups for which number of mounds is reported contain two to five mounds with two being the modal value.

Each site was scored for nine variables, six of which were drawn from the variable list developed by Buikstra (1981:75) for a predictive model study of mounds in the lower Illinois River valley, the other three of which were added for this analysis. The variables defined include:

1. North or south side of the Des Moines River;

2. Hollow - Following Buikstra (1981:75) this was scored as presence or absence of a division of the bluff line with the floodplain continuing over 100 feet into it. Positive scores were assigned those sites plotted as overlooking the hollow;

3. Stream - Also a presence or absence variable, this was scored as present if the 7.5 minute U.S.G.S. quadrangle maps indicated a stream entering the Des Moines valley and if the mound overlooked the stream. As used, however, this variable tended to be redundant with the variable for hollow;

4. Prominent physiographic feature - This was scored as present if the mound or mound group was plotted on a feature that rises more than two contour intervals above the surrounding terrain (cf. Buikstra 1981:75);

5. Steep relief - A positive score was assigned if the mound was located a horizontal distance of less than one-quarter mile from the floodplain. This is similar to, but not quite the same as, Buikstra's (1981:75) "rugged topography" variable;

6. Distance to river - Measured as the north-south distance to the Des Moines River channel. It is understood that the channel may have changed since mound construction. This is an indicator variable only;

7. Distance to valley - Measured as the north-south distance to the near edge of the Des Moines River valley;

8. Elevation above floodplain - Measured in feet by counting contour lines and multiplying by the contour interval;

9. Single or multiple mounds - This was used in lieu of the frequency of mounds, since not all mound group site forms report the number of mounds.

The sites are almost evenly divided between sides of the river: 16 are on the north side, 14 are on the south side. The majority (22) of the sites overlook hollows, but only slightly over half (16) overlook streams. Less than one-third (8) of the sites are on prominent physiographic features, but most (23) are on high rises. These in fact ranged from 70 to 140 feet above the floodplain, except in one place which satisfied the criterion for a high point but was only 20 feet above the floodplain. Distances to the river varied from less than one-quarter mile to over 4 miles, but 16 of 30 sites are within one-quarter mile of the valley (Table 8-10).

The data were examined bivariately using cross-tabulations and chi-square tests for selected pairs of variables. The results are summarized in Table 8-11. Most cross-tabulation tables presented distributions that could have occurred by chance with a high probability, but exceptions were noted.

A strongly opposed pair of variables are those scoring presence-absence of mounds overlooking a hollow and presence-absence of the mound on a prominent physiographic feature. Sites were overrepresented in the not overlooking a hollow - placed on a prominent topographic feature and the overlooking a hollow - not on a prominent feature categories. In other words, they seem to occur in one or the other situation.

TABLE 8-10

FREQUENCY DISTRIBUTIONS OF DISTANCE VARIABLES

Distance (mi)	Number of Sites Distance to River	Number of Sites Distance to Valley
1/4	7	16
1/4 - 1/2	2	7
1/2 - 1	7	-
1 - 1-1/2	4	3
1-1/2 - 2	4	1
2 - 4	5	3
4	1	-

TABLE 8-11

TESTS OF INDEPENDENCE FOR SELECTED VARIABLE PAIRS

Variable Pair	x^2	DF	p
Side of river, hollow	0.40	1	.53
Side of river, prominent physiographic feature	0.04	1	.85
Side of river, single mound - mound group	1.04	1	.33
Hollow, prominent physiographic feature	4.88	1	.03
Hollow, steep relief	0.13	1	.72
Hollow, stream	11.29	1	.01
Prominent physiographic feature, distance to valley	3.52	4	.52
Steep relief, distance to valley	12.98	4	.01
Side of river, steep relief	1.14	1	.29
Prominent physiographic feature, distance to river	7.72	5	.18
Steep relief, distance to river	10.11	5	.05
Hollow, elevation above floodplain	15.27	12	.24
Prominent physiographic feature, single mound - mound group	0.35	1	.56
Steep relief, single mound - mound group	0.13	1	.70
Distance to valley, single mound - mound group	6.03	4	.21

A second opposed pair are the categories of distance to the valley and site in an area of steep relief. The majority of sites in areas of steep relief are very near the major valley, mounds some distance from the valley are not likely to be in areas of steep relief. Expectably, those sites that are not high in elevation above the floodplain are those which are farthest from the main valley.

Overall, the following statements describe the distribution of mounds in the central Des Moines River valley as that distribution is currently understood. Mounds are equally likely on the north and south sides of the valley, and the remainder of the statements apply equally to mounds on the north and south sides. Mounds most often appear on the steep main river bluff, near the edge, and high above the floodplain. The distance to the river itself is variable and, given that the river continually changes its channel, is probably not accurately measurable. Bluff-top mounds often either overlook some kind of indentation in the bluff line or they are placed on a prominent physiographic feature.

Mounds may also appear in tributary valleys, such as that of Whitebreast Creek or the South River. These mounds or mound groups are not in areas of steep relief, nor are they usually placed very high above the floodplain. It should be noted that one "mound group" in such a position examined during Commonwealth's 1983 reconnaissance is best described as questionable and that site forms for one or two other groups indicate some reservations about the sites' identity (but apparently not enough reservation to cause the reporter to dismiss it as a mound).

CONCLUDING REMARKS

The discussions and analyses contained in this chapter have isolated features of the natural environment that are correlated with the sites known in the Red Rock project area. In some cases, at least, these correlations are strong and known sites are in specialized locations which can be identified rather accurately. However, it is to be emphasized that what has really been predicted is the type of setting of the known sites. What is entirely unknown, but desired, is the converse, viz., how likely the setting is to have a site (cf. Lafferty et al. 1981:65). Unfortunately, the Lake Red Rock data set does not permit the assessment of the likelihood of actually finding a site given the setting. To do so, it is necessary to have data on where surveys have been conducted with no sites being found and these data are not available in the present case. The types of settings identified for sites of the various categories described in this analysis may, however, be regarded as initial approximations to predictions of the location of archeological sites. They are the best approximations available at the present level of investigation in the area, and, as such, are important as guidelines for continued investigations.

CHAPTER 9

RECOMMENDATIONS

The Iowa State University investigations and the present study have shown that the Lake Red Rock area has considerable potential to provide data for addressing questions in local and regional prehistory, history, and geomorphology. Yet the investigations to date have been neither intensive nor systematic. The basic recommendations for continued investigations in the project area are designed to rectify this situation. They are also designed to respond to ongoing shoreline erosion and site degradation.

Geoarcheological investigations will continue to be vital to understanding the archeological record in the central Des Moines River valley. Specific recommendations identified at this time include:

1. Check if altimetrically paired terraces display consistent subsurface stratigraphy. Our indications are that elevation and relief are not necessarily diagnostic of depositional uniformity.

2. Map alluvial features on a fine scale; these include especially alluvial fans, terraces, abandoned meander scrolls, and oxbow lakes. The latter represent the latest episodic modifications in Des Moines River channel history and have been the most dominant and dynamic features of floodplain landscapes.

3. Examine, establish and correlate the depositional history of site landforms. This requires drainage-wide stratigraphic linkage between landforms and the site complexes with which they articulate.

4. Along these lines, it is necessary to distinguish microstrata in the alluvial fills for geo-chronological purposes. Systematic overbanking implicates lower energy flooding which requires tight sedimentological sampling procedures for dating and documenting the history of depositional environments.

5. Identify relative intensity and nature of site utilization through careful study of archeological sediments. Tests such as micromorphology, X-ray diffraction, granulometry, and phosphate analysis will help distinguish components of the cultural and natural sediment matrices and will disclose the history of site formation.

6. Place the geological history of the floodplain in regional context. The work of Benn and Bettis (1981), some 20 miles upstream, has disclosed a Holocene terrace sequence based on sequential cut and fill cycles initiated by incision through late Pleistocene outwash deposits. Since a different, i.e., more graded and subtle, series of hydrographic controls and channel mechanisms appears to occur in the lower Des Moines drainage,

it is necessary to develop a local sequence independently, and then tie it into the upper drainage succession.

Archeological investigations should proceed concurrently with the geomorphic work. This is necessary not only because of ongoing site erosion, which should be responded to as soon as possible, but because the dynamic interaction between the disciplines is promoted by simultaneous and integrated investigations. Specific recommendations for the next stage of investigations are as follows:

1. Surveys should be initiated and designed to provide maximal coverage of selected areas. The decision as to whether survey should at this time concentrate on the shoreline or attempt to sample all types of terrain is difficult. Arguments can be presented in favor of either strategy: erosion is proceeding rapidly in places, arguing in favor of shoreline survey, but sites occur across a variety of terrain types and full interpretation and evaluation of newly recorded sites must account for functional variability across the landscape. A compromise strategy of shoreline survey in areas presently eroding the most rapidly, selected other areas of the shoreline, and selected upland areas might maximize both concerns. Selection of areas for survey might profitably be guided by the locational factors identified in Chapter 8.

2. Development and refinement of predictive models should follow the survey. Predictive model development is, of course, a task of the current reconnaissance project. However, it was argued that analyses not based on systematic surveys in which negative data are controlled may establish correlations between sites and natural features, but may not necessarily provide the basis for full prediction. This latter must account for areas where sites are <u>known</u> to be absent. Refinement of predictive models will be productive after continued survey.

3. Testing of key sites will be important for several reasons. One is continued development of the chronology and refined assemblage description. Analyses presented in this report suggest that the paucity of <u>in situ</u> chippable cherts has major ramifications for assemblage content and tool morphology. Lithic technology was identified as a research theme crosscutting the RP3 study units. A second reason for testing is the evaluation of the potential of the sites to provide subsistence information and other data bearing on adaptation, settlement, and cultural dynamics. Since these have not been important foci for the previous investigations, few systematic data are presently available to provide such an evaluation, yet this information is vital to integrating the research program at the lake. A third reason is the evaluation of site formation processes as described in point 5 of the geoarcheological recommendations. Finally, the 1983 reconnaissance identified a number of sites at

which erosion is severe or rapid. All these sites could be considered as candidates for testing, but we would recommend as especially key sites 13MA44, 13MA81 and 13MA163. The first is a multicomponent site that seems to represent a series of intense occupations. The other two are Woodland sites that are presently eroding rapidly, but appear to have intact deposits that might provide important data on this period. Other sites on the shoreline are also eroding and will provide important data.

4. Site 13MA218 is an historic site that was newly recorded by Commonwealth. It is presently known to postdate 1875 and to have been removed before 1967. Artifacts suggest, however, that it was occupied at least as early as the late nineteenth century. This site is undergoing shoreline erosion and should be tested as a key historical site. This testing should be combined with site-specific archival and documentary research.

5. Additional site-specific archival research should be conducted for the historic components at 13MA44 and 13MA84. The latter is listed in the state files as an historic well. It was not visible in the plotted location in September 1983. However, siltation appears to be heavy at this location, and a large tree in the middle of a field is the kind of shade tree one might expect near a former residence. No structure appears on the 1967 aerial photograph, but archival research could clarify the situation at this locus. Additionally, general archival research might identify other locations at which historic remains might be present.

6. National Register criteria should be addressed throughout the study.

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APPENDIX A

SCOPE-OF-WORK

PART I - SECTION C, Description/Specification

I. OBJECTIVE

1.1 The following described professional service contract requires a comprehensive literature search (with oral interviews), a cultural resources synthesis/overview, and a geomorphological field study to provide baseline data for future field investigations of prehistoric, historic, and/or architectural properties on Federal land at Lake Red Rock, Marion, Jasper, Warren, and Polk Counties, Iowa (Exhibit 1). The Contractor shall be required to determine what resources are known (or considered likely by informed sources) to be located on Federal property and to assess the type, extent, and validity of any cultural resource investigations already accomplished. The Contractor shall assess, in general terms, the numbers, locations, cultural component(s), spatial distribution, data potential, and other salient characteristics of cultural resources at Lake Red Rock. Furthermore, the Contractor shall be required to use detailed geomorphological information generated under this contract to provide a basis for identifying landforms likely to contain cultural deposits. Thus, the successful offeror shall formulate a preliminary model of Holocene landscape evolution for the portion of the Des Moines River Valley where Lake Red Rock is located. This element will focus on the main reservoir area in Marion County. The end result shall be a preliminary research design that establishes research objectives and methods in accordance with the document entitled Implementation of the Resource Protection Planning Process (RP3) In Iowa (Henning 1982: draft). Draft copies of RP3 can be examined at the Rock Island District Office or at the Iowa State Historic Preservation Officers facility in Des Moines, Iowa.

1.2 This action is in accordance with the National Historic Preservation Act of 1966 (PL 89-655, as amended by PL 91-190), Executive Order 11593, and Title 36 of the Code of Federal Regulations (Parts 60-66 and 800, as appropriate).

II. BACKGROUND

2.1 The land acquired for the Lake Red Rock Project comprises a total of 41,067 acres. A total of 27,747 acres of fee land is outgranted, 26,102 of that for wildlife management.

2.2 There are 202 recorded archaeological sites (some with historic structures) on Federal land at Lake Red Rock. Of that total, 158 are strictly prehistoric sites, 23 are historic sites, 10 have both prehistoric and historic components, and 11 are of unknown cultural affiliation. Site distributions by county are shown in table 1. The conservation pool (reservoir) is wholly within Marion County; Polk, Jasper, and Warren County sites apply to the maximum flood pool.

TABLE 1

Site Distributions by County

County	Prehistoric	Historic	Prehistoric/Historic	Unknown
Marion	113	20	4	8
Polk	30	3	6	0
Warren	15	0	0	3

2.3 Prospective offerors are advised to reference the attached draft Cultural Resource Management Plan (Exhibit 2) prepared for Rock Island District by the Chicago District. Therein are basic site descriptions by cultural affiliation and elevation. Impacts are discussed and preliminary recommendations are made. A brief summary of previous investigations also is provided. In order to avoid unnecessary duplicitous text, offerors are advised to familiarize themselves with Exhibit 2 when preparing proposals. This information (including recommendations) is baseline data only, and offerors may feel free to refine or modify these data, or present alternative positions on predictive modeling, impacts, and recommendations.

2.4 The intent of this investigation is not to merely restate previous documentation or field work, but rather to evaluate and synthesize the results of previous work to create an up-to-date planning document taking all known cultural resources and potential resources at Lake Red Rock into account. This will be supplemented by new geomorphological and site data collected under this contract.

III. PROPOSALS

3.1 The Contractor shall conduct this investigation in a manner that insures the greatest contribution to an understanding of Iowa and Midwestern culture prehistory and history. In an effort to insure this, prospective principal investigators shall submit a technical research proposal and a separate cost proposal to the Contracting Officer for evaluation. The technical proposal shall include sufficient discussion to fulfill the needs outlined in this Scope of Work and how these needs will be met. The cost proposal will be a detailed, itemized quotation for personnel, goods, and services required to accomplish the technical proposal.

3.2 Prospective offerors must adhere to the minimum professional staffing requirements set forth in Parts 61.5, 64, and 66, Title 36 of the Code of Federal Regulations. For the most part, these guidelines are compatible with standards set forth by the Society of Professional Archaeologists (SOPA) and standards recommended by the Iowa State Historic Preservation Officer. It is the responsibility of the Contractor to insure that the designated principal investigator(s) and key personnel are in compliance with this requirement and that their qualifications are clearly set forth by vita and/or other documents. The Contractor shall identify the principal investigator and key personnel in the proposal, and document experience in work of this type in the Midwest. The principal investigator must be able to document his involvement in the project, and will be held responsible for the technical quality of the work.

3.3 Proposals will be evaluated as specified in Part IV, Section M. The technical evaluation team will first evaluate the technical proposals without prior knowledge or review of concurrently submitted price proposals. Therefore, it is in the best interest of the offeror to include the data necessary to evaluate the merits of technical proposals, independent of cost considerations. Proposals <u>must</u> demonstrate that the offeror is knowledgeable of previous work, current research questions, and the state-of-the-art methodologies. Proposals that simply restate the Scope of Work or offer "canned" approaches may be judged nonresponsive to the RFP. A clear, well written, well thought-out research design is far more effective than fancy packaging and pages of stock text on the offeror's abilities.

3.4 Particular emphasis in proposal evaluation will be given to proposals offering high quality products which identify and evaluate cultural resources at Lake Red Rock in accordance with RP3, and which provide for the required geomorphological analysis and modeling. Offerors should submit a comprehensive scheduling plan to document anticipated levels of effort.

3.5 Contract award will <u>not</u> necessarily be based on low estimated price, but on the most advantageous combination of method, price, and schedule that best meets the Government's needs. This will be a <u>firm-fixed-price, negotiated contract</u>.

3.6 Offerors are invited in their proposals to offer improvements on the Scope of Work so long as the stated minimum requirements are met. The objective is to get the maximum amount of significant data in the most cost efficient manner.

3.7 Laboratory procedures shall be described for special studies such as soils and C-14 analyses. Prospective Contractors shall include in proposals a discussion of capabilities and facilities to adequately perform required laboratory analyses.

IV. SPECIFICATIONS

4.1 The Contractor shall conduct a comprehensive literature search (with oral interviews) of sufficient quality to provide a complete inventory and assessment of prehistoric and historic (including architectural, if required) properties on federally-owned lands at Lake Red Rock, Iowa. Sufficient data shall be synthesized from which to generate preliminary predictive models for site locations, site functions, and cultural affiliations applicable to current management and research objectives. It is anticipated that the resulting syntheses, geomorphic data, and geoarchaeological models will serve as a sound basis for guiding subsequent field research efforts at Lake Red Rock in accordance with RP3 and historic preservation law per 1.2 of this document.

4.2 Data refinement is also recommended for previous work based upon the cultural resources synthesis and new data and interpretations generated under this contract. Furthermore, prospective contractors should consider what research needs identified in RP3 can be addressed through the performance of this contract.

