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THE EFFECTS OF EROSION ON ARCHAEOLOGICAL SITES ALONG THE UPPER OAHE RESERVOIR, SOUTH DAKOTA*

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ABSTRACT

Shoreline erosion of archaeological sites along Lake Oahe, North and South Dakota since the late 1960s has resulted in substantial destruction to many significant and potentially National Register eligible archaeological sites. Using aerial photographs dating to the late-1930s, site maps, and recent aerial photographs, we document the effects of erosion at three major village sites located in the Northern Cannonball region of South Dakota. As a result of a prolonged drought, erosion of archaeological sites has been minimal since the late 1990s. When the current drought cycle ends, erosion will likely resume at pre-drought rates of 3 to 5 meters per year.

INTRODUCTION

During the last several years, below-average precipitation has resulted in water levels for the Missouri River and its impoundments surpassing levels reported for the drought period spanning the years 1987–1992. As of January 2003, water

*Fieldwork at Jones Village in 1997 and 1998 was conducted under ARPA permits DACW45-3-96-6014 and DACW45-3-98. Analysis of cultural material from Jones Village is ongoing, but is being subsidized by Johnson and S. A. Ahler. Access to Jones Village was granted by the landowner Everett Jones, and his renter Alvin Fjeldheim. Access to aerial photographs from the 1930s was provided by W. Raymond Wood. Marion Travis generously loaned several 1957-era USACE photographs to the authors for this research. James Ebert is acknowledged for providing a copy of his hard-to-find 1989 report. Special thanks to John Craig for his assistance with the excavations, logistical support, and for the great food in the field

levels in the six major Upper Missouri River reservoirs were as much as 19 feet below normal. By January 2006, the pool level for Lake Oahe—the largest of the upstream reservoirs—had dropped to 1577 ft MSL which represents more than a 30-foot decrease since January 1998. The U.S. Army Corps of Engineers (USACE), the federal agency responsible for management of this water system, has come under fire from conservationists, business interests, and Native American groups for their reservoir/river management policy. At issue is whether commerce, agriculture, and the need for fresh drinking water take precedence over wildlife conservation, natural resources, and recreation. To a lesser extent has been a discussion in the media of how fluctuating water levels affect cultural resources. With current pool levels below 1600 ft MSL, several sites, such as Mad Bear Camp and Leavenworth, have been exposed to erosion and looting. The Standing Rock Indian Reservation filed suit in 2000 against the corps alleging that poor management of Lake Oahe resulted in erosion of Native American burials (Humphrey, 2000). USACE has issued several press releases during the last several years reminding the public not to disturb burials or collect artifacts from eroding sites. Native American burials, however, comprise only part of the issue, given that entire archaeological sites, including several large and significant villages, have experienced substantial destruction as fluctuating water levels accelerate erosion during years when reservoir pool levels are maintained at higher (greater than 1600 ft MSL) stages.

Since 1999, Lake Oahe pool levels have fallen dramatically (Figure 1, Table 1), thereby resulting in the temporary stabilization of many high-risk sites. When pool-levels return to more normal (e.g., pre-1999) levels upon conclusion of the current drought cycle, archaeological sites once again will begin eroding, most likely at accelerated rates. For many sites, particularly those located in the Southern Cannonball region of northern South Dakota, the conclusion of the current drought cycle will signal the demise for many sites. Although USACE recently has initiated a proactive site stabilization program, it is in many cases too little, too late. Here we provide a brief overview of federally sponsored archaeology along the Upper Missouri River with an emphasis on Southern Cannonball region of Oahe Reservoir. Aerial photographs, site maps, and USACE pool-level (USACE, 2006) data are used to illustrate impacts to three major village sites that have significantly been affected as a consequence of fluctuating pool levels and cutbank erosion.

BACKGROUND

In 1945, USACE and Bureau of Reclamation (BR) instituted construction plans for a vast reservoir system throughout the country. These reservoirs were the result of the Flood Control Act of 1944 and its subsequent authorizing legislation. The majority of the dam-building efforts was focused in the Missouri River Basin, in