4.3 The Contractor shall conduct a literature search and records review to include (but not be limited to) the sources listed below:

a. Oral interviews shall be conducted with local collectors, property owners, former property owners, and Iowa State Historical Society staff and appropriate county historical society staffs or members.

b. Written archival sources shall be utilized such as the National Register of Historic Places, State Landmark Records, HABS/NAER materials, USGS topographic maps, 19th and 20th century plat maps and survey records, official land holding records, State site and historical files, available journals and diaries, and Rock Island District Archives. This element will also include an assessment of Corps of Engineers archival resources applicable to Lake Red Rock to guide future research and management efforts.

c. Professional literature will be utilized (national, regional, local journals; ethnographic materials) for background information and site specific information.

d. Resources of the Iowa Office of the State Archaeologist (Dr. Duane Anderson) and the SHPO (Dr. Adrian Anderson) shall be investigated.

e. The results of the comprehensive literature search shall be documented in the draft and final reports by extensive narrative, reference, and an annotated bibliography.

4.4 Based upon the above, the Contractor will generate a synthesis cultural resources overview with predictive models for the Lake Red Rock project and the region to identify the following:

a. What data exists, as well as what data gaps exist geographically, temporally, and as guidance for research topics which can be approached through this and future investigations?

b. What RP3 study needs can be addressed through the performance of this contract?

c. How will data discovered during this contract contribute to our understanding of cultural resources at Lake Red Rock and the region (interpretive and descriptive).

d. What is the distribution of cultures in relation to RP3 objectives?

e. How do geomorphological and ecological data apply to cultural resource investigations at Lake Red Rock?

4.5 An explicit research design will be required that provides the rationale, goals, and methods for this investigation including but not limited to:

a. The scientific and anthropological reasons for pursuing the proposed investigation;

b. what the investigator hopes to determine about past human activity including such topics as occupational sequences, settlement patterns, subsistence strategies, chronology, trade and social networks, alliances, and geomorphological considerations;

c. the explicit manner in which data will be collected and analyzed, and how these relate to the research goals;

d. geomorphic field strategies to be applied, including sampling fractions, sample unit size, configuration, and placement;

e. descriptive analytic and interpretive techniques, including a description of classification systems to be used and their relationship to research goals;

f. quantitative techniques to be used to interpret existing archaeological data and new geomorphic data generated under this contract.

4.6 Remote sensing techniques will also be described and assessed if proposed.

4.7 Proposals will also include provisions for necessary professional level geomorphological studies to identify and define the sequence, depth, and extent of soils development and to identify geomorphic processes and fluvial history. It is anticipated that geomorphological studies may identify surface and/or subsurface land forms likely to contain cultural resources, as was done for the downstream corridor at Saylorville Lake, Iowa (Benn and Bettis 1981; Benn and Harris 1982 - draft). Thus, the formulation of a preliminary model of Holocene landscape evolution for application to archaeological deposits comprises the principal interpretive component of this contract.

4.8 In order to attain maximum cost effectiveness for geomorphic work, the Contractor shall, wherever possible, make appropriate use of power machinery for test trenching, test pitting, and coring. Power equipment as refered to in this instance includes, but is not limited to, backhoes, trenchers, and power augers.

4.9 If possible, the following information is to be obtained for each site identified under this contract:

a. Site location defined in four (4) quarter section descriptions and UTM coordinates (plotted on USGS topographic maps separate from the report);

b. the horizontal/vertical extent of each site with sketch maps;

c. the number of cultural components at each site and the stratigraphic position of each component in relation to the geomorphological setting,

d. the type or types of activity per component;

e. contracting archaeologists, institutions, or investigators that have studied Lake Red Rock generally or specific archaeological sites;

f. date of work for each site;

g. site number;

h. location of collections;

i. the relationship between the site, environment, physical setting, and surrounding resources;

j. the current status of the sites in terms of site burial, ground cover, and disturbances;

k. an assessment of research potential for the sites with rationale. It is not expected that items a through k will be fully addressed in every case.

V. REPORT

5.1 The principal investigator shall be responsible for preparing a comprehensive technical report based upon the results of the comprehensive literature search (with oral interviews), synthesis cultural resources inventory/overview, and geomorphological study. A report format is attached as Exhibit 3 for guidance. A separate set of USGS topographic maps showing individual site locations and boundaries will be provided by the Contractor, but shall not be included in the main body of the report. Any sketch maps of individual sites also will be included as an appendix when available. Basic data description, including provenience and metrics, UTM coordinates for all sites, and photographs and drawings, will be provided for use both in support of the author's arguments and conclusions, and as a source of basic information that may find wider use by other archaeologists. Individual site sheets shall be included in an appendix; these will be obtained from the agency responsible for adminstering state-wide site files (OSA).

5.2 Six copies of the draft report shall be submitted to the Contracting Officer for review 120 days after work begins on contract (14 days after award). Draft reports shall be complete when submitted, unless other arrangements are made with the Contracting Officer no less than 30 days prior to the due date. Changes directed by the Contracting Officer, based upon draft review, shall be made prior to submission of a final report. In the event that major revisions are required, the Contracting Officer may request, and the contractor will supply, a revised draft report for review at no additional cost to the Government. In the event that a revised draft is required, it will be due 30 days after the notice to produce the final version. The final version will be due 30 days after the Contracting Officer approves the first draft or any revised draft.

5.3 The draft review period may be 60 days. The intervening time is necessary due to the need for reviews from the Iowa State Historic Preservation Officer, the Rock Island District, and the National Park Service.

5.4 Any material (documents, artifacts, or materials) collected under this contract shall be evaluated, analyzed, and referenced according to current professional standards for presentation in the report. These procedures must be specified in offeror's proposals. An inventory of these materials shall be supplied to the Contracting Officer with the final bill.

5.5 The Contractor shall furnish the Contracting Officer with fifty (50) copies of the final document, including all photographs and appendixes (appendixes under separate cover). A master copy of the final report in reproduction format will be furnished to the Contracting Officer with the submission of the final report copies.

5.6 The Contractor will prepare an informational report on this work suitable for presentation to the lay public. It should focus on the general prehistory and history of the area, the work being done, and the interrelationship between the two. Appropriate photographs as illustrations should be included on 35mm color slides.

5.7 Prior to acceptance of the final reports by the Government, neither the Contractor nor his representatives shall release any information or material of any nature obtained or prepared under the contract without prior approval of the Contracting Officer. After acceptance of the final reports, their reproduction and use shall not be restricted by either party. Appendixes not intended for release to the public are identified in Exhibit 3.

VI. RECOMMENDATIONS

6.1 The Contractor shall make recommendations in the technical report for each site and Lake Red Rock as a whole based upon the kinds of data that are present, the data gaps that have been identified, and what research questions could be considered to fulfill the objectives of Iowa's RP3 state-wide plan.

VII. CURATION

7.1 Any artifacts or cultural material collected and any notes, photographs, and data generated during the performance of contract services shall be curated with the Principal Investigator for preservation upon completion of the contract, but at the discretion of the SHPO and the Rock Island District for Contractors based outside Iowa. All artifacts, notes, photographs, samples, and other data will remain the property of the US Government and shall be made available upon request by the District Cultural Resource Designee, Rock Island District, for interpretive programs or additional research purposes. All data generated by this contract shall be curated in one place. It is the Contractor's responsibility to safeguard all of this material and provide an inventory and catalog system to facilitate access. Copies of any inventories generated under this contract will be submitted to the Contracting Officer with the final bill.

VIII. COORDINATION

8.1 Continuous coordination will be maintained with the Iowa State Historic Preservation Officer and the Rock Island District Archaeologist. Evidence of this coordination will be documented in the draft and final reports (Exhibit 3: Report Format).

8.2 Monthly Progress Reports. By the 10th day of each month, the contractor will submit a Memorandum for Record to indicate status of contract progress. This memorandum will indicate specific activity and accomplishments during the preceding month and any scheduled tasks for the following month. These reports will also be used to keep this District informed should major problems occur in the performance of the contract or with significant cultural resources.

IX. SCHEDULE

9.1 The overall contract period is 210 days. The six copies of the draft report will be due 120 calendar days after work begins on contract; the review period may take up to 60 days. The final report will be due 30 calendar days after receipt of the Contracting Officer's comments on the draft report and notice to proceed with the final.

X. GENERAL

10.1 Any arrangements for ingress or egress over non-Federal land are the responsibility of the Contractor. Contractor is responsbile for obtaining permission from the landowner(s) prior to commencing any field work.

10.2 Contractor will keep Lake Management informed as to where work is being conducted and supply them with the names of all field personnel.

10.3 Maps and aerial photographs of the area along with stereoscopes and related equipment will be available for the Contractor's use at the District office.

10.4 Payment shall be made in the following manner:

	District will pay up to:
Completion of Fieldwork and Documentary Work	40 percent of total contract amount
Submission of Acceptable Draft Report	60 percent of total contract amount
Approval of Draft Report by Contracting Officer	80 percent of total contract amount
Submission of Final Report	90 percent of total contract amount
Acceptance of Final Report and Receipt of Materials Inventories	100 percent of total contract amount

The Contracting Officer may approve payment for higher percentages than those shown in the above schedule if an appropriate amount of work can be identified as having been accomplished.

PART I - SECTION H, Special Provisions

1. CONTRACTING OFFICER's REPRESENTATIVE (COR). The Contracting Officer may appoint an individual to act as his representative for this contract. Such representative shall direct the technical effort being performed within the Scope of Work. This representative is not authorized to issue instructions which change the scope of technical requirements, the work to be performed, or the compensation or period of performance of the contract. Such changes, if any, shall be made only by the Contracting Officer. Written progress reports will be submitted to the Contracting Officer the 15th day of each month during analysis. Field conferences will be held as needed.

2. CONTRACTOR'S PROGRAM MANAGER. The Contractor shall designate a Program Manager who will be the Contractor's authorized supervisor for technical and administrative performance of all work performed hereunder. The Program Manager shall serve as liaison between the Contractor and the US Army Engineer District, Rock Island, under this contract.

3. TRAVEL. The Contractor shall use tourist class arrangements (or equal) for all travel to be performed under the contract. Travel in the United States required for performance of contract work will be made at the discretion of the Contractor. Travel outside the continental limits of the United States will not be performed.

4. INSURANCE. The following insurance must be maintained during the entire performance of this contract. This implements Clause 40, INSURANCE, of the contract General Provisions.

Workman's Compensation Insurance	As required by the State in which the work is performed
Employer's Liability Insurance	$100,000.00
Comprehensive General Liability Insurance	$300,000.00 B.I.
Comprehensive Automobile Liability Insurance	$100,000.00/$300,000.00 B.I. $10,000.00 PD

5. IDENTIFICATION OF RESTRICTED RIGHTS COMPUTER SOFTWARE (1977 APR). The offeror's attention is called to the requirement in the "RIGHTS IN TECHNICAL DATA AND COMPUTER SOFTWARE" clause that any restrictions on the Government concerning use or disclosure of computer software which was developed at private expense and is to be delivered under the contract must be set forth in an agreement made a part of the contract, either negotiated prior to award or included in a modification of the contract before such delivery. Therefore, the offeror is requested to identify in his proposal to the extent feasible any such computer software which was developed at private expense and upon the use of which he desires to negotiate restrictions, and to state the nature of the proposed restrictions. If no such computer software is identified, it will be assumed that all deliverable computer software will be subject to unlimited rights. (DAR 7-2003.76)

6. RIGHTS IN TECHNICAL DATA AND COMPUTER SOFTWARE (1981 MAY).

(a) Definitions.

(1) Technical Data means recorded information, regardless of form or

APPENDIX B

PROPOSAL

A PROPOSAL

FOR

A CULTURAL RESOURCE RECONNAISSANCE OF THE LAKE RED ROCK PROJECT, JASPER, MARION, POLK AND WARREN COUNTIES, IOWA

(RFP DACW25-83-R-0031)

SUBMITTED TO:

U.S. ARMY ENGINEER DISTRICT

ROCK ISLAND

CORPS OF ENGINEERS

CLOCK TOWER BUILDING

ROCK ISLAND, ILLINOIS 61201

BY

COMMONWEALTH ASSOCIATES INC.

209 E. WASHINGTON AVENUE

JACKSON, MICHIGAN 49201

PROPOSAL NO.
62-053-P06

PART I
TECHNICAL PROPOSAL

MAY 1983

SECTION B

RESEARCH DESIGN

ARCHEOLOGICAL OVERVIEW

Very few of the known sites in the Lake Red Rock area have identified components earlier than Woodland and, indeed, earlier occupations are poorly studied in all of Iowa. Nevertheless, central Iowa in general, and the Des Moines River Valley in specific, is devoid neither of some evidence of early occupations nor of the potential to recover additional evidence of these occupations.

The RP3 Henning document for Iowa identifies a pre-Clovis study unit and dates it to precede 12,000 B.P. (Henning 1982:20). No sites are currently placed within this unit but the entire state is considered to have the potential to yield data - if in fact Clovis was not the first occupation in Iowa. Any pre-Clovis occupation of the Lake Red Rock area would have likely occurred within only 2 or 3 millennia of the occupation by Clovis hunters. The Des Moines Lake of the Wisconsin glaciers advanced to a position in the Ankeny area, just north of Lake Red Rock, then began its retreat probably between 15,000 and 14,000 years ago (Flint 1971:492). Earlier glaciations had advanced farther south. The Red Rock area was thus either ice-covered or just beyond the ice border throughout much of the late Pleistocene.

Either a spruce forest or mixed spruce/deciduous forest would probably have been present by the beginning of the Paleo-Indian period and would almost certainly have been replaced by deciduous forest by the end of the period at 8000 B.P. How Paleo-Indian hunters adapted to the biome and to the almost certain shift is little understood, however, since Paleo-Indian is poorly known in central Iowa. Indeed, Paleo-Indian materials occur largely as surface finds (Gradwohl 1974:93; Alex 1980:113).

The succeeding Archaic period is only slightly better understood. Archaic occupations are best known in the western part of the state where over two decades of investigations have established the presence of a cultural complex characterized by small to medium sized, side-notched, basally-ground projectile points (Frankforter 1959; Agogino and Frankforter 1960; Shutler and Anderson 1974; Anderson and Semken 1980). This complex is widespread in the lower Missouri and upper Mississippi River drainages from southwest Missouri (e.g., Joyer and Roper 1980), through Nebraska (e.g., Kivett 1959), and into Minnesota (Shay 1971). It is probably best studied at the stratified Cherokee Sewer site (Shutler and Anderson 1974; Anderson and Semken 1980), which is a kill/processing station. The Archaic side-notched point complex is, however, also represented in the upper Des Moines River Valley at the Soldow site in Humboldt County (Flanders 1977) and as surface and occasional finds elsewhere in the valley (Gradwohl 1974:93). Whether the lack of additional in situ Archaic components in the Des Moines River is a result of their absence, their failure to be recognized, or possible burial in alluvial deposits is presently unknown. This last is a long neglected possibility, suggested by the documented context of the Cherokee Sewer site in the Little Sioux River drainage, but contradicted by the surficial nature of the Soldow site (Flanders 1977:126). The study of Holocene landscape evolution in the central Des Moines River Valley to be conducted as part of this procurement should provide data to help address this problem.

In contrast to the sparseness of Archaic remains in the Des Moines River Valley is the abundant representation of Woodland, Great Oasis, and Moingona Phase Oneota materials. Early Woodland ceramic complexes in Iowa are represented by Marion Thick and Black Sand ceramics, both of which are best represented at sites in the Mississippi River Valley and valleys of its major tributaries in the eastern part of the state (e.g., Logan 1976; Anderson 1971; Benn 1978, 1979). A few sherds of Black Sand Incised pottery have been found in the central Des Moines River Valley (Gradwohl 1974:94-95).

Ceramics of the Middle Woodland period are considerably better represented throughout the state (Logan 1976; A. Anderson 1971; Tiffany 1978; Benn 1978, 1979, 1980; Schermer 1982:41) including the central Des Moines River Valley (Gradwohl 1974:94). These ceramics comprise local variants on the Havana and Hopewell wares defined by Griffin (1952) in central Illinois, but in the western part of the state also show affiliation with the Valley Cord Roughened ceramics of the Central Plains (Kansas, Nebraska; Kivett 1949, O'Brien 1971, Tiffany 1978). Sites from this period occur throughout the central Des Moines River Valley in Red Rock and Saylorville Lakes. Mortuary sites and habitation sites of several types are known (Gradwohl 1974:94).

The Havana-Hopewell occupation of the Midwest is followed by several centuries during which the intense inter-regional interaction that had apparently occurred during the previous centuries had declined, and the interaction that was to characterize the latter part of the prehistoric period had not yet begun. This nebulous period of prehistory, ca. A.D. 300-700, is sometimes considered as part of the Middle Woodland (post-Hopewellian; Anderson 1981:29) and sometimes considered as a preface to the Late Woodland; Benn (1978:5) has simply called it the Intermediate period in recognition of its transitional nature. Ceramics in eastern Iowa continue to resemble types designated in central Illinois (Benn 1978, Logan 1976), while those in western Iowa bear stronger resemblance to ceramics of the Woodland complexes in Nebraska and Kansas (Tiffany 1977, 1978). The Red Rock area materials are more similar to those in northern and central Illinois and central Missouri than they are to contemporaneous complexes in the Central Plains.

This marked regional differentiation continued through the end of the prehistoric period. By the last century or two of the first millennium of the Christian era, several distinct village cultures were present in Iowa, among them the Over, Mill Creek, Glenwood, Great Oasis, and several phases of Oneota. The central Des Moines valley contains both Great Oasis and Moingona Phase Oneota remains in mutually exclusive distribution: Great Oasis occurs upstream from the modern city of Des Moines (Henning 1971:129) while Oneota is confined to the portion of the valley of the Des Moines River south of its confluence with the Raccoon River (Osborn 1982:9). Gradwohl (1974:96) has, in fact, confined the Moingona to approximately the limits of Red Rock Lake. Oneota has long been identified as the prehistoric Chiwere Sioux (Joway, Oto, Missouri; cf. Griffin 1937, 1960; Wedel 1959; or Harvey 1979 for reviews). The traits specifically distinguishing Moingona from other Oneota phases are summarized by Gradwohl (1967) and Osborn (1982:86-

89). The phase has been dated to the eleventh and thirteenth centuries A.D., which is consistent with dates for other Oneota phases in Iowa and surrounding states (Osborn 1982:76).

Oneota and Great Oasis are both estimated to have ended about A.D. 1300 and the Des Moines River Valley becomes an archeological void for the next several centuries. Gradwohl (1974:98) has noted that "archaeological evidence at present is not sufficient to corroborate the ethnohistoric groupings probably present in the central Des Moines region." The Sauk and Fox may have occupied the area at least temporarily, beginning in the mid-eighteenth century, and may have been followed by a brief occupation by Mesquakie in the mid-nineteenth century (Gradwohl 1974:98-99).

Euro-American settlement also began in the valley in the mid-nineteenth century. Important to the region's early economy was the production of coal and industrial ceramics. This second, in particular, is an important theme for the historical archeology of the region (Gradwohl 1973:99-101; Ryder 1983:4).

Lake Red Rock was filled in 1969, several years before the major pieces of current cultural resource management legislation were enacted. Archeological investigations began soon after the reservoir was authorized (Wheeler 1949) and continued intermittently until it was completed (McKusick and Ries 1962). Over 200 archeological sites are presently known in the reservoir (Ryder 1983) but a synthesis of the data, identification of research gaps, and identification of pertinent research concerns have yet to be accomplished. Commonwealth perceives the important objective of the cultural resources reconnaissance of the Lake Red Rock project as being the generation of such a synthesis, using several types of evidence to identify the present data base and gaps in the data base, and to generate predictive models.

The purpose of providing such a synthesis is to form a basis for planning investigations, managing endangered resources, and making evaluations of the significance of resources. If Federal cultural resource management legislation is to achieve its goal of preservation of archeological data, then it is important that those data be recovered in a manner consistent with the current standards of the archeology profession. In a pure sense, however, data do not exist in the absence of questions which they may help answer. Those questions in turn are derived from an explicit research design, setting forth relevant research problem areas and methods for their solution. Problem areas must be as specifically phrased as possible in order to achieve maximum fit between research objectives and data recovery. In areas with a long history of archeological research or with recent problem-oriented research it becomes possible to more precisely specify relevant research concerns. For example, the long history of research in the Illinois River Valley in Illinois has allowed the specification of major research domains and specific questions relevant to that valley (IDOC n.d.:67) and these can be drawn upon in formulating research designs for a specific project.

Achieving a similar level of synthesis and problem specification is the major objective of the Lake Red Rock cultural resources project. Iowa has recently implemented the Resource Protection Planning Process (RP3) by defining a series of study units. These units are topical. They are based solely on content and time, and are related to space only after their definition (Henning 1982). A project like Lake Red Rock is regional in scope and will therefore cross-cut study units. The literature search and synthesis will therefore seek to identify those RP3 study units relevant to the central Des Moines River Valley and define the research domains and specific problem areas for the region.

Several themes in prehistory form the basis for the discussion of units identified in the RP3 (Henning 1982). These include chronology, both relative and absolute, subsistence practices, settlement systems, interregional interactions, cultural distributions, and the problem of site preservation on the Holocene landscape. Emphasis will therefore be placed on assessing the data base and gaps in the data base for each topic.

This will be accomplished by use of several lines of evidence. Of general importance will be a review of the available literature on Iowa and central Iowa archeology in general and Lake Red Rock archeology in specific. Sources will include those consulted in preparing the brief archeological overview presented above, but will be more exhaustive of local sources for site-specific information. The Rock Island District Archives, resources of the Iowa Office of the State Archaeologist, Iowa State Historic Preservation Office, Iowa State Historical Society, Iowa State University, University of Iowa, and any other agency identified as a potential source of published or manuscript data will be consulted. It is expected that this research will provide the information necessary for a reasonably detailed narrative on central Des Moines River Valley archeology that will identify which cultural complexes are currently identified in the valley, a compilation of available chronological data (i.e., radiocarbon dates, temporally diagnostic artifacts or artifact attributes such as ceramic decoration), and an assessment of settlement and subsistence data. It is also expected that the information will be highly uneven. For example, it is expected that Moingona Phase Oneota chronology, ceramics style, settlement and subsistence can be discussed in some detail and research questions phrased at a fairly specific level, but that it will be very difficult to describe more than general diagnostic traits for Early-Middle Archaic occupations.

Archival sources such as the National Register of Historic Places and the state site files will also be searched for such specific data as are available for each site. These will include location, site type, age, location of collections, etc. It is also expected that these data will vary considerably in completeness and utility.

After the site-specific data are collected, an in-the-field examination of sites will be conducted. This examination will have as its goal the ground-truthing of the survey data and supplementing survey data to the extent possible. A two-person field team will visit as many sites as possible to:

1. Precisely plot the sites and define their location. It is expected that this may prove problematic if multiple loci fit a description (especially those given only to one or two quarter sections). Attempts will be made to resolve discrepancies by recording sites as new sites and perhaps vacating old site numbers if it cannot be determined to which site a number pertains, and if it is permissible to the state site survey. All sites examined will be described in four quarter sections and by UTM coordinates and plotted on USGS topographic maps.

2. Assess the extent of visited sites. This will be accomplished by looking for the limits of scatters and documenting them with sketch maps. Shovel tests placed at 5m intervals along the cardinal directions will be used as necessary to assist visual examination of the surface. Examination of shovel test results and inspection of shoreline cuts or erosion features across sites will also be used to document vertical extent if possible. This will be coordinated with the geomorophic investigations to maximize data recovery from deep site testing on Holocene terraces and floodplains.

3. Assess the age of cultural components at each site. This will be addressed in the initial site file and literature search, but judging from the list compiled by Ryder (1983:5-10) can almost certainly be updated by means of surface collection at the time of site visit and oral interview with collectors. The goal of surface collection at the time of site visit and oral interview with collectors. The goal of surface collection will be to collect only those artifacts (projectile points, ceramics) that will identify the components present at the site and then only if the information does not duplicate that already known. Examination of private collections, provided those collections are attributable to specific sites, will further supplement the literature and surface inspection data.

4. Assess the type or types of activity for each component. It is expectable that the literature search will provide only very general information or no information at all on this topic. It does not seem feasible, however, to attempt too detailed an analysis of site function on the basis of only literature search and surface inspection. Rather, it is safest at the initial level of analysis to assign sites to general activities and functions. An excellent example of the tenuousness of site type identifications from preliminary inspection only is the Clarkson Site, 13WA2, recently reported by Osborne (1982). This site was only briefly mentioned by Wheeler (1949:6) and was listed by McKusick and Reis (1962:18) as "not worth excavation." Yet Osborne's investigation recovered a large quantity of materials and features and was able to produce significant chronology, subsistence, and settlement data.

5. Determine previous investigations at the site. This will be assessed during the literature search and agency contact phase of the project.

6. Determine date of work.

7. Determine site number. These also will be assessed during the literature and file search.

8. Assess current status of the site. This will be assessed during the field inspection. The type of ground cover will be recorded, the elevation will be carefully plotted in relation to lake permanent pool and maximum pool levels, the extent of any vandalism and potential for future vandalism will be assessed and recorded, and any other disturbances described.

9. Assess the relationship between the site and its setting both by field inspection and later in the laboratory using mapped data. Field inspection will include relating the site to landforms and water sources by accurate plotting of the site on field topographic maps. Relating the site to landforms will also draw on the analysis of Holocene landscape evolution being conducted concurrently with the archeological investigations. Laboratory investigations are described below.

Recording procedures for the project will be designed for transfer to computer readable medium (disk or tape) using a data base management system. A field form will be devised for use by the project that will record basic data from the Iowa state files but will also include the field data, such as ground cover, vandalism, etc., as described above. The data will then be transferred to computer disk or tape as soon as practical after collection. They will be analyzed and summarized to determine the number of known components for each study unit, their distribution both within the reservoir and in relation to streams and landforms, their size and type, and the distribution of the various types of sites. These data will also be used to document the extent, nature, and condition of the aggregate of known sites at Lake Red Rock.

This analysis will be supplemented by a more detailed analysis of the locations of sites relative to features of the natural environment. This analysis will have as its primary purpose the generation of a predictive model for the Lake Red Rock area.

Known sites in the Lake Red Rock area were largely not recorded by systematic survey techniques; therefore, it is to be expected that the derived model will be biased and may not be fully able to predict the locations of sites or especially the absence of sites. Nevertheless, it has long been known that credible general settlement models can be built using non-probabilistically collected survey data (e.g., Roper 1979a). The experience of the Illinois predictive models program (Brown 1981), for example, would suggest that model building using this type of data must be approached with lower-powered techniques than could be used with well-controlled data, but that useful initial models can be derived.

Commonwealth proposes to base predictive modeling for the Lake Red Rock area on site catchment analysis techniques (cf. Roper 1979b on site catchment analysis). This method has recently been used in the Midwest in general (e.g., Roper 1979a, Styles 1981) and in Iowa in specific (e.g., Tiffany and Abbott 1982, Schermer 1982) to examine the relations between sites and their natural setting. Separate analyses will be conducted for each study unit (Early and Middle Archaic, Late Archaic, etc.) and possibly even temporal divisions of units if the data warrant (e.g., within the Woodland where analyses in nearby regions suggest important settlement shifts from Early to Late Woodland). Analysis will concentrate on modeling the broad zone surrounding each site within which it is believed that the heaviest steady exploitation of resources would have occurred. Soil maps will be used as the basis of the analysis and will be used in conjunction with maps of landforms and drainage to model the topographic, hydrological, and vegetation zones surrounding each site. A series of concentric circles with radii of 1, 3, and 5 km will be centered on each site and the extent of each resource zone measured using a planimeter, dot counter, or similar device. Data will then be transferred to computer medium and analyzed to determine a series of location types. Analysis will be accomplished using simple statistics such as means and standard deviations, but will continue to more complex comparisons and synthesis using analysis of variance and perhaps factor analysis and/or cluster analysis techniques.

The locational groups for each study unit will then be related to the general site types to search for regularities in the selection of different types of loci for performing various activities. This will provide finer resolution of the data and allow for more specific predictions.

All research performed under this contract will then be compiled and a narrative report prepared. The results of the file searches, literature search, and field inspection will be integrated to provide an overview of known resources in the Lake Red Rock area. This overview will describe the cultural sequence and chronology of the area. It will identify the basis for the discussion and will identify the gaps in the data base. A preliminary research design for the lake area will be generated, addressing needs identified in the RP3 document (Henning 1982) and identifying problem areas that the Red Rock data may address and those problems that must be addressed before further problems can be solved (e.g., the response of Archaic hunters to the probable establishment of the grasslands around 8 millennia ago cannot be addressed until a chronology of this period is established). It is anticipated that the synthesis will address general concerns such as an assessment of the sites in Lake Red Rock, but will be organized according to RP3 study units for the majority of the discussion. The predictive models will be incorporated into the discussion for each unit.

HISTORICAL BACKGROUND INVESTIGATION

Historical archeology site files for the Lake Red Rock investigation and surveys will be examined at the Office of the State Archeologist in Iowa City. Dr. Lowell Scoike of the State Historical Society in Iowa City will also be contacted for pertinent information on historical sources. Jack Lufkin at the State Historic Preservation Office in Des Moines will be consulted for the information which he and Barbara Long compiled on historic sites and architecture in central Iowa, the 1978-81 CIRALG Historic Sites Survey. Land records will be examined at the Marion County Courthouse in Knoxville, and other relevant county courthouses, and the historical collections at Central College in Pella will be searched for information on land use. Historical Society member Patsy Sadler will also be contacted in Pella. Nineteenth century sources such as Donnel's Pioneers of Marion County will be examined to obtain biographical information on identified occupants of historic sites. General land use history will refer to Allan Bogue's seminal studies of settlement and agricultural development on the Iowa prairie. If appropriate, examination of coal mining and ethnic communities will draw upon the recent excellent research and publications of Dorothy Schwieder. All of this research will be directed toward the collection of data relevant to the RP3 historic period study units summarized by Henning (1982). Particularly (or potentially) relevant, based on the RP3 planning maps, are historic occupations and/or components related to the Adventure and Exploitation, Frontier Safety, Early Settlement, Settlement Boom, The Nation Divided, Urban and Industrial Development, Mineral Development and all of the recent (post 1890) Study Units. Particular attention will focus on early settlement and industry (i.e., kilns, transportation networks). The historic site data like that for the prehistoric, will be examined to delimit patterns and changes in the patterns of local settlement systems, and economic networks (i.e., local, state, national and global economic systems).

GEOARCHEOLOGICAL INVESTIGATIONS

The geomorphology investigations at Lake Red Rock will serve to complement the issues addressed by the archeological research. They will not be geared towards the accumulation of paleo-environmental data bases, per se, but will attempt to abstract from such data sets those variables which may contribute to reconstructions of the prehistoric geography. Specifically, investigations will be geared towards identifying, dating and mapping principal Late Quaternary landforms, outlining processes of sedimentation, and discriminating between those archeological distributions that reflect prehistoric settlement trends and those that are artifacts of differential preservation. The geoarcheological research design represents a diversion from the purely descriptive; it addresses multifaceted problems and utilizes interdisciplinary methodologies to pinpoint those environmental parameters critical to the operation of the cultural system. Thus, for example, the geoarcheologist's tasks range from isolating locational aspects of prehistoric site distribution (a geographic problem) to differentiating between human and natural processes of site formation (a sedimentological question).

The Lake Red Rock RFP (1983:6) underscores the need for a geoarcheological research strategy by outlining its concern that "...the resulting syntheses, geomorphic data, and geoarcheological models will serve as a sound basis for guiding subsequent field research" and specifically "...that geomorphological studies may identify surface and/or subsurface land forms likely to contain cultural resources."

The current research design incorporates the synthetic objectives of geoarcheological research: it attempts to integrate paleo-environmental contexts with the prehistoric remains found in them. In line with the archeological concerns referred to above, the following types of investigation will be performed across the 41,000 acre survey area:

1. Reconstruction of the depositional and pedological patterns across the circumscribed training site. Comprehensive investigations necessitate linking local stratigraphies with the regional sequences of the Des Moines and Racoon River catchments.

2. Integration of reconstructed landform-environmental systems with site distributions. This will be performed in conjunction with archeological investigations. Patterned archeological-landscape associations will provide guidelines for structuring subsequent work.

3. Identification of subsistence implications of site-landform correlations. Particular geomorphic configurations define preferential settings which may articulate with archeological distributions.

4. Inference of site utilization, activity patterns, and formation process from cultural deposits ("anthropogenic sediments"). These site-specific investigations will be undertaken once archeologists disclose particular archeo-sedimentary matrices.

Toward a Geoarcheological Paradigm: Definitions and Scales of Inquiry

Implementation of the tasks posed above involves identifying archeological locations and interpreting the paleo-environmental contexts in which they were found.

Archeological locations include occurrences as well as sites because, in most surveys, collections of artifacts and other cultural residues are not necessarily found in in situ occupation units (= sites); archeological occurrences "denote materials in their field context" (Bishop and Clark 1967:868-9; Isaac 1977:29) and include disturbed materials or those that have been secondarily redeposited. These are often termed find spots as well.

As a guideline to the geomorphological investigations it is necessary to discriminate between the various archeo-sedimentary and site-landform associations - or archeological locations - that are likely to be encountered in the field. At Lake Red Rock, three distinct topo-physiographic areas - bottomlands, first terrace outcrops corresponding to elevation ranges at 7725', 740-750', and >800' - have been identified, and each holds a unique potential for archeological retrieval. These potentials are governed by the preservation, conditions and subsurface relations that obtain for each. It should be stressed, however, that the likelihood for encountering "non-pristine" (i.e., disturbed) archeological materials is especially high across this range of settings (see Thomas, 1975; Lewarch and O'Brian, 1981), but that the setting of a site in erosional context may still furnish valuable information bearing on ancient land-surfaces and the relative dating of particular landforms. For this reason it is useful to delineate the types of archeological locations that are likely to occur.

Accordingly, a classification system has been developed which recognized three major types of archeological locations: Primary Sites, Semi-primary Sites, and Find Spots.

These locations are differentiated as follows:

1) Primary in situ (P) - These contain materials that are culturally intact, and in lithostratigraphic context.

2) Semi-primary (SP) - Materials are not culturally intact--there has been local dispersal, reworking, or disturbance of archeological materials--but agencies and processes of redistribution can be identified since cultural residues are geologically sealed in lithostratigraphic context. Strictly speaking, these sites may be considered secondary, but since they bear such contextual similarities with surrounding "P" sites, and relative and external associations are essentially intact, we call them "SP".

3) Find Spots (FS) - These are simply locations containing archeological materials in poor or questionable geological context, mainly occurring as surface artifacts. Several categories may be recognized in the field.

   FS-1 - The location contains scattered but fresh artifacts of indeterminate cultural affinity.

FS-2 - The location features an assemblage that is culturally homogeneous and probably belongs to the same occupation.

FS-3 - Isolated materials of human manufacture that have surfaces and edges subsequently altered by natural agencies. They may or may not be culturally diagnostic.

In the classification of "P", "SP", and "FS" designations, the major determinants in the alteration of archeological materials and their distributions are non-cultural processes, specifically those environmental factors responsible for the interaction between culturally-deposited materials and the sediment matrix in which they are found; such interactions between cultural and non-cultural site-forming processes have been referred to elsewhere as "n-transforms" (Schiffer and Rathje, 1973; Schiffer, 1975). To understand the nature of these interactions it is necessary to identify the paleo-environmental context of archeological locations.

By paleo-environmental context, we refer to those materials of the prehistoric environment that are either preserved in an archeological horizon or otherwise identifiable in the local or regional environment.