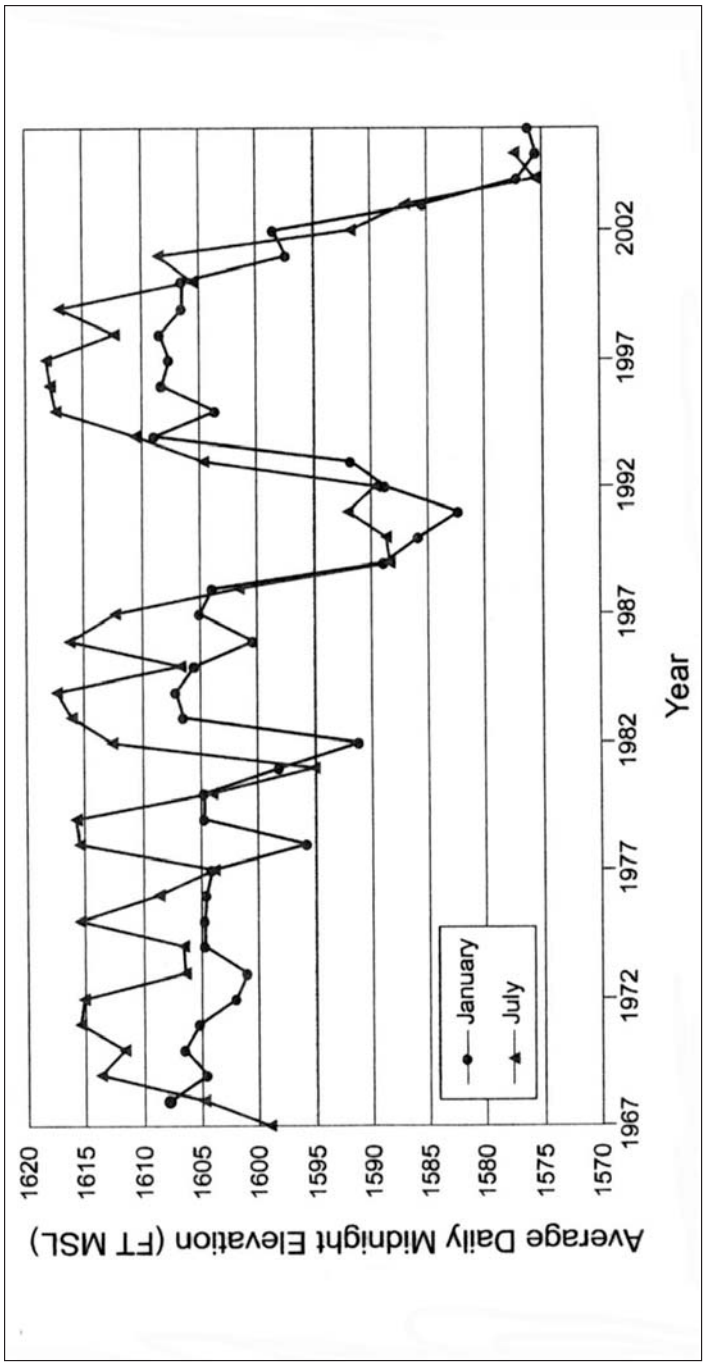

Figure 1. Average daily pool levels in feet MSL (mean sea level) for Oahe Reservoir for January and July 1967 through 2006. Note the large differences between the winter and summer pool levels, and the significant decreases in pool levels that have occurred since 1999. Data courtesy of USACE. (http://www.nwd-mr.usace.army.mil/rcc/projdata/oahe.pdf)

Table 1. Average Daily Midnight Elevation by Month for Oahe Reservoir from 1967–2006.
Data courtesy of USACE (www.nwd-mr.usace.army.mil/rcc/projdata/oahe.pdf)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1967						1594.9	1599.0	1600.6	1602.4	1603.8	1605.3	1606.8
1968	1607.7	1608.6	1609.6	1608.9	1607.9	1607.0	1604.9	1601.8	1600.1	1601.5	1603.6	1605.4
1969	1604.5	1607.1	1611.0	1614.9	1615.8	1614.7	1613.7	1612.5	1608.9	1606.7	1606.8	1607.2
1970	1606.5	1607.3	1606.9	1606.1	1610.4	1613.0	1611.7	1609.0	1606.3	1605.0	1605.4	1605.2
1971	1605.2	1607.1	1610.7	1614.2	1616.2	1616.3	1615.5	1612.3	1608.9	1605.9	1603.6	1601.8
1972	1601.9	1603.0	1606.8	1609.4	1612.2	1615.1	1615.2	1612.7	1608.7	1604.8	1602.1	1598.5
1973	1601.0	1602.8	1605.5	1608.1	1608.5	1608.0	1606.5	1604.7	1603.3	1602.2	1603.2	1604.3
1974	1604.7	1606.6	1608.4	1609.1	1608.5	1608.4	1606.6	1605.3	1603.9	1602.5	1603.2	1604.3
1975	1604.7	1605.5	1606.7	1608.3	1611.7	1613.5	1615.5	1617.3	1615.2	1611.3	1606.6	1604.8
1976	1604.5	1605.8	1606.1	1606.8	1607.1	1608.4	1608.6	1607.5	1605.2	1603.5	1603.6	1604.0
1977	1604.1	1606.2	1608.1	1608.0	1606.6	1605.8	1603.9	1600.8	1597.9	1596.2	1594.6	1593.8
1978	1595.7	1599.1	1603.9	1613.3	1615.2	1615.6	1615.5	1614.3	1611.8	1608.8	1606.1	1604.9
1979	1604.7	1606.4	1608.4	1612.3	1614.8	1615.6	1615.8	1614.5	1612.4	1609.5	1607.1	1605.2
1980	1604.7	1605.2	1607.1	1608.1	1607.0	1605.2	1604.1	1600.9	1598.9	1597.4	1596.9	1597.4
1981	1598.1	1600.0	1602.0	1599.7	1596.1	1595.0	1595.1	1595.1	1592.9	1592.0	1590.8	1591.3
1982	1591.1	1594.7	1599.5	1604.4	1606.6	1612.2	1612.6	1611.8	1609.0	1607.8	1608.1	1608.1
1983	1606.5	1606.6	1609.5	1612.8	1615.4	1615.4	1616.1	1614.7	1613.1	1611.0	1608.5	1606.6
1984	1607.0	1609.3	1610.9	1612.2	1614.5	1616.5	1617.5	1615.3	1612.0	1609.3	1607.4	1605.8
1985	1605.4	1607.3	1609.5	1610.7	1609.8	1609.0	1606.8	1604.2	1602.4	1601.4	1600.1	1598.6
1986	1600.3	1602.5	1608.7	1614.1	1617.7	1617.1	1616.4	1613.9	1611.1	1610.3	1609.1	1606.9

1987	1605.0	1605.1	1607.9	1614.5	1613.8	1613.7	1612.4	1610.9	1608.9	1606.8	1604.0	1603.8
1988	1603.8	1605.0	1606.7	1606.2	1605.0	1604.0	1601.7	1598.6	1594.8	1591.5	1588.8	1589.0
1989	1588.9	1590.1	1591.6	1593.2	1591.7	1590.2	1588.4	1585.9	1583.9	1582.1	1582.3	1584.0
1990	1585.8	1588.5	1590.5	1589.8	1588.2	1588.7	1588.7	1587.2	1585.0	1582.0	1581.9	1582.8
1991	1582.3	1584.7	1587.1	1587.2	1587.5	1591.2	1592.1	1590.0	1585.8	1584.5	1585.3	1586.5
1992	1588.7	1590.5	1592.5	1591.5	1590.7	1590.2	1589.7	1590.3	1591.0	1590.8	1591.4	1592.0
1993	1591.8	1593.0	1594.7	1597.4	1599.1	1600.8	1604.6	1609.6	1610.9	1610.6	1610.3	1609.9
1994	1608.8	1607.8	1610.0	1611.1	1610.5	1610.4	1610.5	1609.1	1607.3	1605.8	1604.3	1603.6
1995	1603.5	1605.5	1608.0	1609.3	1614.1	1617.9	1617.5	1614.2	1612.9	1611.8	1610.4	1608.1
1996	1608.1	1609.5	1612.1	1612.8	1613.7	1618.2	1618.0	1616.9	1615.6	1614.2	1611.4	1608.2
1997	1607.6	1608.8	1612.6	1617.4	1617.7	1617.8	1618.2	1617.8	1617.0	1615.9	1614.2	1610.8
1998	1608.3	1607.9	1607.9	1609.0	1609.6	1610.3	1612.3	1612.3	1611.3	1610.0	1609.3	1608.4
1999	1606.5	1607.1	1608.7	1609.7	1613.9	1616.5	1617.2	1616.9	1615.9	1612.7	1608.9	1606.7
2000	1606.4	1605.5	1607.4	1606.8	1607.1	1606.9	1605.6	1603.5	1600.9	1599.2	1597.8	1597.0
2001	1597.3	1598.2	1599.8	1603.4	1606.4	1608.1	1608.5	1607.4	1604.5	1602.3	1600.4	1599.1
2002	1598.5	1598.9	1598.6	1597.0	1596.3	1593.8	1591.7	1589.6	1587.4	1586.1	1584.3	1584.3
2003	1585.3	1586.1	1587.7	1587.5	1588.1	1588.3	1586.9	1585.5	1582.8	1579.7	1577.5	1576.5
2004	1577.0	1578.4	1580.8	1581.9	1579.7	1577.5	1575.6	1573.2	1572.5	1573.7	1575.4	1576.1
2005	1575.5	1575.7	1575.8	1574.1	1575.7	1577.0	1577.3	1575.3	1573.3	1573.4	1574.9	1575.3
2006	1576.0	1577.4										