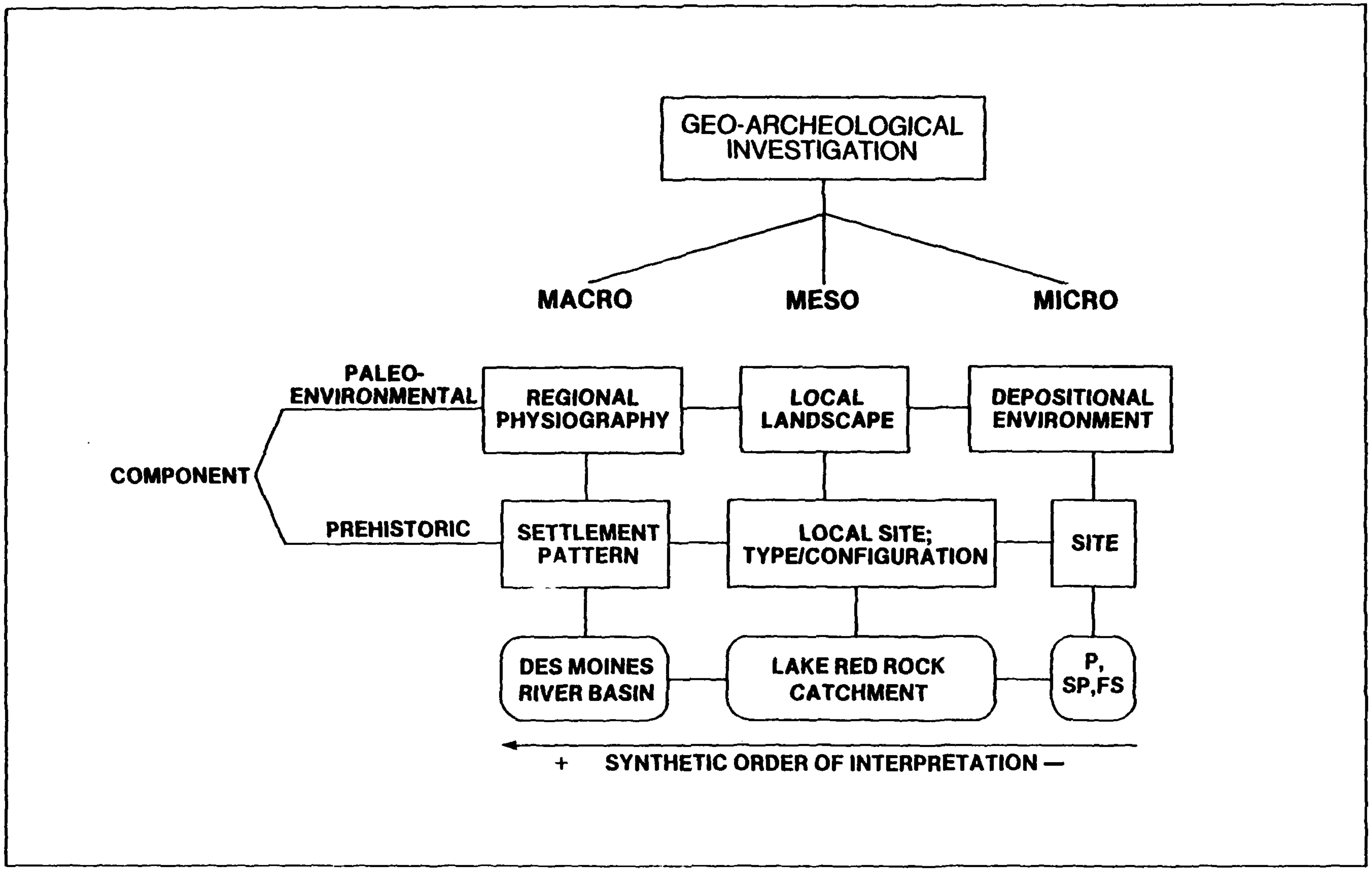
Paleo-environmental context, then, may be examined in multi-scale settings. This is an especially crucial consideration for studies, such as those proposed for Lake Red Rock which stress the generation of a predictive model based on both geomorphological and archeological concerns (RFP:3). It is clear that neither local nor regional Late Quaternary frameworks provide an adequate data base for modelling prehistoric or environmental change. As a result, multi-scale settings, which are spatially determined, must address geoarcheological issues ranging from the site-specific (i.e., site types in the Lake Red Rock Reservoir) to the regional site distribution (i.e., along the Des Moines River catchment.)

Ideally, a regional (= macroenvironmental) scale project emphasizes the relationship between the geomorphological setting of the entire area under investigation and the settlement locations. In practice, establishing the regional paleo-environmental context involves collecting information about site meso-environments (i.e., topographic settings and relief, physiography) and microenvironments (i.e., the immediate depositional environment). For the geoarcheologist, meso-environment refers also to those local landscapes and/or catchments constituting the prehistoric habitat. Microenvironmental observations, those made on site or site-cluster specific levels, include the recognition of site-forming processes, activity areas, and differential preservation of the archeological record (Hassan 1979). Each level of environmental inquiry involves consideration of distinctive variables.

Empirically the regional domain of the present study is the Lake Red Rock reservoir, while the actual meso-environmental data base is most directly tied to the Des Moines River catchment. Site-specific studies are conducted at all locations indentified for geoarcheological purposes at Lake Red Rock.

Figure 1 illustrates the range of prehistoric and paleo-environmental components that may be identified in multi-scale geoarcheological investigations at Lake Red Rock. Operationally, investigations will emanate from the reservoir and will then be integrated step-wise with the Des Moines River geomorphological and archeological sequences.

FIGURE 1
MULTI-SCALE GEO-ARCHEOLOGICAL INVESTIGATION
LAKE RED ROCK PROJECT



It is therefore suggested that higher order and progressively synthetic levels of analysis are an outgrowth of cumulative lower order investigations. This theoretical perspective underlies the research strategy developed to address the questions posed at the outset. The Lake Red Rock study proposes to:

1) Describe the Late Quaternary geomorphological milieu.
   It is necessary to identify meso- and micro-landforms to understand those natural processes which created successive landscapes and altered the settings of the sequential occupance. Regional macro-scale geomorphological observations (Ruhe 1969; Ruhe et al. 1967) will be augmented by catchment and site-specific identifications made at Lake Red Rock and isolated settings in the Des Moines River Valley.

2) Identify the cultural as well as natural micro-stratigraphic sequence.
   The systematic differentiation of micro-depositional environments and site-forming activities through study of facies variability, allows recognition of sedimentation processes. These agencies and depositional modes account for the occupational and stratigraphic record and enable the researcher to monitor the stratigraphy with reasonable chronometric controls.

3) Link the prehistoric sites with the lithostratigraphic units and/or with existing land surfaces formed by such units. Geoarcheological associations are supplemented by faunal and pollen data providing a composite picture of changing biota through time. Changing spatial distributions of sites may then be compared with patterns of environmental change.

Finally, the successions in the study area may be compared with parallel sequences across the Mississippi Basin to determine whether or not there are grounds for extra-regional (= zonal) correlation.

Site-Specific Studies and Anthropogenic Sediments

With the disclosure of distinctive site settings it will become necessary to determine processes and patterns of site formation. Development of a predictive model is enhanced by familiarity and recognition of the components of the archeo-sedimentary matrix. It follows that paleo-geographic interpretation derived from site-specific profiles bears directly on key questions of preferential settlement and feeds into more general issues of areally based settlement loci. In general, investigations at the site-specific level will attempt to address the following geoarcheological problems:

1. articulation of climatic-morphogenetic environments

2. establishment of the site-developmental sequence

3. differentiation between sedimentary processes and residues of cultural activity at the site

An underlying and immediate concern of the strategy formulated is the need to identify both depositional agencies and postdepositional processes of sediment modification. In this connection, it is necessary to differentiate between sediments and soils since both are often used interchangeably by archeologists and both provide distinctive types of environmental information germane to geoarcheological interpretations. The term soil refers to zones of alteration formed at or near the surface of the earth under the influence of plants, other biological elements, and atmospheric conditions (Birkeland 1974). Such soil zones may be vertically differentiated by mineralogy, texture, and chemical characteristics and are distinct from the parent material.

Sediments are geological materials formed by earth processes under ordinary surface conditions by the action of water, wind, ice, gravitation, and biological organisms (Hassan 1978). Their evolution may be described as occurring in three stages: weathering, transportation, and deposition. Sediments may additionally incorporate residues produced through human activity; these are anthropogenic sediments and are generally contained in complex clastic matrices.

The thrust of the foregoing discussion is that, since both soils and sediments document distinctive paleo-environmental conditions that betray both modes of origin and subsequent weathering pattern, the proposed laboratory tests should be geared towards differentiating these conditions as systematically as possible. In temperate and alluvial settings such as that of central Iowa where successions of paleo-environmental events are rapidly recorded in a complex stratigraphy, it is imperative to isolate stratigraphic units with careful precision and to identify both depositional modes and diagnostic alterations. Floodplains are depositional catchments for sediment accumulation; weathering processes are not continuous on active alluvium, diagnostic soils do not often form, and azonal profiles are common. Work in this area should be especially attuned to gauging the systematic development of soil profiles away from the floodplain at T-1 and uplands locales and to identifying the relative maturity of such units.

In ancient floodplain settings, the interface between pedogenesis and sedimentation may or may not be clearly defined. Incipient soil formation may be documented by a series of "A" horizon transformations but often such units are either truncated or weathered out (see Birkeland 1974) and are not identifiable in the field. It is necessary to complement fieldwork with careful lab analysis (see section on lab procedures) to determine the degree of pedogenic development. On the site-specific level, laboratory procedures were designed to monitor:

1. depositional modes of sediment transport

2. the shifting pedo-sedimentary balances in the profile

3. introduction of anthropogenic residues in the sediment matrix

A major focus of the present investigations will be the elucidation of cultural processes of site formation. Field and lab strategies have revealed that even in the absence of artifactual-evidence, significant traces of human activities have been left in the landforms, vegetation, and soils of all areas where settlement has taken place over long periods of time. (See Eidt, 1973, 1977.)

Soil analysis plays a role in settlement investigation because soil alterations caused by human activities are cumulative, permanent, and representative of land use type. The direction of modern investigation aims at establishing the status of abandoned areas with particular focus on chemical elements such as soil phosphorus, calcium, potassium, magnesium, pH, and soluble salts with a view toward comparing unknown sample "prints" for these quantities with those taken from known feature functions.

Rece^` analysis of Mississippian cultural features at the Rucker's Bottom site in northeast Georgia (Anderson and Schuldenrein 1983) has revealed that Eidt's methods for soil phosphate analysis are extremely useful in identifying such "prints" and ultimately in classifying and delineating feature types. His method is based on the fact that as humans inject different amounts and types of phosphate into the soil corresponding to excreta, cadavers, garbage, fertilizer, industrial activities, etc., or as they remove it during harvests, mining, deforestation, etc., measurable alterations in the much smaller native values occur. Comparison of results with those from non-affected soils in a given area, or with similar soils elsewhere, can provide useful guidelines as to type and intensity of land use activities. Careful mapping of soil phosphate types delimits the areal extent of each activity.

In practice, soil phosphate analysis is conducted in the field to map and describe the locations of features and, consequently, potentially optimal areas for excavation. Samples are then collected for laboratory analysis for higher order interpretive purposes. The soils lab at the University of Wisconsin-Milwaukee houses a computer bank containing diagnostic "prints" of particular feature types from archeological sites all over the world.

The present project proposes to utilize the phosphate method for gauging the nature and extent of buried cultural distributions, especially along floodplain locales at Lake Red Rock. The services of Dr. R. Eidt, the chief architect of this method, will be engaged in the laboratory, and his efforts will be coordinated with both the geomorphological and archeological aspects of the research.

Detailed procedures of the field and laboratory methods to be utilized in the site-specific research are discussed separately.

Geoarcheological Research Methods and Procedures

In this section the various methods and procedures utilized for research implementation are described sequentially. The following stages will direct the course of the research:

Stage	Function
1	Literature and Background Studies
2	General Field Reconnaissance and Terrain Description
3	Detailed Field Mapping and Section Profiling
4	Deep Testing
5	Sediment Sampling
6	Laboratory Analysis
7	Data Reduction and Report Preparation

It is noted that Stages 2 through 5 will be ongoing concurrently.

The tasks to be performed at each stage are summarized as follows:

1. Literature and Background Studies

The first stage will be directed toward obtaining available data on the Quaternary geology of the Lake Red Rock/Des Moines River drainages. Background sources will include primary sources such as soil survey reports as well as systematic geomorphologic and geoarcheological studies of the area (e.g. Ruhe 1969; Benn and Bettis 1981). Background searches will also draw on plat maps, insurance maps, and military maps which show broad changes in drainage during the historic period. Aerial photos will document subtle as well as dynamic changes in geomorphology. These studies will allow the research team to direct attention to the project area from both present and past perspective. Vegetation and faunal reports will be consulted as well. Collectively, a model for paleo-environmental succession will be formulated that will outline trends and patterns in more detail than is normally contained in general geological reports. Additionally, historic records documenting drainage, flow and channel behavior, and discharge rates should refine what is known from geologic records. Comparisons will expand our understanding of the Holocene fluvial regimen along the Des Moines and offer clues to the evolution of the contemporary erosional landscapes.

The gathering of background environmental data will begin prior to and in conjunction with the actual geomorphological field program. As detailed in the description for Stage 3, the field data assembled in the early phases of work will be synthesized and reassessed by the project staff in conjunction with regional information to localize optimal research avenues for further study during successive phases of fieldwork.

2. General Field Reconnaissance and Terrain Description

This stage constitutes the initial field venture and will be undertaken by the project geoarcheologist (J. Schuldenrein) and a field assistant.The purpose of the field reconnaissance will be to obtain an overview of the systemic geomorphology of the project area. Diagnostic locations for detailed study and investigation will be isolated at this time. Preliminary indications of landform relations will already have been synthesized from background research, topographic maps, and aerial photographs. Investigators will key efforts towards identification of those geomorphic configurations that are most exemplary of both past and present processes of landscape morphogenesis. Each of the major physiographic zones will be surveyed and particularly informative profiles and areal distributions will be flagged, recorded, photographed, and mapped; at that time recommendations will be made as to procedures to be followed for optimization of data recovery in upcoming stages. It will be noted, for example, whether detailed profiling, sediment sampling or extensive areal mapping should be conducted in the vicinity of a particular formation or landscape. Research methodologies will be especially sensitive to patterned distributions of such diagnostic features as abandoned channels and chutes, rill and gully networks, and relict or active terrace formations.

Particular attention will be paid to the regional drainage networks. Principal outcrops will be studied to obtain a general picture of the overall depositional sequence. Critical to the investigations at the Lake Red Rock Reservoir will be the reconstruction of the alluvial history of the Des Moines. Tributary and relict alluvial features will be assessed in terms of the potential they hold for synthesizing the general chrono-stratigraphy of the catchment. For similar reasons, terrace profiles will be sampled for paleo-pedological purposes and in the interests of evaluating the trends and regional patterns of pedogenesis.

The reconnaissance will establish a "big-picture" scenario and should provide direction for the course of the finer-grained studies to be undertaken in Stages 3-5.

3. Detailed Field Mapping and Section Profiling

Stage 3 initiates the fieldwork to be undertaken by the investigators. The team will be in the field at all times and its principal tasks will be:

1) Mapping of diagnostic field sections and trenches.

2) Areal mapping of major landform configurations and surfaces.

3) Sampling for pollen sediments and appropriate recording procedures (see Stage 5).

The general locations of these settings will have been established (Stage 2), but levels of effort will vary between locations and determinations of requisite tasks to be performed will be made on the basis of field relations. In the interests of economy and efficiency, initial profiles and mapping will center on the principal outcrops. Since these offer composite pictures of vertical and lateral stratigraphy, it is anticipated that they will provide the basis for the reconstructed sequences.

It is stressed that once detailed mapping and sampling are underway and researchers become familiarized with the range and diversity of settings, decisions will be made to modify or alter extant plans, again in the interests of maximizing information yield. The tasks listed above form the core of the field effort. Stage 3 will be geared almost exclusively to the catchment-wide study and to articulating the local geomorphology and Late Quaternary stratigraphy.

Changing focus from catchment-wide to site-specific levels of research inaugurates a Phase II strategy to the fieldwork, in accordance with the research design. The phase will occur during the second week of work. It is assumed on the basis of concurrent schedules with the Commonwealth archeological team, that site distributions will be recognized by this time and that the test excavation portion of the archeology operation will be underway. Investigations of site-specific settings will form the main thrust of the work thereafter and will address issues of site formation processes, paleogeography, and ultimately the design of a site predictive model.

The final days of the field effort will complete the systematic geomorphological sampling and research operation, localizing those formations, landform configurations, and profiles deemed pivotal in rounding out the sequence. Simultaneously, and as more contextual information is learned regarding site provenance, a representative sampling of all archeo-sedimentary matrices will be collected and processed. Archeo-sedimentary studies and cartographic work will ultimately produce a composite map of:

1) Detailed site and catchment topography.

2) Distribution of surficial geology and geomorphic features.

3) Locations of principal outcrops (to be used for an isopach map of subsurface stratigraphic distributions and relations).

4) Plot archeological locations and provenance units.

It is noted that given the catchment-wide perspective necessary for this scalar geomorphologic analysis, it will be necessary to extend the domain of investigations onto the Des Moines River Drainage.

4. Deep-Testing

Deep testing will be performed in conjunction with the field mapping and profiling operations. It will be applied only to select locales, specifically those warranting detailed subsurface stratigraphic investigation at interior locations not otherwise exposed. The most immediate application of a deep testing strategy is mandated by a site-specific situation. Field procedure calls for the excavation of trenches of variable depth and length by tractor-mounted backhoe to expose subsurface strata. Examination of trench stratigraphy will generally be conducted in conjunction with the test excavations at the archeological sites. Trenches will be placed beyond the confines of sites to determine the depth and lateral extent of cultural deposits while concurrently exposing the natural stratigraphy detailing geomorphic history. In a similar vein, such trenches will provide an indication of any deeply buried archeological components which may extend below near surface cultural evidence. It will thus be possible to record the disposition of individual pieces (i.e., artifacts), determine agencies of dispersal, and classify the archeological locations accordingly.

In areas where deep testing is unfeasible or when the general disposition of subsurface strata is provisionally understood, probing will be utilized as an alternative technique. For these purposes, a 4-inch mechanical bucket auger will be employed and transects will traverse site rich areas. In past situations it has proven useful to map buried surfaces by dispersing borings in intervals determined by the site setting.

Particular strategies for deep testing will be determined on the basis of individual site requirements. It is also possible that the use of the equipment may not be needed, especially if site locations are aligned with naturally exposed sections, but such decisions will be made in the field. It is understood that trenches will be backfilled pursuant to study and mapping of the units.