particular the Missouri Valley of North Dakota and South Dakota. Several archaeologists, notably William Duncan Strong, Frederick Johnson, and William S. Webb, recognized that these reservoirs posed an inherent threat to America's archaeological resources (Strong et al., 1945). They subsequently founded the Committee for the Recovery of Archeological Remains (CRAR) in 1945 to address the impacts of reservoir inundation to archaeological resources.

CRAR was organized under the joint sponsorship of the Society for American Archaeology (SAA), the American Anthropological Association (AAA), and the American Council of Learned Societies (ACLS). The immediate goal of CRAR was to have the federal government establish a River Basin Surveys (RBS) program similar to the large-scale archaeological programs conducted under the Tennessee Valley Authority and the Works Progress Administration of the 1930s. The specific goal of the RBS was to salvage as much archaeological and paleontological information as possible from sites to be impacted by the reservoirs. CRAR sought and obtained sponsorship for the RBS from the Smithsonian Institution (SI) through Secretary Alexander Whetmore (Glenn, 1994; Thiessen, 1999). From the onset of the SI-RBS program, academic institutions, state agencies, and archaeological societies were authorized to undertake research at specific sites or reservoir areas. Between 1946 and 1950, the federal government provided no financial support to these cooperating agencies. Beginning in 1950, NPS began to financially support the salvage efforts of some of these organizations through research contracts (Glenn, 1994). These contracts never fully covered the total costs of research, but they did defray some expenses incurred by the cooperating institutions. This method of cost-sharing lasted throughout the history of the SI-RBS program.

The majority of salvage projects initiated along Lake Oahe were at village sites located between Pierre and Mobridge, South Dakota (for figures depicting locations of the major SI-RBS excavations see Lehmer (1954, 1971); and Stephenson (1971)). With the exception of a few sites (e.g., Leavenworth (39CO9), Fort Manuel (39CO5), Demery (39CO1), Bamble (39CA6), and Anton Rygh (39CA4)), archaeological investigations between Mobridge, South Dakota and the North Dakota-South Dakota state line (approximately 50 km) were virtually nonexistent (Figure 2) despite the fact that scores of potentially significant archaeological sites occur along this stretch of the Missouri River.

The SI-RBS program operated from 1946 through July 1969 at which time project personnel and facilities were transferred to NPS and the program was reborn as the Midwest Archeological Center. At the same time, it was agreed that NPS would continue the salvage mission of the SI-RBS into the foreseeable future (Glenn, 1994; Thiessen, 1999). Unfortunately, a major lack of funding precluded the initiation, with few exceptions, of long-term large-scale research projects along Oahe Reservoir. Thiessen (1999) provides a comprehensive history of the SI-RBS program and subsequent involvement of Midwest Archaeological Center.

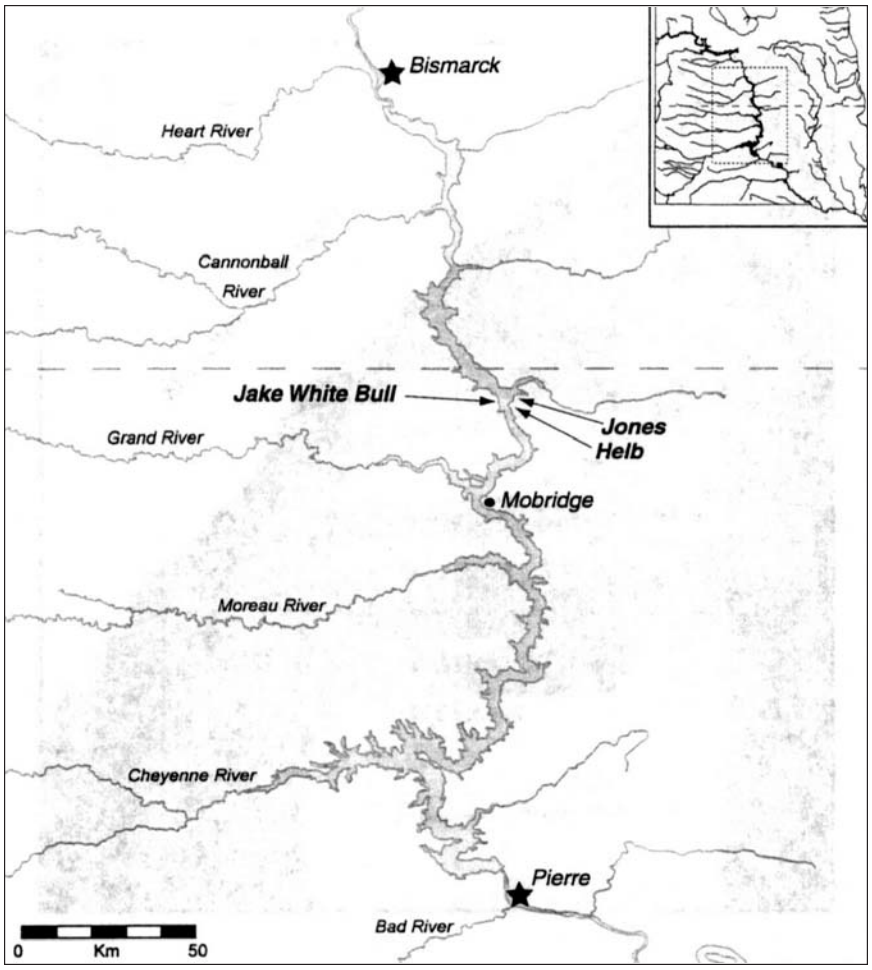

Figure 2. Map of Lake Oahe showing the major tributaries and archaeological sites discussed in the text.

THE IMPACT ON ARCHAEOLOGICAL SITES: JONES VILLAGE, JAKE WHITE BULL, AND HELB

When construction of Lake Oahe was initiated, archaeologists recognized that sites would be adversely affected and took action to mitigate these effects, focusing on sites that were in most danger of being destroyed. After completion of Oahe Reservoir, and as the pool-level began to reach capacity, a few archaeologists, notably D. J. Lehmer and W. R. Wood, turned their attention to archaeological sites along the northern end of Oahe Reservoir in South Dakota. With few

exceptions, the SI-RBS program had all but ignored the area from around Mobridge, South Dakota to southern North Dakota, in part perhaps because sites located at higher elevations were not perceived to be in imminent danger. Also, there is the possibility that there may have been a misconception regarding the ultimate fate of the Southern Cannonball region sites—that is, these sites would be inundated and thereby preserved until such time that the reservoir was drawn down. All of this was called into question in 1966 when an aerial survey conducted by Lehmer and colleagues determined that several large and previously uninvestigated village sites were actively eroding. At the urging of Lehmer and Wood, NPS contracted with the University of Missouri in 1969 to excavate three sites: Walth Bay (39WW203), Lower Grand (39CO14), and Helb (39CA3) (Falk and Ahler, 1988). In 1976, USACE contracted with the University of North Dakota to conduct reconnaissance and test excavations at Jake White Bull (39CO6) and Travis 2 (39WW15) (Ahler, 1977, 1980; Ahler, et al. 1977; Weston, 1979). In the mid-to-late 1970s, USACE contracted with the University of Nebraska and the University of South Dakota to conduct shoreline survey augmented by limited testing along the east shore of Lake Oahe (Falk and Pepperl, 1986). In all cases, the archaeologists stressed the need for additional work at these and other sites in peril. Despite recognition that archaeological sites were being destroyed, many of which were potentially eligible for the National Register of Historic Places, federally-sponsored archaeological fieldwork in the Southern Cannonball region was minimal from the mid-1970s through the late-1990s. More recently, however, this situation has begun to change.

It is probably no coincidence that lawsuits filed by Native American groups coincide with USACE's apparent renewed interest in cultural resource preservation along Lake Oahe. In the last several years, USACE has developed a program management plan for its Cultural Resource Program (USACE, 2002), and indeed it does appear that archaeological resources are becoming a higher funding priority. Between 1987 and 1997, USACE spent about $1.29 million on cultural resource projects in the upper Missouri reservoirs; between 1998 and 2004, this investment was increased to a little more than $6 million (USACE, 2004). Although recent efforts indicate that cultural resources are a higher USACE priority than in the past, decades of apathy have resulted in significant impacts and the innumerable loss of information for many archaeological sites located along the upper reservoir.

In many cases, the pre-reservoir conditions of the larger village sites in the Missouri Valley are documented in aerial photographs generated by the Agriculture Adjustment Association (AAA) during the 1930s and 1940s. When these photographs first became available, their value was recognized, almost immediately, by archaeologists such as T. E. Huddleston (1947), who used AAA aerial photographs taken in the late 1930s for northern South Dakota and southern North Dakota to identify at least 60 prehistoric village sites. Huddleston recognized that most of these village sites probably had been located previously by

archaeologists, but argued that a great deal of time and energy could have been saved had aerial photographs been available to those conducting the archaeological surveys (Huddleston, 1947:28).

Aerial photographs produced in the 1930s remain invaluable, even today, for documenting large village sites. These photographs show the Missouri Valley prior to the construction of reservoirs and are excellent for not only locating and identifying sites, but also for determining how the impoundment of the Missouri River has impacted archaeological sites. Consequently, aerial photographs generated in the 1930s can be used as a pre-reservoir baseline by which we can document the destruction of archaeological sites. In the discussion that follows, we use aerial photographs and site maps to document the history of destruction at three major villages in the Southern Cannonball region. To accomplish this task, we digitized 1930s era AAA photographs. We then digitized site maps and 1997 aerial photographs which were scaled and overlaid on the earlier AAA images. The end product is a figure that provides a history of destruction at a given site. Such figures also provide a means for quantifying erosion between various time periods. We stress, however, that these figures are not perfect in the sense that our placement of cutbanks are depicted exactly where they occurred at any given point in time, but instead can be considered accurate to within a few meters (e.g., ~5–15 meters), and are sufficient for our study which seeks to document the broad scale temporal impacts to these sites.

Jones Village (39CA3)

Jones Village (39CA3) is located on the east bank of Lake Oahe, approximately 30 km north of Mobridge, South Dakota. The site is classified as Initial Middle Missouri (IMM) under Lehmer's (1971) taxonomic framework. The village is unique because it is spatially separated from other IMM villages by at least 75 miles, making it the northernmost IMM village, and it appears that the site may have been comparable in size to the largest known IMM site, Sommers (39ST56; Steinacher, 1990). Although it is possible that a portion of the site may have been occupied by later Extended Middle Missouri groups, as a small fraction of the pottery suggests, the irregular arrangement of houses and artifactual evidence salvaged in 1997 and 1998 point to a dominant IMM occupation (Johnson, 1998). A series of five radiocarbon dates based on wood charcoal place the occupation of the site from A.D. 1039–1211 (Johnson, n.d.).