5. Sediment Sampling

A major emphasis of the geoarcheological research will be in the interpretation of both natural and cultural sediments. These will be collected in the field over the course of the section profiling and deep testing stages (3 and 4). Diagnostic stratigraphic sections will be sampled vertically and sequentially, in 10 cm or analytically appropriate intervals, at the Commonwealth Soils and Sedimentology Laboratory, the Minerals Laboratory of the U.S. Geological Survey (Reston, Virginia), the Geology Department at the University of Michigan and at the State Soils Laboratory, University of Wisconsin. Field soil sampling will be carefully documented through the use of special sample record forms utilized on all Commonwealth geoarcheological projects. A "macro" soil/sediment identification form will be used for coding and the identification of color, composition, and textural and structural features. Certain postdepositional features such as cementation or precipitation of secondary carbonates or nodules will also be noted on this form (Figure 2).

Finally, samples will be collected from archeological test pits and submitted for laboratory phosphate and chemical analysis (at the University of Wisconsin, Milwaukee).

6. Laboratory Analysis

An underlying and immediate concern of the strategy applied in the selection of analytical procedures is the need for identification of both depositional agencies and postdepositional processes of sediment modification.

Across well differentiated terrains, recognition of the interface between pedogenesis and sedimentation is not often clear. In alluvial and terrace environments incipient soil formation may often be documented by a series of relict "A" horizon transformations and the creation of a weak solum and a "texture" B horizon. Identifications of gradational pedosedimentary changes may be key to correlating the landform and pedogenetic sequences. The following laboratory procedures were designed to monitor:

1) depositional modes of sediment transport.
2) the shifting pedosedimentary balances in the profile.
3) introduction of anthropogenic residues in the sediment matrix.

The laboratory procedures are enumerated below. Performance of analyses will be conducted at the institution identified in parentheses.

1) <u>Atomic Absorption Spectrophotometry</u> - By testing for seven diagnostic elements, the chemical changes associated with weathering profiles can be examined in detail. This analysis will be performed on all pedogenetic sequences and correlations will be made across the profiles studied. An atomic absorption spectrophotometer will be used for analyzing iron, calcium, magnesium, aluminum, potassium, sodium and phosphorous. Determinations of soil pH will also be made at this time. (Soils Laboratory - University of Wisconsin, Milwaukee).

FIGURE 2

CAI SOIL/SEDIMENT CODING FORM

SAMPLE NO. ____________
SITE: ____________ PROJECT JOB NO. ____________
COLLECTED BY: ____________ DATE: ____________ WEATHER: ____________

LOCATIONAL DATA
QUAD: ____________ SERIES: ____________ SECTION: ____ T ____ R ____ ¼ ____ ¼ ____ ¼
UTM: ZONE ________ E/W ________ N/S ________ SURFACE ELEV. ____________

LOCAL RELIEF: ____________

ROCK OUTCROPS: ____________

VEGETATION COVER:
Composition: ____________

____

____________ Percentage: ____________

EXPOSURE SAMPLED: ____________
Type: ____________ Depth: ____________
STRATIGRAPHIC UNIT AND DESCRIPTION: ____________

____

____________ Thickness of Unit: ____________
COLOR: ____________ (wet) ____________ (dry)
TEXTURE: ____________

____

STRUCTURE:

PLATY	PRISMATIC	ANGULAR BLOCKY	SUBANGULAR BLOCKY	GRANULAR
FINE (<2mm)	FINE (<20mm)	FINE (<10mm)	FINE (<10mm)	FINE (<2mm)
MED (2-5mm)	MED (20-50mm)	MED (10-20mm)	MED (10-20mm)	MED (2-5mm)
COARSE (5-10mm)	COARSE (50-100mm)	COARSE (20-50mm)	COARSE (20-50mm)	COARSE (5-10mm)
VERY COARSE (>10mm)	VERY COARSE (>100mm)	VERY COARSE (>50mm)	VERY COARSE (>50mm)	VERY COARSE (>10mm)

PED DEVELOPMENT:
Apedal (Single Grain, Massive),
Weak, Moderate, Strong
Compound: ____________ break into ____________

ORGANIC MATTER:

Abundance: ______________________________

Type: ______________________________

Size: Macro (> 2mm), Micro (< 2mm)

MOTTLING:

ABUNDANCE	SIZE	CONTRAST	SHARPNESS OF BOUNDARY
FEW (< 2%)	EX. FINE (< 1mm)	FAINT	SHARP
COMMON (2-20%)	V. FINE (1-2mm)	DISTINCT	CLEAR
MANY (20-40%)	FINE (2-5mm)	PROMINENT	DIFFUSE
V. MANY (> 40%)	MED (5-15mm)		
	COARSE (> 15mm)		

STONINESS:

ABUNDANCE	SHAPE	LITHOLOGY	
FEW (< 2%)	ROUNDED	GRITTY (2-6mm)	
COMMON (2-20%)	SUBROUNDED	GRAVELLY (6mm-6cm)	PEBBLY (Rounded/Subrounded Stones; 6mm-6cm)
MANY (20-40%)	SUBANGULAR	COBBLY (Rounded/Subrounded Stones; 6cm-20cm)	
V. MANY (> 40%)	ANGULAR		
	–		
	UNEQUAL AXIS		
	PLATY	FLINTY, CHERTY, SHALY, SLATY — Stones are > 50% of these lithologies	
	TABULAR		

SIZE

V. SM. (2-6mm)
SM. (6mm-2cm)
MED (2-6cm)
LG. (6-20 cm)
V. LG. (20-60 cm)
BOULDERS (> 60 cm)

VOIDS:

FISSURES (WIDTH):	PORES (DIAM.):
V. FINE (< 1mm)	V. FINE (< .5mm)
FINE (1-3mm)	FINE (.5-2mm)
MED (3-5mm)	MED (2-5mm)
COARSE (5-10mm)	COARSE (> 5mm)
V. COARSE (> 10mm)	

CEMENTATION:	STICKINESS:	PLASTICITY:
Very Weak	Negligible	Negligible
Weak	Slight	Slight
Strong	Moderate	Moderate
Very Strong	Very	Very

ROOTS:

ABUNDANCE (Per 100cm^2)	SIZE (Diam.)		TYPE
FEW (1-10)	V. FINE (<1mm)	COARSE (DESCRIPTION) ______	WOODY
COMMON (10-25)	FINE (1-2mm)	______	FIBROUS
MANY (25-200)	MED (2-5mm)	______	FLESHY
ABUNDANT (>200)	COARSE (>5mm)	______	
		______	

CARBONATES:

ORIGIN	TYPE	SHAPE	ABUNDANCE
PRIMARY	CRYSTAL	ROUND	FEW (<2%)
SECONDARY	NODULE	ELLIPSOID	COMMON (2-20%)
	CONCRETION	IRREGULAR: ______	MANY (20-40%)
	SOFT (DIFFUSE) CONCENTRATION	______	V. MANY (>40%)

PEDOGENIC/SEDIMENTARY INCLUSIONS:

TYPE	SHAPE	ABUNDANCE	DEVELOPMENT	DISTINCTNESS
CRYSTAL	ROUND	FEW (<2%)	PEDOGENIC	SHARP
NODULE	ELLIPSOID	COMMON (2-20%)	HYDROGRAPHIC	CLEAR
CONCRETION	CYLINDRICAL	MANY (20-40%)	SEDIMENTARY	DIFFUSE
OTHER: ______	IRREGULAR: ______	V. MANY (>40%)		
______	______			

CUTANS:

TYPE	ABUNDANCE (% of Interface)	LOCATION	CONTINUITY (per Surface)	DISTINCTNESS
ARGILLIC	FEW (<10%)	VOIDS	ENTIRE	PROMINENT
SAND/SILT	COMMON (10-50%)	PED FACES	CONTINUOUS	DISTINCT
SESQUIOXIDE	MANY (>50%)	AROUND INCLUSIONS: ______	DISCONTINUOUS	FAINT
ORGANIC		______	PATCHY	
CALCAREOUS				
DIAGENETIC				

FERRO-MANGANESE PRESENCE: ______________________________

____

____

BOUNDARY TO LOWER HORIZON:

DISTINCTNESS	FORM
SHARP	SMOOTH
ABRUPT	WAVY
CLEAR	IRREGULAR
GRADUAL	BROKEN
DIFFUSE	

ADDITIONAL NOTES & OBSERVATIONS:

2) Organic Matter Assays - Successions of "A" horizons or the probable occurrence of organically enriched pond sediments associated with some site settings suggests that either limited pedogenic environments or marshy basins may have been loci for prehistoric settlement at various intervals. It may be possible to determine whether these represent cyclical and recurrent environments of occupation by presence of a succession of slack water deposits, or if they attest to more protracted intervals of leaching and/or illuviation into a solum subsequently eroded by fluvial activity. Organic matter determinations will be performed using the method of backtitration with Fe $(NH_4)_2$, $(SO_4)_2$ solution (Jackson 1958). (Geology Laboratory - University of Michigan).

3) Total Carbonates - In paleoclimatic studies carbonate translocation and reprecipitation is often used as an index of weathering intensity associated with long-term variations in moisture budgets. Recent research has pointed to the need for differentiating between primary and secondary carbonates in paleo-environmental reconstruction. For this reason, the total carbonate test is of limited utility but will be used to supplement results produced by other analyses (i.e., thin-section microscopy, atomic absorption). Calcimetry will be evaluated using the Chittick gasometric method measuring the volume of carbon dioxide released after the application of .1N HCl. (Geology Laboratory - University of Michigan).

4) Clay Minerals - Clay mineralogy of a sediment is utilized to infer conditions of deposition and weathering since the minerals are highly susceptible to in situ alteration. They are also among the most common minerals in sediments and their differential vulnerability to breakdown is especially diagnostic. Clays are identified by x-ray diffractogram patterns and are extracted from the sediment matrix by centrifuging after the removal of carbonates, organic matter, iron oxides and particle size separation. (Soils Laboratory - University of Wisconsin, Milwaukee).

5) Heavy Minerals - Heavy minerals are characterized by a relatively high specific gravity. Their significance lies in the fact that sand populations consist of a wide variety of minerals that can be used to trace the source of sediments. This is especially critical in alluvial settings where variable transportability results in patterned depositional suites. Heavy mineral separation will be performed on the sand fraction according to the standard procedure of isolating heavy from fine minerals by bromoform. (Minerals Laboratory - U.S. Geological Survey, Reston, Virginia).

6) Thin Sections - Micromorphological characteristics of soils and sediments include structural, textural, and intrusive features of natural and anthropogenic origin. Many of these cannot be recognized in the field. Samples are collected as peds (i.e., complete soil units), impregnated with a plastic epoxy resin, and are then

cut and mounted on slides. They are examined under a polarizing microscope and diagnostic morphological features and patterns are described and assessed both qualitatively and quantitatively (see Schuldenrein n.d.). The method of micromorphological analysis of soils is well known among pedologists (see Brewer, 1964), but has only recently been applied to the study of archeological sediments (Catt and Weir 1976; Goldberg 1979b), and soils (Schuldenrein n.d.). Of particular relevance to the present research is the ability to distinguish primary from secondary patterns of carbonate nodule crystallization. This was done by practitioners at archeological sites in the semi-arid Lower Jordan Valley (Schuldenrein 1983; Wieder and Yaalon 1974). Researchers were then able to link occupational strata with episodes of pedogenesis. Many of the analytical procedures and classification schemes for soil/sediment micromorphology have been developed by Schuldenrein and Goldberg (1981) in their prehistoric site and paleo-environmental investigations in the Lower Jordan Valley. The present effort will attempt to apply these principles to archeological soils and sediments at the Lake Red Rock Reservoir (Preparation at von Huene Laboratories - Pasadena, California. Analysis at CAI Laboratory - Jackson, Michigan).

7) Granulometry - Grain size analysis is perhaps the most standard sedimentological analysis performed by Quaternary geologists. Granulometric data are often diagnostic for interpreting sedimentary depositional environments through the application of Folk's (1957) skewness, kurtosis and sorting parameters. Alluvial deposits, such as those to be sampled across the study area, often furnish the most instructive data bases. Thus, for example, channel deposits vary widely in size, but consist mainly of coarse material which is often bimodal. Basin deposits feature primarily fine sand, silt and clay components, but tend to be unimodal; floodplain sediments are generally silt and silt-clays. To pinpoint the sedimentary origins of the alluvium and terrace deposits, an intensive microstratigraphic sampling procedure will be instituted. A similar strategy will be pursued at the site-specific level to identify the occupational strata. The coarse fraction will be analyzed by mechanical sieving, while the hydrometer method will be utilized for determining the composition of the fine fraction. (Geology Laboratories - University of Michigan).

8) Phosphates - This method has been described earlier. Essentially it is utilized by archeologists to determine the extent and intensity of settlement at given locations. Anthropogenic sediments are clear indicators of human disturbance of the natural sedimentation regime, and their identification facilitates the interpretation of particular archeological features contextually. This is an index that should prove invaluable in the discernment of living areas and will be instrumental in the classification of archeological locations as outlined earlier. Following preliminary

field tests (see Stage 5) samples will be collected and analyzed according to sequential fractionation by differential solubility, the method outlined by Eidt (1973, 1977).

Procedurally, the fractionation method consists of separation of inorganic settlement phosphate into its components by means of non-overlapping extraction. Three discrete extraction methods produce unique phosphate readings which are, in turn, utilized to interpret the nature of human input into the soil sediment matrix. Experience at correlating economic activities with phosphate values indicates that relatively moderate amounts of Fraction I, II, and III, ranging from 10-300 ppm total P, represent a range of economic activities such as those from ranching to hack farming. Values above 300 ppm indicate more intensive activities such as dwelling areas, intensive gardening, manufacturing, garbage dumps, etc. Extremely high total P readings (above 2000 ppm) represent burials, refuse pits, slaughter areas, urbanized zones, etc. Accurate mapping and proper interpretation of data make it possible to differentiate at quite a low level among the various feature functions. (Soils Laboratory - University of Wisconsin, Milwaukee).

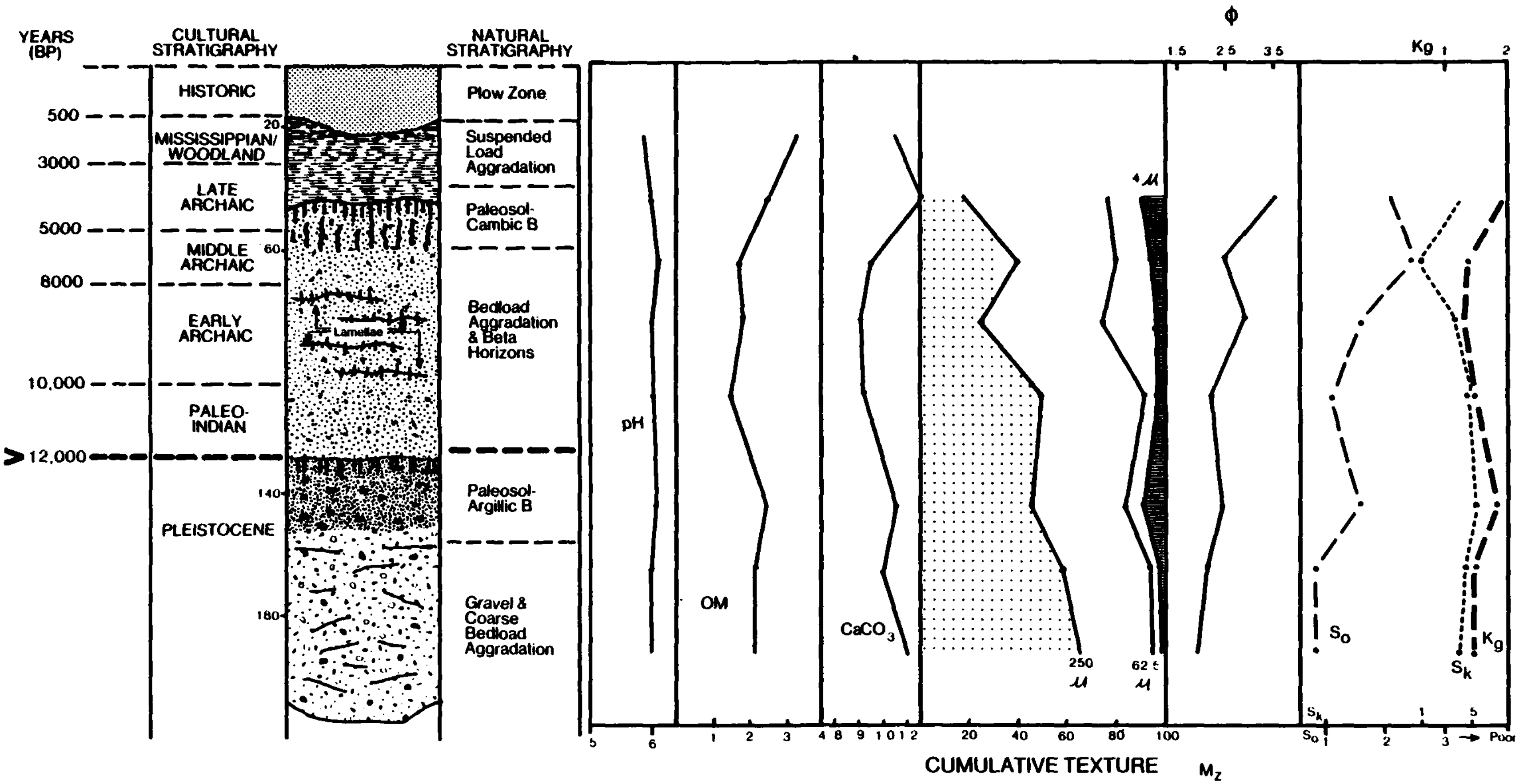
With the completion of the laboratory studies, the analytical phases of the geoarcheological investigations will be completed and the results will be synthesized and incorporated into the report. Figure 3 is the graphic representation of results obtained from laboratory analyses performed on a soil/sedimentary column at the multi-component prehistoric site of Rucker's Bottom, northeast Georgia (Anderson and Schuldenrein 1983). The inter-digitation of culture and lithostratigraphic units enabled sequential identifications of depositional environments of the various prehistoric periods. A similar approach will be utilized for the Lake Red Rock analysis.