The site was first recorded by W. H. Over and revisited in 1952 by J. J. Hoffman and C. Farrell, and again by Lehmer and colleagues during a fly-over in 1966. K. Lippincott visited the site in 1970, and made a small surface collection of lithic material and shell fragments. University of Nebraska-Lincoln (UNL) archaeologists examined the site during a shoreline survey and testing project in 1979. The UNL crew recorded portions of at least 60 features, including 12 houses that were exposed in the cutbank, and they excavated four 1 × 1 meter test units (Falk and

Pepperl, 1986). The earlier documentation of the site suggested that Jones Village could be assigned to the Extended variant of the Middle Missouri Tradition. As the 1979 fieldwork progressed, it became clear that there was a large and significant IMM component at the site. Had Jones Village been suspected of being an IMM site during the SI-RBS era, there is little doubt that it would have received significant attention and would have been the focus of large-scale excavations.

Despite the potential significance of the site, we are not aware of any additional work at Jones until spring 1997 when C. Johnson, alarmed at the rate of destruction at the site and the knowledge that little research had been conducted, assembled a team of volunteers to map and salvage some of the features exposed in the cutbank. During the summer of 1997, Johnson returned with Speakman, K. Kvamme, and a small team to conduct limited remote sensing. Johnson and Speakman again returned to the site in the spring of 1998 and excavated several additional features. As a consequence of these efforts, portions of more than 15 houses, 75 features, and a previously unknown fortification ditch were documented and/or excavated.

A surface collection of artifacts from the beach resulted in recovery of a wide array of artifacts. Hundreds of IMM pottery sherds were collected, as were numerous bone tools and unmodified faunal material. Stone tools and flaking debris derived from Knife River Flint and Tongue River Silicified Sediment also were collected. Of particular interest is that a large portion of the tools and flaking debris exhibited evidence of bipolar reduction, which is unusual for this region of the Plains.

Erosion at Jones Village (and other sites along Lake Oahe) has been steady and unrelenting since completion of the reservoir, save for the six dry years between 1987 and 1992 and the most recent nine years (1998 to present). Between 1965 and 1979, we estimate that 50–75 meters of the site eroded away; an additional 45–60 meters of erosion occurred between 1979 and 1997. We estimate that approximately 150 meters of erosion has occurred at the site since 1965 (Figure 3). If we control for the minimal amount of erosion that would have occurred during drought years (e.g., 1988–1992 and 1999–present), we estimate that erosion has occurred at a rate of about 4–5 meters per year since the late 1960s. Although 5 meters per year may seem high, these numbers are consistent with numbers reported at other sites along Oahe (e.g., Ebert et al., 1989; Johnson, 1996). One example of the rapidity with which the erosion can occur was made evident to us in July 1997. Two months earlier, we observed that USACE boundary monument 22-7 located near the northwest side of the sites was about 2 meters from the edge of the cutbank. When we returned to the site two months later, we were unable to locate this marker—it had eroded away as a result of high reservoir level and wave action driven by westerly winds. The following year, boundary monument 22-7 was located on the beach—approximately 8 meters from the edge of the cutbank. Clearly, extensive erosion along Oahe has not only affected archaeological resources, but also private property. Sometime after the 1998

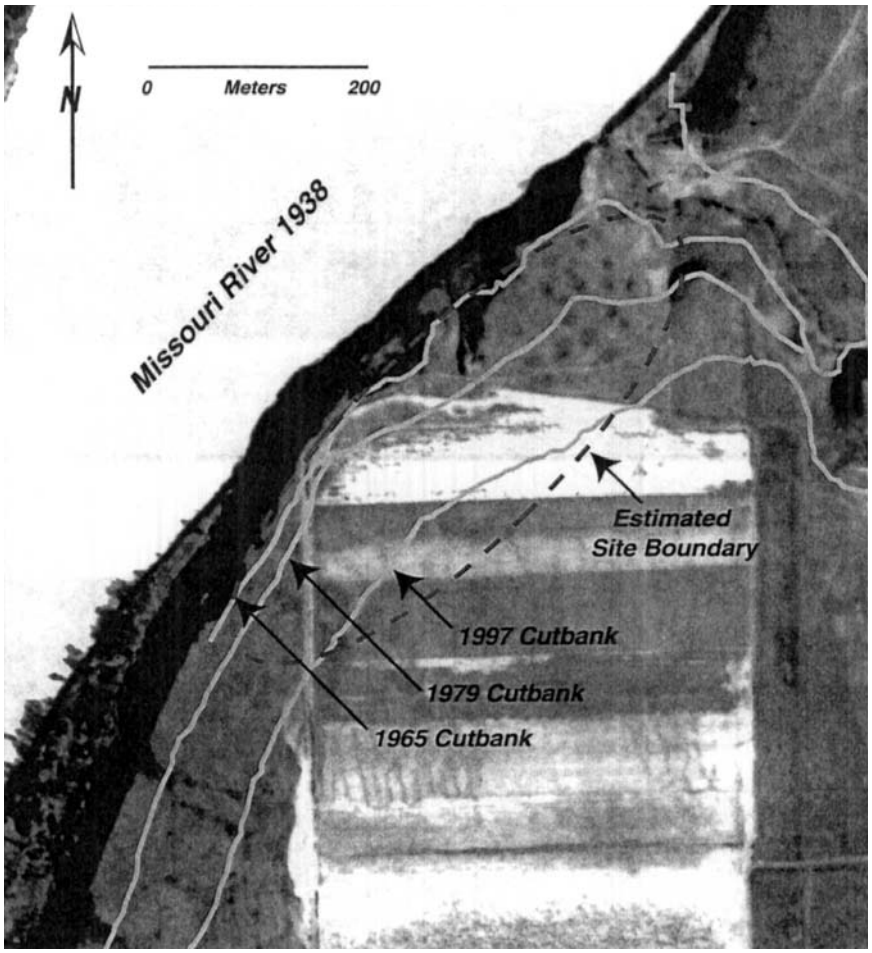

Figure 3. Aerial photograph of Jones Village depicting the site as it was in 1938. The location of the Lake Oahe cutbank in 1965 is based on a USGS topographic map. The location of the 1979 cutbank is based on site maps presented in Falk and Pepperl (1986). The location of the 1997 cutbank is based on an aerial photograph and on fieldwork conducted at the site (Johnson, 1997, 1998). The 22 or so dark circular features on the northern end of the site are house depressions. Other house depressions and the fortification ditch are not visible due to agricultural activity.

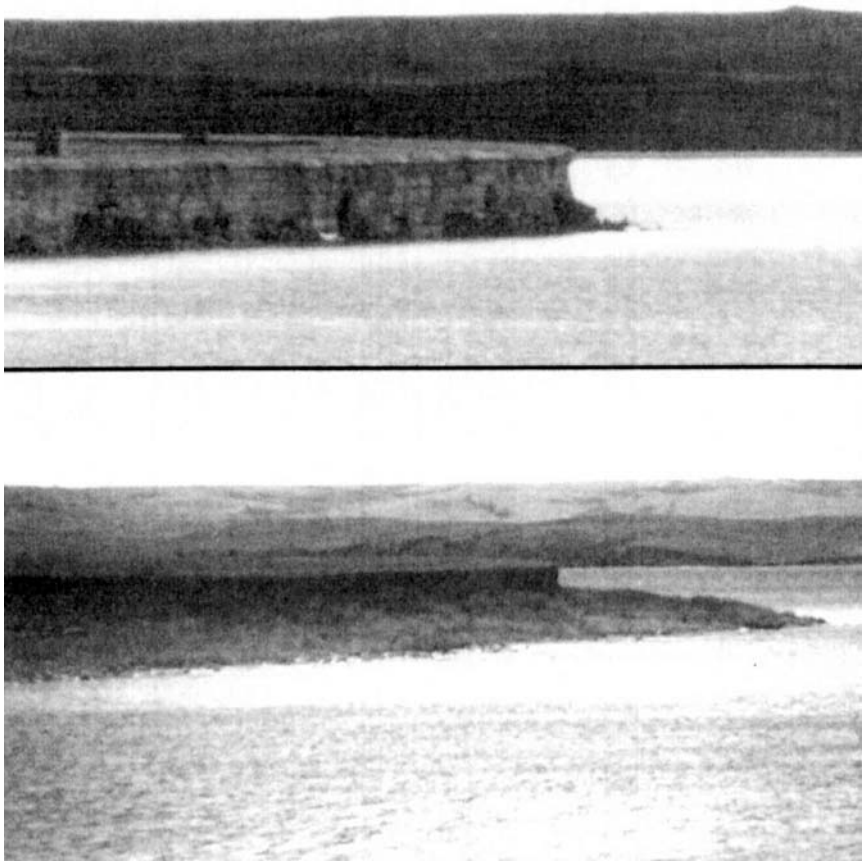

Figure 4. Top: view to the southwest of Jones Village in July 1997; the pool level at the time of this photograph is ca. 1618 feet MSL. Bottom: similar view of Jones Village in September 1998; the pool level at the time of this photograph is ca. 1611 feet MSL. The pool level in December 2004 was ca. 1576 feet MSL. The total height of the cutbank ranges from 4 to 5 meters. Photographs by R. J. Speakman

excavations, USACE undertook stabilization measures of the site consisting of boulders placed along the cutbank.

The erosion of Jones Village and many other sites along Lake Oahe can be attributed, at least in part, to dramatic changes in the elevation of the lake through time (e.g., Figure 4). When pool levels are high, wave action and water current

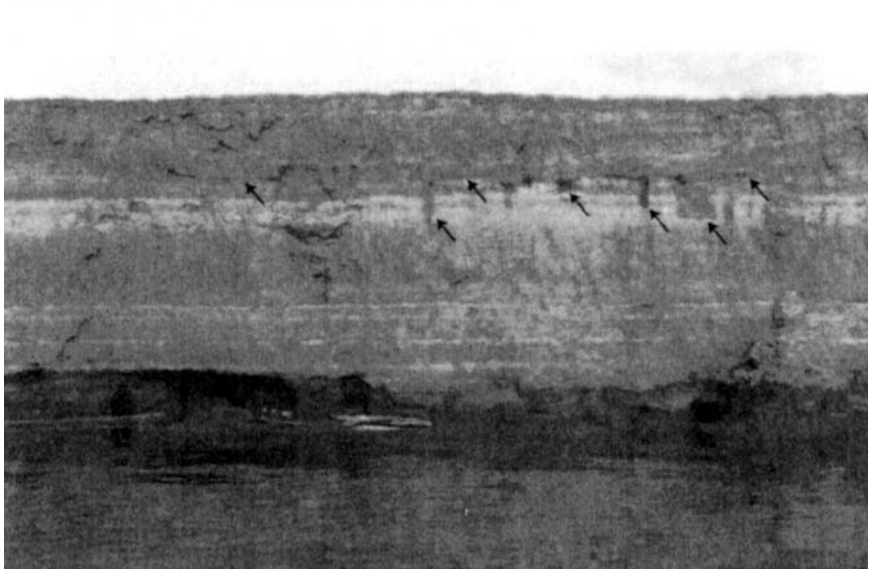

Figure 5. View of the cutbank at Jones Village (39CA3). Arrows indicate the floor and several post molds and pit features. Undercutting of the bank is evident at the bottom of the cutbank. The floor of the house is about 1.4 meters below the ground surface; the total height of the cutbank at this location is about 5 meters. Photograph by Craig Johson, May 1997.

undercut the bank (e.g., Figure 5). When the pool level drops, the overlying sediments, weakened by the undercutting that has occurred, cleave away from the cutbank (e.g., Figure 6). Kay (1995:9–10) also has proposed that when saturated, the underlying Pierre Shale bedrock is unable to support the weight of the overlying sediments which then break-off as large blocks that slump or glide into the lake. It is probable that both scenarios, as well as freeze-thaw cycles, contribute to the erosional process at sites along Oahe.