7. Data Reduction and Report Preparation

The final stage of project activity is the synthetic interpretation of the data accumulated over the course of background, field, and laboratory phases of the research and their incorporation with the theoretical framework outlined in the Research Design. The objective is to outline the parameters of the changing prehistoric occupance of the Lake Red Rock territory in response to a carefully researched series of environmental successions. On an empirical level the methods and procedures outlined in Stages 1 to 6 provide the geoarcheological data base.

The result of the geoarcheological study will serve as a guide for future work at Lake Red Rock. It will furnish a comprehensive perspective on site location and should therefore be instrumental in refining the archeological survey strategies to be applied to the area. The report should help streamline plans for mitigation and will provide the environmental backdrop for interpreting the context of sites and their distributions.

FIGURE 3
COMPOSITE STRATIGRAPHY
ARCHAIC BLOCK 9EB91 - RUCKER'S BOTTOM



ARCHAIC PERIOD SEDIMENTATION
(in cm / 100 years)

LATE	1 0
MIDDLE	0 9
EARLY	1 7

On the site-specific level the study hopes to explain why certain site types occur in particular settings and what the expectancy is of encountering recurrent configurations across the differentiated provinces of the research territory. Establishment of guidelines for site expectancy expands the potential for understanding the changing nature of man/land interaction in a dynamic environment.

APPENDIX C

KEY STAFF VITAE

VITA OF DONNA CAROL ROPER

PII Redacted [redacted]

Address: Commonwealth Associates Inc. [redacted]
209 East Washington Avenue
Jackson, Michigan 49201
(517) 788-3426

EDUCATION

1964 Oneonta High School - Oneonta, New York

1968 B.A. in History, with Departmental Honors
Hartwick College - Oneonta, New York

1970 M.A. in Anthropology
Indiana University - Bloomington, Indiana

1975 Ph.D. in Anthropology
University of Missouri - Columbia, Missouri

TEACHING EXPERIENCE

1972-74 Teaching Assistant in Anthropology, University of Missouri, Columbia. Discussion sections for introductory Anthropology course.

1974 (fall) Lincoln Land Community College, Springfield, Illinois. Taught extension course on central Illinois archaeology.

RESEARCH POSITIONS

1970-71 Research Assistant, American Archaeology Division, University of Missouri, Columbia.

1971-73 Research Assistant, Post-Pleistocene Prairie Peninsula Project, Illinois State Museum, Springfield, Illinois (provided support during academic year 1971-72 while in residence at the University of Missouri, plus support during the summers of 1971-1973).

1973-75 Adjunct Research Assistant, Quaternary Studies Center, Illinois State Museum, Springfield, Illinois.

1975-80 Archaeologist III, American Archaeology Division, University of Missouri, Columbia, Missouri.

1980 to Present Senior Archeologist, Commonwealth Associates Inc., Jackson, Michigan.

FIELD AND LABORATORY EXPERIENCE

1967-69 (summers) Hartwick College Field Project in Archaeology. Worked as field assistant at the Brooks-Catella (1967) and Adequentaga (1968, 1969) sites.

1967-68 (winter) Assisted in cataloging and other museum tasks, Yager Museum, Hartwick College, Oneonta, New York.

1970 (summer) University of Missouri archaeology field school, student. Excavations at several sites in Saline County, Missouri - including 23SA2, 23SA128, 23SA164 A&B, and The Old Fort.

1970 (August) Nauvoo, Illinois. Two-week excavation under the direction of Robert T. Bray at the Joseph Smith stable.

1971-73 (summers) Extensive survey and limited test excavations throughout the Sangamon River Drainage of central Illinois. Supervised test excavations at the Eilers Site (11C's V20) in August 1972. Also performed much laboratory processing and analysis of ceramics, lithics, site location data, and computer analysis of proto-historic land survey data.

1974 (summer) Phase II excavations at the Airport Site, Springfield, Illinois. Field Supervisor under the direction of Walter E. Klippel.

1975-76 Continuous fieldwork from June 1975 to December 1976. Survey in the Harry S. Truman Reservoir, Missouri. Field Director and Laboratory Coordinator for the Cultural Resources Survey of the reservoir, and Co-Principal Investigator of the Corps of Engineers contract.

1977-80 Harry S. Truman Reservoir, Missouri. Principal Investigator and Project Director of Corps of Engineers contract for mitigation of the adverse impact of the reservoir upon the archaeological resources.

1980 to Present Commonwealth Associates Inc.

Fieldwork:

Survey of six equipment staging areas and two haul road reroutes. AMOCO's Whitney Canyon Project, Wyoming.

Survey of two 42-inch pipeline loops. Michigan Wisconsin Pipeline Company, Indiana and Michigan.

Construction monitoring at Susquehanna Steam Electric Station, Pennsylvania.

Testing of three prehistoric and four historic sites on the Trailblazer pipeline, Nebraska.

Evaluation of sites on Trailblazer pipeline, Weld County, Colorado.

Principal Investigator/Project Manager for Phase I, II, III services for Soyland's Coal-fired Generating Station, Pike County, Illinois.

Survey of pipeline replacements for Mt. Simon gathering system, Kankakee County, Illinois.

Survey of pipeline upgrade for Amarillo line, Louisa County, Iowa and Rock Island County, Illinois.

Principal Investigator/Project Manager for survey of new maintenance road corridor, Black Dirt Area Local Flood Protection Project, Orange County, New York.

Principal Investigator/Project Manager for archeological survey along M-45, Ottawa County, Michigan.

Principal Investigator/Project Manager for cultural resources reconnaissance at Lake Red Rock, Iowa.

Principal Investigator/Project Manager for cultural resource investigations at Fort Gibson Lake, Oklahoma.

Principal Investigator for Phase II investigations at the Williams II Site, LeFlore County, Oklahoma.

Principal Investigator/Project Manager for data recovery (mitigation) at two sites in the Dry Creek Historic District, Loup County, Nebraska.

Laboratory, in addition to conduct of laboratory phases for above listed field investigations:

Spatial analysis of ceramic and lithic assemblages from two sites in Piedmont, North Carolina.

Analysis of raw material use patterns at sites on the Susquehanna River floodplain, Luzerne, County, Pennsylvania.

Principal Investigator for surveys, and directly responsible for analysis of site location patterns, historic and prehistoric, in Hiawatha and Ottawa National Forests, Michigan.

Project statistician for study of site locations in Piceance Basin, northwest Colorado.

Principal Investigator for Frontier Pipeline Class III Inventory, Wyoming.

Report review, preparation of short sections of reports, and proposal preparation for numerous additional projects.

CONTRACTS

Testing Site 23CE261, Stockton Lake Downstream Area, Sac River, Missouri. U.S. Army Corps of Engineers, $8,500.

Mitigation of the Adverse Impact of the Harry S. Truman Reservoir upon the Archaeological Resources, Osage River, Missouri. U.S. Army Corps of Engineers, $962,276.07.

PROFESSIONAL ORGANIZATIONS

Fellow, American Anthropological Association
Member, American Association for the Advancement of Science
Member, Society for American Archaeology
Member, Plains Conference for Archaeology
Member, various state archaeological societies
Member, Missouri Association of Professional Archaeologists (Board of Directors, 1977-1980, Secretary-Treasurer, 1979-1980)
American Society for Conservation Archaeology
Member, Oklahoma Council of Professional Archaeologists
Fellow, Conference on Michigan Archaeology

TITLE OF M.A. THESIS

"Statistical Analysis of New York State Projectile Points"

TITLE OF Ph.D DISSERTATION

"Archaeological Survey and Settlement Pattern Models in Central Illinois"

PUBLICATIONS

1974 Review of "An Archaeological Survey of the Macoupin Valley" by Kenneth B. Farnsworth. Illinois Association for Advancement of Archaeology, Newsletter 6(1):6-7.

The Distribution of Middle Woodland Sites within the Environment of the Lower Sangamon River, Illinois. Illinois State Museum Reports of Investigations, No. 30.

Observations on Prehistoric Raw Material Selection in Sheridan County, Montana. Junior author with Ann M. Johnson. Archaeology in Montana 15 (1):22-29.

1975 Reporting the Results of a Factor Analysis: Some Suggested Guidelines. Newsletter of Computer Archaeology X (3):1-5.

Excavations at the Airport Site, 11Sg^{v}280. Illinois Association for Advancement of Archaeology, Newsletter 7 (1):3-5.

1976 A Trend Surface Analysis of Central Plains Radiocarbon Dates. American Antiquity 41 (2):181-189.

Lateral Displacement of Artifacts due to Plowing. American Antiquity 41 (3):372-375.

Nominal Data and Factor Analysis: A Comment on Geier. Plains Anthropologist 21 (73):231-236.

An Introduction to the Truman Reservoir Project. Missouri Archaeological Society Newsletter, No. 303:1-3.

Floral Remains from Two Middle to Early Late Woodland Sites in Central Illinois and their implications. Junior author with Frances B. King. The Wisconsin Archeologist 57 (3):142-151.

1977 A Key for the Identification of Central Illinois Woodland Pottery Types. The Wisconsin Archeologist 58 (4):245-255.

1978 The Airport Site: A Multicomponent Site in the Sangamon River Drainage. Illinois State Museum Research Series, Papers in Anthropology, No. 4.

1979 Breakage Patterns of Central Illinois Projectile Points. Plains Anthropologist 24 (84, pt. 1):113-121.

Archaeological Survey and Settlement Pattern Models in Central Illinois. Midcontinental Journal of Archaeology, Special Paper No. 2 and Illinois State Museum Scientific Papers No. 16.

The Method and Theory of Site Catchment Analysis: A Review. Advances in Archaeological Method and Theory, Volume 2, edited by Michael B. Schiffer, pp. 119-140. Academic Press, Inc., New York.

1980 Review of "Mississippian Settlement Patterns" edited by Bruce D. Smith. Plains Anthropologist 25 (90):366-367.

Archaic Adaptations in the Central Osage River Basin: A Preliminary Assessment. (Junior author with Janet E. Joyer). In Archaic Prehistory on the Prairie - Plains Border, edited by Alfred E. Johnson, pp. 13-23. University of Kansas Publications in Anthropology 12.

1981 Review Comments on Five Predictive Models Reports, Units IV, V, VIII, IX, and X. In Predictive Models in Illinois Archaeology, edited by Margaret Kimball Brown, pp. 147-151. Illinois Department of Conservation, Division of Historic Sites, Springfield.

A Paleo-Indian Point from Henry County, Missouri. Plains Anthropologist 26 (94):311-317.

1982 Review of "Catchment Analysis" edited by Frank J. Findlow and Jonathon E. Ericson. American Antiquity 47 (2):460-462.

A Petroglyph in Stockton Lake. Missouri Archaeological Society Newsletter.

MANUSCRIPTS IN PRESS

Review of "Plowzone Archeology" edited by Michael J. O'Brien and Dennis E. Lewarch. Solicited for Plains Anthropologist. Submitted September 1983.

Review of Settlement Predictions in Sparta, by Robert Lafferty III, et al. Solicited for Southeastern Archaeology. Submitted November 1983.

Review of Data Bank Applications in Archeology, edited by Sylvia Gaines. Solicited for Southwestern Lore. Submitted November 1983.

Notes on Lithic Raw Materials from a Dismal River Site in Western Nebraska. Submitted to South Dakota Archeology, June 1983.

CONTRACT REPORTS

Report on Phase II Excavations at the Airport Site, $IISg^{v}280$. Prepared for the Springfield Airport Authority Board of Commissioners. Illinois State Museum, Springfield, 15 pp. 1974.

Cultural Resources Survey, Harry S. Truman Dam and Reservoir Project: The Archeological Survey: Part I, Prior Surveys, pp. 1-20; Part II, Survey of Borrow Areas and Relocations, pp. 21-45. Report to the U.S. Army Corps of Engineers. American Archaeology Division, University of Missouri, 1975.

Cultural Resources Survey, Harry S. Truman Dam and Reservoir Project: Lower Pomme de Terre River Area. Part I, Introduction, pp. 1-7; Part II, The Archeological Survey, pp. 8-40, with Appendix: Research Design, by Donna C. Roper and W. Raymond Wood, pp. 41-48. Report to the U.S. Army Corps of Engineers, American Archaeology Division, University of Missouri, 1976.

The Downstream Stockton Study: The Cultural Resources Survey: Part I, Archeological Resources, pp. 1-143. Report to the U.S. Army Corps of Engineers. American Archaeology Division, University of Missouri, 1977.

Cultural Resources Survey, Harry S. Truman Dam and Reservoir Project: Volume IV, The Archeological Survey, pp. 1-258; Volume V, Projectile Points by Donna C. Roper and Michael R. Piontkowski, pp. 213-281. Report to the U.S. Army Corps of Engineers, American Archaeology Division, University of Missouri, 1983.

The Downstream Stockton Study, Investigations at the Montgomery Site, 23CE261, by Charles D. Collins, Andris A. Danielsons, and James A. Donohue, edited by Donna C. Roper. Report to the U.S. Army Corps of Engineers. American Archaeology Division, University of Missouri, 1983.

A Class III Cultural Resource Survey of AMOCO's Sulfur Transportation System for the Whitney Canyon Project; with J. A. Newkirk. Report to AMOCO Production Company. Commonwealth Associates Inc., Report R-2287, 21 pp. 1981.

A Class III Cultural Resource Survey of Six Equipment Staging Areas and Two Haul Road Reroutes for AMOCO's Proposed Sulfur Transportation System for the Whitney Canyon Project, Wyoming; with J. A. Newkirk. Report to AMOCO Production Company. Commonwealth Associates Inc., Report R-2293, 57 pp. 1981.

"Prehistoric setting" and "Patterns of raw material use". In Archeological Investigations at the Susquehanna Steam Electric Station, pp. 60-91, 202-212. Report to Pennsylvania Power and Light Company. Commonwealth Associates Inc., Report R-2282A. 1981.

Prehistoric Cultural Stability in the Missouri Ozarks: The Truman Reservoir Mitigation Project, edited by Donna C. Roper. Report to the U.S. Army Corps of Engineers. American Archaeology Division, University of Missouri, Columbia. 3 Vols. 1983.

"Spatial Analysis of Assemblages"; with Stephen R. Claggett. In The Haw River Sites: Archeological Investigations at Two Stratified Sites in the North Carolina Piedmont, pp. 689-765. Report to the U.S. Army Corps of Engineers. Commonwealth Associates Inc., 1982.

Cultural Resources Survey of two Natural Gas Pipeline Loops. Report to the Michigan Wisconsin Pipe Line Company. Commonwealth Associates Inc., Report R-2362, 36 pp. 1981.

"Environmental setting" and "Archeological background". In An Archeological Resource Inventory of the Trailblazer Pipeline, Nebraska, Colorado, and Wyoming, pp. 6-32. Report to the Natural Gas Pipeline Company of America. Commonwealth Associates Inc., Report R-2382. 1982.

"Introduction", pp. 1-5, "Investigations at three prehistoric sites in Nebraska", pp. 45-74, In Testing and evaluation of eight sites on the Trailblazer Pipeline in Nebraska and Wyoming. Report to the Natural Gas Pipeline Company of America. Commonwealth Associates Inc., Report R-2405. 1982.

Task 1. Preliminary Report for the Piceance Basin Project, with J. A. Newkirk and P. A. Treat. Report to the White River Resource Area, Bureau of Land Management (Colorado). Commonwealth Associates Inc., 1982.

Task 2. Preliminary Report for the Piceance Basin Project, with J. A. Newkirk. Report to the White River Resource Area, Bureau of Land Management (Colorado). Commonwealth Associates Inc., 1982.

Soyland Archaeology Project Summary Project Report of Investigations 3/29/82-7/15/82. Report to Soyland Power Cooperative, Decatur, Illinois. Commonwealth Associates Inc., 1982.

Predictive Modeling in the Piceance Basin, Northwest Colorado; with J. A. Newkirk. Report to the Bureau of Land Management, White River Resource Area - Craig District. Commonwealth Associates Inc., Report R-2429. 1983.

An Archeological Reconnaissance of New Pipe Line Right-of-Way within the Mt. Simon Gathering System Replacement Project, Kankakee County, Illinois. Report to the Natural Gas Pipeline Company of America. Commonwealth Associates Inc., Report R-2528, 23 pp. 1983.

An Archeological Reconnaissance of Portions of the Amarillo Pipeline Ugrade, Louisa County, Iowa and Rock Island County, Illinois. Report to the Natural Gas Pipeline Company of America. Commonwealth Associates Inc., Report R-2552, 35 pp. 1983.

An Archeological Survey of the New Maintenance Road Corridor, Black Dirt Area Local Flood Protection Project, Wallkill River Basin, New York. Report to the U.S. Army Engineer District, Philadelphia. Commonwealth Associates Inc., Report R-2555, 16 pp. 1983.

Testing and Evaluation of the Williams II Site (34Lf25/165), Wister Lake, Oklahoma; with J. A. Newkirk and H. E. Jackson. Report to the U.S. Army Corps of Engineers, Tulsa District. Commonwealth Associates Inc., Report R-2568, 75 pp. Draft, 1983.

Settlement Pattern/Settlement System Analysis. In Class III Archeological Survey for the Proposed *Frontier Pipeline, Wyoming, pp. 359-383.* Report to Frontier Pipeline Company. Commonwealth Associates Inc., Report R-2543. 1983.

Phase I Archeological Investigation and Deep Site Testing along M-45, Ottawa County, Michigan; with D. R. Hayes, D. J. Weir, and J. Schuldenrein. Report to the State of Michigan Department of Transportation and Department of State, Michigan History Division. Commonwealth Associates Inc., Report R-2588, 34 pp. 1984.

A Cultural Resources Reconnaissance at Lake Red Rock, Iowa; with J. Schuldenrein and others. Report to the U.S. Army Corps of Engineers, Rock Island District. Commonwealth Associates Inc., Report R-2596, 247 pp. Draft, 1984.

Archeological Investigations at Fort Gibson Lake, Mayes, Cherokee, and Wagoner Counties, Oklahoma; with D. R. Hayes and J. Schuldenrein. Report to the U.S. Army Corps of Engineers, Tulsa District. Commonwealth Associates Inc., Report R-2598, 100 pp. Draft, 1984.

A Locational Analysis of the Lumbering Camps. In 1983 Cultural Resource Survey of the Hiawatha National Forest, pp. 197-230. Report to the U.S.D.A. Forest Service. Commonwealth Associates Inc., Report R-2589. 1984.

PAPERS PRESENTED, GUEST LECTURES

Society for American Archaeology: 1971, 1976, 1977 (invited symposium participant), 1978 (invited symposium participant), 1982.

Midwest Archaeology Conference: 1972, 1973, 1974, 1976, 1983.

Plains Conference: 1973, 1975, 1976, 1977 (invited symposium participant), 1979.

Illinois Archaeological Survey - Illinois Association for Advancement of Archaeology Workshop: 1972, 1974.

Guest lecturer and seminar participant, University of Arkansas, April 1976.

Guest lecturer to various University of Missouri classes, 1975-1979.

CURRICULUM VITAE

NAME: Joseph Schuldenrein

ADDRESS: <u>Office</u>

PII Redacted

Commonwealth Associates Inc.
Environmental Systems Division
209 East Washington Avenue
Jackson, MI 49201
Tel: (517) 788-3551

[redacted]

[redacted]

EDUCATION:

State University of New York at Stony Brook, 1967-1971,
B.A. in Anthropology with Departmental Honors

University of Chicago, 1973 - 1983
M.A. in Anthropology, 1976
Ph.D. in Anthropology, 1983

LANGUAGES: French, Polish, Hebrew, reading knowledge of German

PROFESSIONAL ORGANIZATIONS:

American Anthropological Association
Society for American Archeology
International Society of Sedimentologists
Israel Geological Society
Plains Conference on Archaeology
Society for Archaeological Science
Smithsonian Association
Illinois Archeological Survey
Southeastern Archeological Conference

FELLOWSHIPS AND GRANTS:

1967-71	New York State Regents Scholarship
1974-75	University Fellowship, Department of Anthropology, University of Chicago
1975-76	Field Museum of Chicago Fellowship
1976-78	Fulbright-Hays Fellowship for Overseas Research
	Government of Israel Research Grant

TEACHING EXPERIENCE:

1975	Teaching Assistant to Dr. R. L. Hall, University of Illinois - Chicago Circle for field course in <u>Eastern Woodlands Archeology</u> (Dickson Mounds, Illinois), summer semester.

TEACHING EXPERIENCE (Cont.):

1977, 1978: Part-time Instructor at Hebrew University, Jerusalem, Israel, for advanced seminar, Problems in Old World Prehistory.

TEACHING INTERESTS:

General Anthropology
Cultural Resource Management: Method, Theory and Application
New World Prehistory (emphasis on Eastern Woodlands)
Old World Prehistory (especially of the Near East)
Methods in Geo-Archeology
Late Quaternary Environments and Human Adaptation
Physical Geography and Soil Science (as independent as well as anthropologically related disciplines)

RESEARCH INTERESTS:

Paleo-Indian and Archaic Settlement Systems in the Midwest and Southeast
Micromorphology of Archeological Sediments
Late Pleistocene Climates and Prehistory, Demography
Land Use Patterns in Later Prehistory

FIELD AND LABORATORY EXPERIENCE:

1982 to Present: Geo-archeological Consultant - Tell Jahil excavation and survey, Jordan (Andrews University, Dr. L. Geraty, Director)

1982 to Present: Geo-archeological Consultant - Oriental Institute - Kish Project (Iraq) on early Urbanism (University of Chicago, Dr. M. Gibson, Director)

1982 to Present: Principal Investigator and Project Manager - Delaware River Flood Plain and Point Pleasant Archaeological Project, Pennsylvania (Philadelphia Electric) - Commonwealth Associates

1982: Principal Investigator and Project Manager Maple-Pine Archaeological Survey, Pennsylvania (Pennsylvania Power and Light) - Commonwealth Associates Inc.

FIELD AND LABORATORY EXPERIENCE (Cont.):

1981 to Present: Principal Investigator and Project Manager Abbeville - Bullard Archeological Mitigation (Richard B. Russell Reservoir), Georgia - South Carolina (Inter-Agency Archeological Services - Atlanta) - Commonwealth Associates Inc.

1980 to Present: Co-principal Investigator - Rucker's Bottom Archeological Mitigation (Richard B. Russell Reservoir), Georgia - (Inter-agency Archeological Services - Atlanta) - Commonwealth Associates Inc.

1980-1982 Environmental Archeology Coordinator - Haw River Prehistoric Project, North Carolina (U.S. Army Corps of Engineers) - Commonwealth Associates Inc.

1981: Environmental Archeology Coordinator - Saginaw Prehistory Survey, Michigan (General Motors) - Commonwealth Associates Inc.

1980-1981: Principal Investigator and Project Manager - Susquehanna River Flood Plain and Pond Hill Geo-archeological Project, Pennsylvania (Pennsylvania Power and Light) - Commonwealth Associates Inc.

1980: Environmental Archeology Coordinator - Archeological Survey for Great Lakes - Commonwealth Associates Inc.

1979: Head Cartographer; Oriental Institute - Mediterranean Project (University of Chicago, Dr. L. E. Stager, Director)

1977-1978: Doctoral Dissertation Research in Israel; Project on Quaternary Paleoenvironments and Prehistory of the Lower Jordan Valley. Sponsored jointly by Fulbright-Hays/Government of Israel grants (to J. Schuldenrein) and the Institute of Archeology, Hebrew University, Israel (Dr. O. Bar-Yosef, Director). Research stressed the reconstruction of changing prehistoric habitats with the application of geo-archeological methods.

FIELD AND LABORATORY EXPERIENCE (Cont.):

1977-1978: Field Geomorphologist and Soil/Sediment Analyst; Qadesh-Barnea/Northern Sinai Prehistoric Project (Hebrew University, Dr. O. Bar-Yosef and Dr. P. Goldberg, Directors)

1976: Geomorphologist and Soil Scientist; Palmahim Project, Central Israeli Coastal Plain (Rockefeller Museum, Dr. O. Bar-Yosef, Acting Director)

1976: Research Geomorphologist; Mississippi Valley/Cahokia Mounds Prehistoric Investigations, Illinois (University of Illinois - Chicago Circle, Dr. R. L. Hall and Dr. B. G. Gladfelter, Directors)

1975-1976: Research Assistant for Geomorphology, Soil Analysis, (South African Cave Project) and cartography (Nile Valley French Mapping Study) (University of Chicago, Dr. K. W. Butzer, Supervisor)

1975: Consulting Geo-archeologist and Site Surveyor; Survey of Lower Illinois Valley (Foundation of Illinois Archeology/Northwestern University, Dr. S. Struever, Director)

1974-1975: Chief Field Geomorphologist; "Nine-foot Channel" Prehistoric Site Survey of Upper and Central Illinois Valley (U.S. Army Corps of Engineers/University of Illinois - Chicago Circle, Dr. R. L. Hall, Director)

1973: Field Assistant and Stratigrapher; Nahal Hadera Prehistoric Excavations (Hebrew University, Dr. O. Bar-Yosef, Director)

1972: Field Assistant and Excavator; Prehistoric Project in Gebel Maghara, Northern Sinai (Hebrew University and University of Illinois - Chicago Circle, Dr. O. Bar-Yosef and Dr. J. L. Phillips, Directors)

FIELD AND LABORATORY EXPERIENCE (Cont.):

1971-1972: Field Assistant, Stratigrapher and Excavator; Cahokia Mounds Excavations, Illinois (University of Wisconsin - Milwaukee, Dr. M. L. Fowler, Director)

PAPERS PRESENTED:

1975: Early Prehistory and Geomorphology Along the Central Illinois Valley. Presented at the Twentieth Annual Midwestern Archeological Conference, Ann Arbor

1978: Soil Catenary Relations and Prehistoric Site Distributions Along the Coastal Plain of Israel. Presented at the Israel Geological Society Congress on "The Quaternary of the Coastal Plain", Jerusalem, Israel

1980: Late Quaternary Environments and Prehistoric Occupation of the Lower Jordan Valley. Presented at the Forty-fifth Annual Meeting of the Society for American Archaeology, Philadelphia

1980: The Application of Micromorphclogical Analysis to Archeological Soils: A Case Study from the Lower Jordan Valley. Presented at the Annual Meeting of the Geological Society of America, Atlanta

1981: Holocene Alluviation Sequences and the Archaic Succession in the Southeastern Interior: Observations on Synchroneity in the Geoarcheological Record. Presented at the Forty-sixth Annual Meeting of the Society for American Archeology, San Diego

1981: Archeological Investigations at Rucker's Bottom Elbert County, Georgia (with David G. Anderson). Presented at the Thirty-eighth Annual Meeting of the Southeastern Archeological Conference, Asheville, North Carolina

1982: Geo-archeological Investigations at Rucker's Bottom, a Multicomponent Site at the Richard B. Russell Reservoir, Georgia. Presented at the Forty-seventh Annual Meeting of the Society for American Archeology, Minneapolis

PAPERS PRESENTED (Cont.):	1982:	Archeo-stratigraphy and geomorphic dynamism at the Palmahim sites, Israel. Presented at the Eleventh International Congress on Sedimentology, Hamilton, Ontario, Canada.
	1982:	The Early Archaic Component at the Rucker's Bottom Site, Georgia (with David G. Anderson). Presented at the Thirty-ninth Annual Meeting of the Southeastern Archeological Conference, Memphis.
	1983:	Human Ecology and Prehistory Along the Savannah River: A Geo-archeological Perspective (with David G. Anderson). To be presented at the Symposium on Science and Archeology in the Southeast, Forty-eighth Annual Meeting of the Society for American Archeology, Pittsburgh.
	1983:	Prehistoric Environments of Occupation in the Lower Jordan Valley, 20,000 - 8000 B.P. To be presented at the Symposium on Late Pleistocene and Holocene environmental changes in the Western Mediterranean. University Paul Sabatier, Toulouse, France.
SYMPOSIUM ORGANIZER:	1981:	The Haw River Archaeological Project: Methodological Advances in Southeastern Prehistory and Geo-archeology. Forty-sixth Annual Meeting of the Society for American Archeology, San Diego.
PAPERS AND PUBLICATIONS:	1971:	The Evolution of the Code of Hammurabi. Unpublished A. B. Honors Paper, Department of Anthropology, S.U.N.Y. Stony Brook.
	1974:	Sedimentary Environments and Prehistoric Site Distributions in the Alluvial Valley of the Illinois (with R. L. Hall). Environmental Impact Reports, U.S. Army Corps of Engineers. Chicago. 205 pp.
	1976:	Bio-Physical and Paleo-Ecological Dimensions of Site Settlement Variability in the Central Riverine Archaic. Unpublished MA Paper, Department of Anthropology, University of Chicago.

PAPERS AND PUBLICATIONS (Cont.):

1976: Occupational Terraces and Natural Stratigraphy in the Central Illinois Valley: The Beardstown Terrace Complex. Transactions of the Illinois Academy of Sciences, 69: 122-44.

1978: Late Quaternary Stratigraphy and Prehistory of the Lower Jordan Valley. Metequfat Ha'even 17.

1978: Paleo-geographic Implications of Prehistoric Settlement Systems in the Central Illinois Valley. Anthropology 2:47-63.

1980: Gilgal, A Pre-Pottery Neolithic Site in the Lower Jordan Valley (with T. Noy and E. Tchernov). Israel Exploration Journal 30: 63-82.

1981: Late Quaternary Paleo-environments and Prehistoric Site Distributions in the Lower Jordan Valley: A Preliminary Report (with P. Goldberg). Paleorient 7:57-75.

1983: Late Quaternary Paleo-environments and Prehistoric Site Distributions in the Lower Jordan Valley. Unpublished Ph.D. dissertation, Department of Anthropology, University of Chicago.

1983: Early Archaic Settlement on the Southeastern Atlantic Slope: a View from the Rucker's Bottom Site, Elbert County, Georgia (with David G. Anderson). North American Archeologist 4(3):177-210.

1983: Mississippian Period Settlement in the Southern Piedmont: Evidence from the Rucker's Bottom Site, Elbert County, Georgia (with David G. Anderson). Southeastern Archeology 2(2).

1984: Towards a Geo-archeological Context for Saginaw Valley Prehistory: a Perspective from CRM. Michigan Academician in press.

In Preparation: Prehistory and the Alluvial Sequence of the Middle Susquehanna River, Pennsylvania (with Donna C. Roper). To be submitted to the Journal of Field Archaeology.

REFERENCES:

K. W. Butzer (Ph.D. Committee Chairman)
Departments of Geography and Anthropology
University of Chicago
5828 S. University Avenue
Chicago, Illinois 60637

O. Bar-Yosef
Institute of Archeology
Hebrew University -
Mt. Scopus
Jerusalem - ISRAEL

R. McAdams
Department of Anthropology and
Oriental Institute
University of Chicago
1126 East 59th Street
Chicago, Illinois 60637

Dan Yaalon
Department of Geology
Hebrew University -
Givat Ram
Jerusalem - ISRAEL

R. L. Hall
Department of Anthropology
University of Illinois -
Chicago Circle
P.O. Box 4348
Chicago, Illinois 60680

P. W. Weigand - Chairman
Department of Anthropology
S.U.N.Y. Stony Brook
Stony Brook, New York
11794

JOHN R. KERN 1984

BUSINESS ADDRESS
Commonwealth Associates Inc.
209 East Washington Avenue
Jackson, Michigan 49201
(517)788-3560

PII Redacted [redacted]

[redacted]

ACADEMIC HISTORY

Ph.D. University of Wisconsin, Madison, WI 1976
American History major; African History minor
Dissertation: Colonial American Political Protest 1676-1747
Advisor: Stanley N. Katz

MA University of Wisconsin, Madison, WI, 1968
American History
Thesis: Colonial American Historians 1700-1760

BA Swarthmore College, Swarthmore, PA, 1961
History major; Political Science, Economics minors

Diploma Phillips Exeter Academy, Exeter, New Hampshire, 1957

AWARDS

Graduate School: Vilas Graduate Fellowship, 1974; Ford Foundation Fellowship, 1969; Non-Resident Tuition Fellowship, 1965-1967; Colonial Dames Fellowship, 1965

College: Hannah A. Leedom Fellowship for Graduate Study, 1961; Graduated with Honors; Open Scholarship; Varsity Letter in Soccer

Secondary School: Phillips Exeter Academy Open Scholarship; Varsity Letter in Track, Four Years

PROFESSIONAL EMPLOYMENT

1979- Manager, Cultural Resources
Commonwealth Associates Inc., Jackson, Michigan

1978-1979 Supervisor, Historical Planning Section
Commonwealth Associates Inc., Jackson, Michigan

1974-1978 Historic Preservation Coordinator,
Michigan History Division, Michigan Department of State, Lansing, Michigan

PROFESSIONAL EMPLOYMENT (Contd)	1973-1974	Teaching Assistant and Vilas Graduate Fellow, University of Wisconsin, Madison, Wisconsin
	1970-1973	Assistant Professor: Colonial American History, Research Seminar, Afro-American History, Nineteenth-Century American History, Western Civilization; California State College, Stanislaus, Turlock, California
	1969-1970	Teaching Assistant, University of Wisconsin, Madison, Wisconsin
OTHER EXPERIENCE	1965	Forest Products Laboratory Technician, Forest Products Laboratory, Madison, Wisconsin
	1962-1964	Peace Corps Volunteer: Physical Education Instructor; Track and Cross-Country Coach, Village d'Enfants, LeKef, Tunisia
	1960-1961	Forest Service Surveyor's Assistant Boise National Forest, Idaho
	1958-1959	Settlement House Volunteer, Chester, Pennsylvania

PUBLICATIONS

"Waterman Barbour Gymnasiums Historic Structure Report," Michigan History, LXII (1978), 31-36

"Boston Press Coverage of Anglo-Massachusetts Militancy," "Newsletters to Newspapers: Eighteenth-Century Journalism (West Virginia University, 1977), 57-72

"A Short History of Michigan," Michigan History, LX (1976), 3-69; 20,000 copies published for secondary school and college use (Lansing 1977), 80p., illustrations, bibliography, index

Michigan's Annual State Historic Preservation Plan for Fiscal Year 1978, (editor), submitted to the U.S. Department of the Interior, August 1977

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Inventory of Historic Resources, Volume II of Michigan's Historic Preservation Plan, (editor), submitted to the U.S. Department of the Interior, August 1975

Michigan's Historic Preservation Plan, Volume I, The Historical Background, (editor), submitted to the U.S. Department of the Interior, December 1974

SPEECHES

"Geoarcheological, Historical Archeological and Historical Investigations at the Blue Water Bridge, Port Huron, Michigan," co-author with Joseph Schuldenrein, Society for Historical Archeology, Williamsburg, Virginia, January 1984

"History as Arbiter of Associational Significance for Material Culture and the Built Environment," Society for Historical Archeology, January 1983

"Social Change: The Rise and Fall of Tenancy in the Cotton South," Society for American Archeology, Minneapolis, Minnesota, April 1982

"Historical/Architectural Evaluation for VEPCO 230 kV Transmission Lines," Symposium on Environmental Concerns in Rights-of-Way Management, San Diego, California, February 1982

"The Uses of History, Ethnohistory and Historical Archeology for the Investigation of Afro-American Sites," Society for Historical Archeology, Philadelphia, Pennsylvania, January 1982

"History and Archeology: Sharpley's Bottom as a Case Study," Public History Conference, Raleigh, North Carolina, April 1981

"History for Hire," Public History Conference, Raleigh, North Carolina, April 1981

"History, Folk Housing, Oral History and Historical Archeology: Interdisciplinary Investigations at Sharpley's Bottom, Monroe County, Mississippi," Society for Historical Archeology, New Orleans, Louisiana, January 1981

"Cultural Resource Management," Educational Programs Department, Greenfield Village and Henry Ford Museum, Dearborn, Michigan, July 1980

SPEECHES (Contd)

"Planning Historic Sites Surveys," West Virginia Department of Culture and History, Conference on Historic Sites Surveys, Charleston, West Virginia, March 1980

"Nonacademic Applications of Historical Training," Program in American Culture, University of Michigan, Ann Arbor, Michigan, February 1980