Jake White Bull (39CO6)

Jake White Bull (39CO6) is a fortified earthlodge village originally containing about thirty houses. It is located on the west bank of the Missouri River approximately 30 km north of Mobridge, SD. P. L. Cooper originally discovered and described the site using an aerial photograph (Ahler, 1977:11). In 1966 the site was visited by J. J. Hoffman and D. J. Lehmer who documented the site and observed that it was actively eroding into Oahe reservoir (Ahler, 1977:11). In 1977, USACE contracted with University of North Dakota archaeologists to conduct a very limited reconnaissance and evaluation program at the site. The site

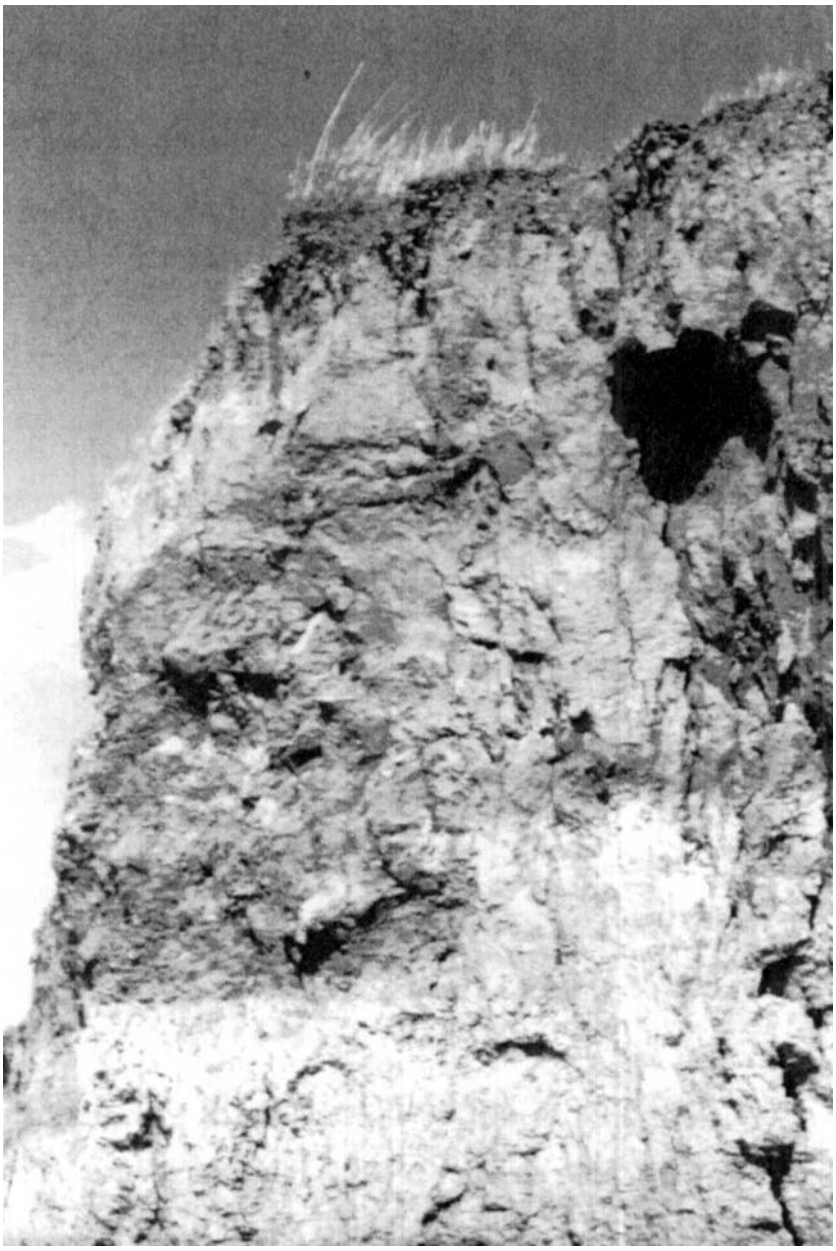

Figure 6. Portion of the cutbank at Jones Village that is nearing the point of collapse. Note the vertical crack on the right side of the picture. Photograph by R. J. Speakman, July 1997.

was subsequently mapped and limited excavations were conducted. The USACE, in response to extensive shoreline erosion, conducted work to stabilize the shoreline at Jake White Bull in 2001. A recommendation that this work be conducted was first made by Ahler in 1977, 25 years earlier (Ahler, 1977:150–151).

Figure 7 depicts Jake White Bull as it was in 1938. Visible in the aerial photograph are 30 or so house depressions and a fortification ditch that encompassed the site. When the site was first visited by Hoffman and Lehmer in 1966, the eastern edge of the site was partially eroded and inundated by the rising water of Lake Oahe. By 1976, approximately 75% of the site had been destroyed. Based on a 1997 aerial photograph, we estimate that between 1976 and 1997 approximately 30–40 meters of erosion occurred. We estimate that currently only about 10% of the site remains intact.

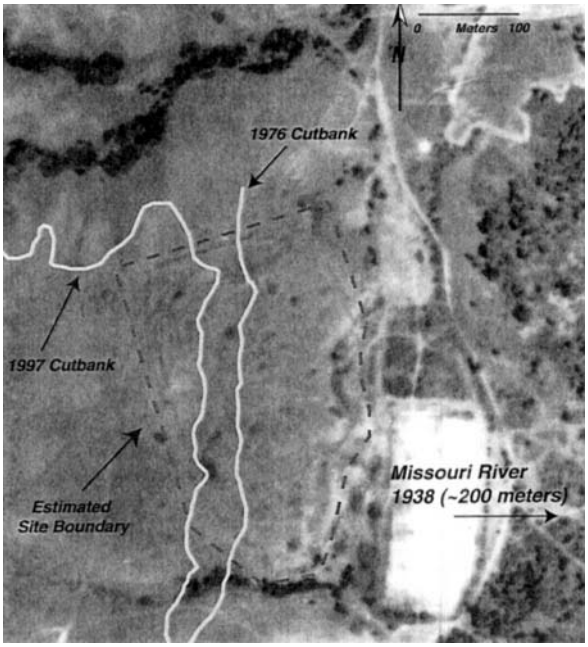

Figure 7. Aerial photograph of Jake White Bull (39CO6) depicting the site as it was in 1938. The location of the Late Oahe cutbank in 1976 is based on Ahler's (1977) map of the site. The 1997 cutbank is based on a 1997 aerial photograph and site visit. A fortification ditch and multiple house depressions are visible within the area denoted by the dashed line.