"Historians and Historical Archeology," Society for Historical Archeology, Albuquerque, New Mexico, January 1980

"Historical Research for Historic Preservation," College of Architecture and Urban Planning, University of Michigan, Ann Arbor, Michigan, September 1978; September 1979

"The Economics of Preservation," Seminars on Preservation, Ann Arbor Historic District Commission, Ann Arbor, Michigan, May 1978

"Renovating Upper Stories: Housing in the Downtown," Ann Arbor Tomorrow, Ann Arbor, Michigan, April 1978

"The Boston Impressment Riot of 1747: Prologue to Revolution," Midwest Chapter of the Society for Eighteenth-Century Studies, Toledo, Ohio, October 1976

"Boston Press Coverage of Anglo-Massachusetts Militancy in the 1730s," Bicentennial Symposium on Eighteenth-Century Journalists, Morgantown, West Virginia, April 1976

"Colonial American Political Protest, 1675-1750," Michigan Academy of Science, Arts, and Letters, Michigan State University, East Lansing, Michigan, March 1976

"Teaching Afro-American History," Conference on Ethnic History, Stanislaus State College, Turlock, California, April 1973

"Anglo-Massachusetts Militancy, 1730-1741," Pacific Coast Branch American Historical Association, Portland, Oregon, September 1970

CULTURAL RESOURCE STUDIES

Archeological and Historical Investigation of the M-43 Improvement Project I-196 to Bangor, Van Buren County, Michigan (Co-Principal Investigator and Project Historian), report submitted to State of Michigan Department of

CULTURAL RESOURCE STUDIES (Contd)

Transportation and Department of State, December 1983, Commonwealth Associates Inc., Jackson, Michigan

Cultural Resources Survey of the Proposed Pee Dee Electric Generating Facility, Florence County, South Carolina (Project Historian), draft report submitted to South Carolina Public Service Authority, October 1983, Commonwealth Associates Inc., Jackson, Michigan

Phase II Archeological Investigations at Sharpley's Bottom Historic Sites, Tombigbee River Multi-Resource District, Alabama and Mississippi (Principal Investigator), report submitted to National Park Service, October 1983, Commonwealth Associates Inc., Jackson, Michigan

Archeological Investigations of Proposed Recreational Development and Proposed Wildlife Subimpoundments at B. Everett Jordan Dam and Lake, North Carolina (Co-Principal Investigator, Project Historian and Project Manager), draft report submitted to Wilmington District, Corps of Engineers, September 1983, Commonwealth Associates Inc., Jackson, Michigan

Cultural Resources Investigations for the M-100 Grand Ledge Bridge Replacement Project, Eaton County, Michigan (Principal Investigator, Project Historian and Project Manager), report submitted to State of Michigan Department of Transportation and Department of State, September 1983, Commonwealth Associates Inc., Jackson, Michigan

Land Use History for the City of Muskegon, Western Avenue Utility Reconstruction (Principal Investigator and Project Historian), report submitted to City of Muskegon, Michigan, September 1983, Commonwealth Associates Inc., Jackson, Michigan

The Light Rail System: an Archeological Evaluation (Historian), draft report submitted to southeastern Michigan Transportation Authority, Detroit, Michigan, August 1983, Commonwealth Associates Inc., Jackson, Michigan

Land Use History for the Muskegon Downtown Hotel and Convention Center Project (Project Historian and Project Manager), report submitted to Muskegon County Board of Commissioners, Muskegon, Michigan, July 1983, Commonwealth Associates Inc., Jackson, Michigan

Archeological and Geoarcheological Phase II Evaluation for the I-94 Blue Water Bridge Plaza Revision (Historian), report submitted to Michigan Department of Transportation and Michigan Department of State, July 1983, Commonwealth Associates Inc., Jackson, Michigan

CULTURAL RESOURCE STUDIES (Contd)

Phase II Archeological and Historical/Architectural Review for the Connectors Between M-62 and U.S.-31, Berrien County, Michigan (Project Historian and Architectural Historian), report submitted to State of Michigan Department of Transportation and Department of State, January 1983, Commonwealth Associates Inc., Jackson, Michigan

Route Selection Study: Twin Oak-Zenith 345 kV Transmission Line (Project Historian and Architectural Historian), preliminary report submitted to Houston Lighting & Power Company, November 1982, Commonwealth Associates Inc., Jackson, Michigan

Sharpley's Bottom Historic Sites: Phase II Historical Investigations, Tombigbee River Multiresource District, Alabama and Mississippi (Principal Investigator, Historian and Project Manager), report submitted to National Park Service, October 1983, Commonwealth Associates Inc., Jackson, Michigan

Testing and Evaluation of Two Sites on the Trailblazer Pipeline in Nebraska and Testing and Evaluation of Eight Sites on the Trailblazer Pipeline in Nebraska and Wyoming (Project Historian), reports submitted to Natural Gas Pipeline Company of America, May and January 1982, Commonwealth Associates Inc., Jackson, Michigan

Architectural and Cultural Resource Study of the Schlee Farmhouse and Tract in Jackson County, Michigan (Principal Investigator, Project Historian and Project Manager), report submitted to U.S. Fish and Wildlife Service, December 1981, Commonwealth Associates Inc., Jackson, Michigan

Historical and Architectural Evaluation and Impact Assessment of the Charlottesville to Remington VEPCO Transmission Line (Principal Investigator, Historian and Project Manager), five component reports submitted to Virginia Electric and Power Company, April 1981-April 1982, Commonwealth Associates Inc., Jackson, Michigan

Preliminary Archeological and Historical Assessment of the Flint Area Plant Site for General Motors Assembly Division (Project Historian), report submitted to Lombardo and Associates, March 1981, Commonwealth Associates Inc., Jackson, Michigan

CULTURAL RESOURCE STUDIES (Contd)

Study Plan for Environmental Assessment for the Bonny Liquid Natural Gas Project, Rivers State, Nigeria (Project Manager responsible for design and coordination of Ethnohistory, Social Anthropology and Historical Archeology), report submitted to Bonny LNG and Phillips Petroleum Gas Services, February 1981, Commonwealth Associates Inc., Jackson, Michigan

Phase I Interdisciplinary Investigations at Sharpley's Bottom Historic Sites, Tombigbee River Multi-Resource District, Alabama and Mississippi (Principal Investigator, Historian and Project Manager), draft report submitted to Interagency Archeological Services, October 1980; final report submitted January 1982, Commonwealth Associates Inc., Jackson, Michigan

Study of Archeological, Architectural and Historic Resources within the Metropolitan Memphis Area: Tennessee, Arkansas, and Mississippi (Principal Investigator and Project Historian), draft reports submitted to the Memphis District, Corps of Engineers, November 1979; December 1979; January 1980; March 1980; final reports submitted February and April 1981, Commonwealth Associates Inc., Jackson, Michigan

Cultural Resources Survey of the Red River from Shreveport to the Mississippi River (Quality Assurance for Historical Background and Ethnohistoric and Folkloric Backgrounds), draft report submitted to the New Orleans District, Corps of Engineers, December 1979; final report submitted October 1981, Commonwealth Associates Inc., Jackson, Michigan

Historic and Architectural Resources Evaluation, Appalachian Development Highway Corridor "H" (Principal Investigator, Historian and Project Manager), report submitted to the West Virginia Department of Highways, September 1979, Commonwealth Associates Inc., Jackson, Michigan

Cultural Resources Overview and Sensitivity Analysis for the Delaware River and Bay (Project Manager and Historian), report submitted to the Philadelphia District, Corps of Engineers, February 1979, Commonwealth Associates Inc., Jackson, Michigan

CULTURAL RESOURCES STUDIES (Contd)

Cultural Reconnaissance of the Cape May Inlet to Lower Township Project in Cape May County, New Jersey (Project Manager and Historian), report submitted to the Philadelphia District, Corps of Engineers, February 1979, Commonwealth Associates Inc., Jackson, Michigan

Archeological and Historical Investigations of the Floodplain Area, Midland Plant Site, Midland, Michigan (Project Historian), report submitted to Consumers Power Company, Jackson, Michigan, January 1979, Commonwealth Associates Inc., Jackson, Michigan

Archeological and Historical Survey of the Grass Rope Unit, Lower Brule, South Dakota (Project Historian), report submitted to the Bureau of Reclamation, Huron, South Dakota, November 1978, Commonwealth Associates Inc., Jackson, Michigan

Historic Resources Evaluation, Stonewall Jackson Lake Project, West Fork River, West Virginia (Principal Investigator, Project Historian and Project Manager), draft report submitted to the Pittsburgh District, Corps of Engineers, June 1978; final report submitted July 1980, Commonwealth Associates Inc., Jackson, Michigan

PROFESSIONAL SOCIETIES

American Association of State and Local History
National Council on Public History
National Trust for Historic Preservation
Organization of American Historians
Society for Historical Archeology
Society for Industrial Archeology

REFERENCES

Professor Stanley N. Katz
Department of History
Princeton University
Princeton, New Jersey 08540 (609)452-4170

Dr. James M. Smith, Director
Winterthur Museum
Winterthur, Delaware 19735 (302)656-8591

Mr. Willis Watkins
Assistant General Manager
Michigan State Exposition and Fair Grounds
1120 West State Fair Avenue
Detroit, Michigan 48203 (313)368-1000

BARBARA BEVING LONG

3140 EASTON BLVD.
DES MOINES, IOWA 50317
515-266-4964

October 7, 1983

PROFESSIONAL EXPERIENCE

Architectural Historian/Historian/Consultant, October 1980 to present.
- --Conduct architectural and historical surveys as part of Environmental Impact Statements.
- --Research and write National Register applications for property owners.
- --Conducted 11-month survey of historic sites for City of Des Moines (October 1982-September 1983) and wrote 180-page report.
- --Have undertaken various projects for Iowa Office of Historic Preservation, including writing architectural and historical evaluations of National Register applications and editing a report.

Historian/Associate Planner, September 1978 to October 1980, Central Iowa Regional Association of Local Governments (CIRALG).
- --Conducted survey of historic sites in central Iowa. Using primary sources and local interviews, located and evaluated specific sites, then wrote brief history for each community and related it to Iowa historical themes.
- --Wrote 72-page publication, "Hometown Architecture," about the history of central Iowa as seen through its buildings.
- --Wrote grant applications and National Register nominations.
- --Provided technical assistance, especially related to historic preservation, to communities in eight counties of central Iowa.

Architectural Surveyor, June 1978 to August 1978, CIRALG.
- --Evaluated, described, mapped and photographed architecturally significant structures in eight-county area.
- --Conducted courthouse search to determine owners and legal descriptions.
- --Wrote analysis of townscape and quality of buildings.

RELATED EXPERIENCE

Statewide Coordinator, December 1980 to October 1983, of a combined lobbying effort of National Trust for Historic Preservation, Preservation Action and other preservation groups.
- --Promoted citizen participation and contacted Congressional representatives regarding historic preservation concerns.

Chairman, Research Committee, November 1978 to June 1981, Living History Farms/Young Attorneys' Wives of Polk County.
- --Chaired research group eager to document 19th century law practice for use in Living History Farms reconstructed town of the 1870s.

--Supervised 15 volunteers on 3 committees.
--Conducted research.
--Wrote reports regarding architecture, furnishings and typical activities of the Iowa lawyer.
--Located and secured donation of law office building for the town.

Workshop Participant, National Trust for Historic Preservation, 1980 Community Preservation Workshop.
--Workshop provided information about preservation planning, surveys, fundraising, and other areas related to historic preservation and was especially valuable because enrollment was limited to 30 people.

EDUCATION

Postgraduate M.A., Landscape Architecture, August 1978, University of Wisconsin-Madison.
--Major emphases: historic preservation
American urban history and architecture
--Thesis: Analysis of city and park planning work of John Nolen in Wisconsin

Undergraduate B.A., Art History, June 1971, University of Wisconsin-Madison.
--Graduated with distinction
--Attended Northwestern University and University of Iowa

REFERENCES

--Available upon request

APPENDIX D

COORDINATION CORRESPONDENCE

C: JRKern / WWSchinley
File

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61201

REPLY TO
ATTENTION OF:

Planning Division

RECEIVED
ENVIRONMENTAL

Ms. Donna Roper, Ph.D.
Commonwealth Associates, Inc.
209 East Washington Avenue
Jackson, Michigan 49201

Dear Ms. Roper:

We have completed our review of your draft report entitled Cultural Resources Reconnaissance at Lake Red Rock, Iowa, prepared under contract DACW25-83-C-0064. The only external review received is from the Iowa State Historic Preservation Officer. You are instructed to address these comments in the final report through text changes and/or letters of response to comments in the correspondence appendix. Our comments are also enclosed. All letters of comment should be included in the correspondence appendix.

We regret to inform you that Interagency Archeological Services, Rocky Mountain Regional Office - Denver was not able to review your report due to their current workload. A copy of their letter is enclosed for inclusion in the final report.

Overall, the report is of exceptional quality. We are pleased to direct you to produce the final reports. If you have any questions, please call Mr. Charles Smith at 309/788-6361, Ext. 6349, or write to the following address:

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building
Rock Island, Illinois 61201

Sincerely,

James Schuerre
for Arthur J. Klingerman
Chief, Planning Division

Enclosures

Sheet 1 of 2

ROCK ISLAND DISTRICT

Branch/Office NCRPD-E **Reviewer** C. Smith **Ext. No.** 6349

Subject: Review of Draft Report entitled "Cultural Resources Reconnaissance at Lake Red Rock, Iowa" under contract DACW25-83-C-0064 **Date** ______

CMT. NO.	Dwg. or Para. No.	COMMENT
1	p.6, L: 2&3	Delete "in themselves"
2	Table 2-3	Indicate which dates are for Great Oasis components
3	p. 31	The fact that limited exploitable siliceous rocks were available for flint knapping should be critically examined in future studies to determine the effects upon lithic manufacturing techniques and site inventories. The authors' impression that tools and flakes appear to have been extensively utilized and reworked, provides a project area specific insight for future lithic procurement and processing studies.
4	p.43, L: 11 para. 2	Change "expanse" to "expense"
5	pp.43-45	How did the climatic shifts and concommitant vegetation changes affect prehistoric populations in terms of resource availability, land use, social structure, data preservation (i.e., erosion or burial), and so forth. This will help tie the information presented here with the more culturally-oriented portions of the report.
6		For this study, the strategy for site visitation based upon an elevation of 780 AMSL was appropriate. These sites are currently suffering from effects of flooding, wave wash, and erosion.
7	p. 59	In the second to last line, delete the word "were" after "48"

ROCK ISLAND DISTRICT

Branch/Office ________ Reviewer ________ Ext. No. ________

Subject: ________ Date ________

CMT. NO.	Dwg. or Para. No.	COMMENT
8	p. 97	The authors point out that small lithic scatters in areas with abundant chert resources are generally interpreted to represent processing stations or specific activity areas. However, it is insightful to suggest that similar findings at Lake Red Rock may not be so easily interpreted. In fact, these kinds of interpretations could lead to an overemphasis on delineating processing stations, obfuscating the actual functions of sites generated under conditions of lithic resource scarcity.
9	pp. 96-97	The relationship between bipolar technology and scarcity of raw lithic materials is intriguing.
10	p. 167	Note that Benn has pre-1000 A.D. dates at Saylorville Lake (ca 850).
11		Appendixes should include the SOW, the proposal, key staff vita, relevant correspondence, and any responses to review comments.

IOWA STATE HISTORICAL DEPARTMENT
OFFICE OF HISTORIC PRESERVATION

ADRIAN D. ANDERSON, Executive Director
STATE HISTORIC PRESERVATION OFFICER

February 13, 1984

Mr. Arthur J. Klingerman, Chief, Planning Division
Rock Island District, Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

RE: Lake Red Rock Literature Search, Cultural Resource Overview and Geomorphological Field Study
DACW25-83-C-0064

Dear Mr. Klingerman:

Thank you for the opportunity to review the most recent Lake Red Rock report. The report illuminates some recurring problems: inconsistent site data, information and site type definitions; problems with collectors and unauthorized use of areas; the destruction of sites by development and subsequent public use; and missing site sheets. The report successfully copes with these problems and presents a predictive model on which to base future work. The choices of geomorphic samples seemed well-placed, and tables 5-6 and 8-2 present information in a usable format.

One point of clarification which would render the report more useful as a guide in planning and management concerns site recommendations. In reading the report, I did not get a strong sense of which sites included in the present investigations might require more work. Additional work would need to focus on those sites which might be eligible for the National Register, with the intent of gathering data to support or negate a site's meeting the criteria of eligibility. By concentrating further investigations first on determining which sites meet the criteria, we will have the basis for formulating priorities in research. Then the recommendations made in the report will have some context.

Additional work (Phase II testing) should not be solely "emergency" oriented. Surveys and testing projects should be systematic and based on the model outlined in the report. Model development should focus on areas not dealt with in much detail in the model, understandably the kinds of sites we know least about: early, small or ephemeral. I envision historical research as part of any systematic survey or Phase II investigation. For all investigations it will be important to establish survey data which includes areas surveyed, but in which no sites were found.

In reference to the historical sections, the level of work is not comparable to the archaeological sections. This may be the result of the Scope of Work, or a lack of historical survey data. Nevertheless, while it is possible to get some sense of the general kinds of sites/properties/artifacts one might expect to find in the Red Rock area, the historical section does not discuss research priorities, data gaps or research questions, and does not relate RP3 study units to research directions. Perhaps these issues can be addressed in the final draft.

From the standpoint of historical resources and their treatment in this report, the work appears to fit into a familar tradition. This is one in which the commitment of financial resources was almost entirely to archaeological resources, with a small amount held back to prepare a veneer "once-over-lightly" treatment of historic period happenings via a review of easily available secondary literature. Perhaps future investigations will be able to discuss standing structures, if any, or explore shifting patterns of land settlement and land use in light of changing ethnic and occupational relationships.

If you have any questions concerning these comments, please do not hesitate to contact members of our staff. We appreciate the opportunity to review this draft report.

Sincerely,

Mary Ann McBride /for

Adrian D. Anderson, Executive Director
State Historic Preservation Officer

ADA/MAM/slh