Helb (39CA208)

The Helb site was located on the east bank of Lake Oahe approximately 27 km north of Mobridge, South Dakota. The site was originally recorded in 1952 by SI-RBS archaeologists C. Farrell and J. J. Hoffman as site 39CA204, an area that included approximately 240 acres and was described as having "numerous pits identity unknown." Helb was subsequently designated a low priority site and no additional work at the site was planned. The site was relocated and formally described in 1966 by J. J. Hoffman, D. Evans, D. Lehmer, and W. Bass, who were conducting an aerial survey of segments of Lake Oahe. Limited investigations by University of Missouri archaeologists in 1969 resulted in large surface collection and a site map. During 1972 and 1973, in response to mass erosion of the site, detailed excavations were conducted by personnel from the Midwest Archeological Center, Lincoln, Nebraska. On-going destruction of the site was monitored by various individuals through the remainder of the 1970s. By 1979, it was believed that only small portions of six houses (out of about 40) remained. In 1992,

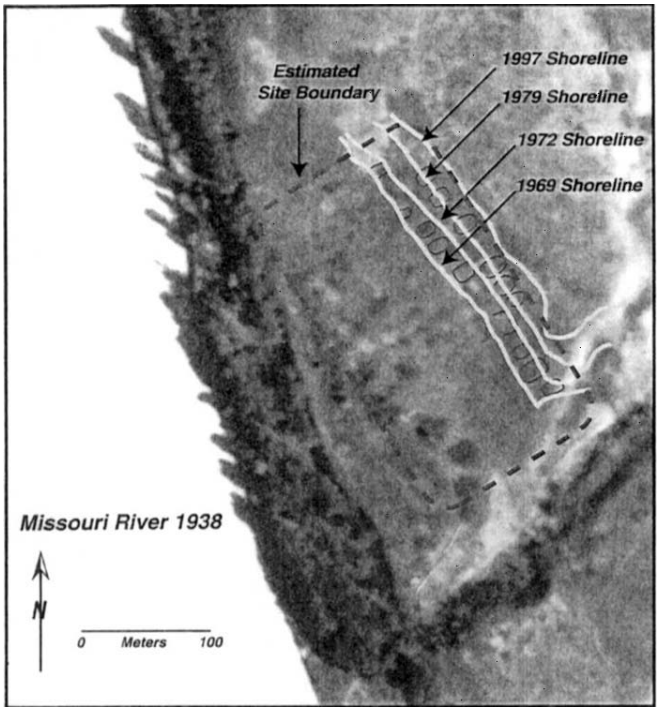

Figure 8. Aerial photograph (circa 1938) showing the location of the Helb site (39CA208) relative to the Missouri River. The location of the 1997 cutbank is based on a 1997 aerial photograph. The 1969 shoreline is based on W. R. Wood's 1969 base map; house outlines from the base map are superimposed on the 1938 aerial photograph. Shorelines from 1972 and 1979 are based on site maps of Helb provided in Falk and Ahler (1988).

the University of Arkansas was contracted by the USACE to conduct limited investigations and evaluate the current status of the site (Kay, 1995).

Figure 8 reproduces the 1969 Falk and Ahler (1988:87) map of Helb which has been reduced and scaled to overlay on the 1938 AAA aerial photograph. The site is barely discernible in the 1938 (and 1957) aerial photographs. Fortunately, the existence of a historic embankment running along the northern and eastern edge of the site is visible in aerial photographs of the site, as well as a few prominent houses, facilitates the placement of the 1969 map over the 1938 aerial photograph. Figure 8 shows the site as it was first mapped in 1969, it does not, however, show the other 25 houses that were destroyed between 1966 when the site was first located and 1969 when the site was first mapped. Figure 8 also does not illustrate the portions of houses 10–15 that were documented during Kay's 1992–1993 field-work campaigns. The 1997 aerial photograph of the sites shows that the far northeastern corner of the historic embankment is still present but suggests that the last row of houses is completely destroyed. It is very possible that Helb no longer exists.

CONCLUSIONS

The ethnohistory and archaeology of the Middle Missouri subarea are concerns of long standing. Substantial archaeological fieldwork has preceded and followed the impoundment of the Missouri River. And, fieldwork conducted at scores of major archaeological sites ultimately culminated in Lehmer's 1971 synthesis. Subsequent research has likewise resulted in the publication of numerous articles, graduate theses, and technical reports. It would be wrong, however, to regard these efforts as sufficient for present management needs. Since the excavation of many sites along Lake Oahe during the SI-RBS heyday, there have been many truly revolutionary changes in research methodologies—changes that have the potential to radically alter and/or improve our knowledge of the age or antiquity of archaeological sites and of prehistoric human and social dynamics. By virtue of changes in methodology and related theory, and the imminent loss of many village sites, a proactive management program is required for the Middle Missouri subarea. The management of Jones Village, Helb, Jake White Bull, and other threatened sites must be pursued aggressively. Obviously, such a management plan will be difficult and expensive, but failure to do anything less will certainly result in the loss of significant cultural information (Kay, 1995).

Accelerated shoreline erosion and pot hunting have reached crisis proportions. Although we have witnessed a short-term reprieve in the former, the return of accelerated shoreline erosion is inevitable. In the case of the latter, only through increased education, site monitoring, and enforcement of laws can we minimize the effects of illicit collecting. Given that it is not feasible to monitor every site, public education programs must figure prominently in long-term management plans of archaeological sites along Oahe. However, any adverse effects caused by

illegal collecting and looting of sites are minimal when compared to the damage inflicted by erosion.

Using aerial photographs, we have documented the effects of massive shoreline erosion of archaeological sites in Campbell and Corson counties South Dakota: Helb (39CA208), first documented in 1966 is most likely entirely destroyed; Jake White Bull (39CO6) is almost gone; and Jones Village (39CA3), perhaps once the largest and most significant archaeological site in northern South Dakota is almost completely destroyed. Helb, Jake White Bull, and Jones are only three examples of scores of sites along reservoirs in the Missouri Basin undergoing similar processes. Numerous papers and reports have documented the erosion and its impacts to archaeological sites in Lake Oahe (i.e., Ahler, 1977; Ahler, 1980; Ahler et al., 1977; Ahler et al., 1974; Ebert et al., 1989; Falk and Ahler, 1988; Falk and Calabrese, 1973; Falk and Pepperl, 1986; Johnson, 1997; Johnson, 1998; Kay, 1995; Weston, 1979). To their credit, USACE has initiated stabilization programs at a large number of sites along Lake Oahe, but this work comes 30–40 years too late for many sites. If large scale survey and salvage work are not initiated now, many of these sites will be lost forever when pool levels begin to rise at the conclusion of the current drought cycle—of course if we wait too long, the problem unfortunately will resolve itself once and for all.

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