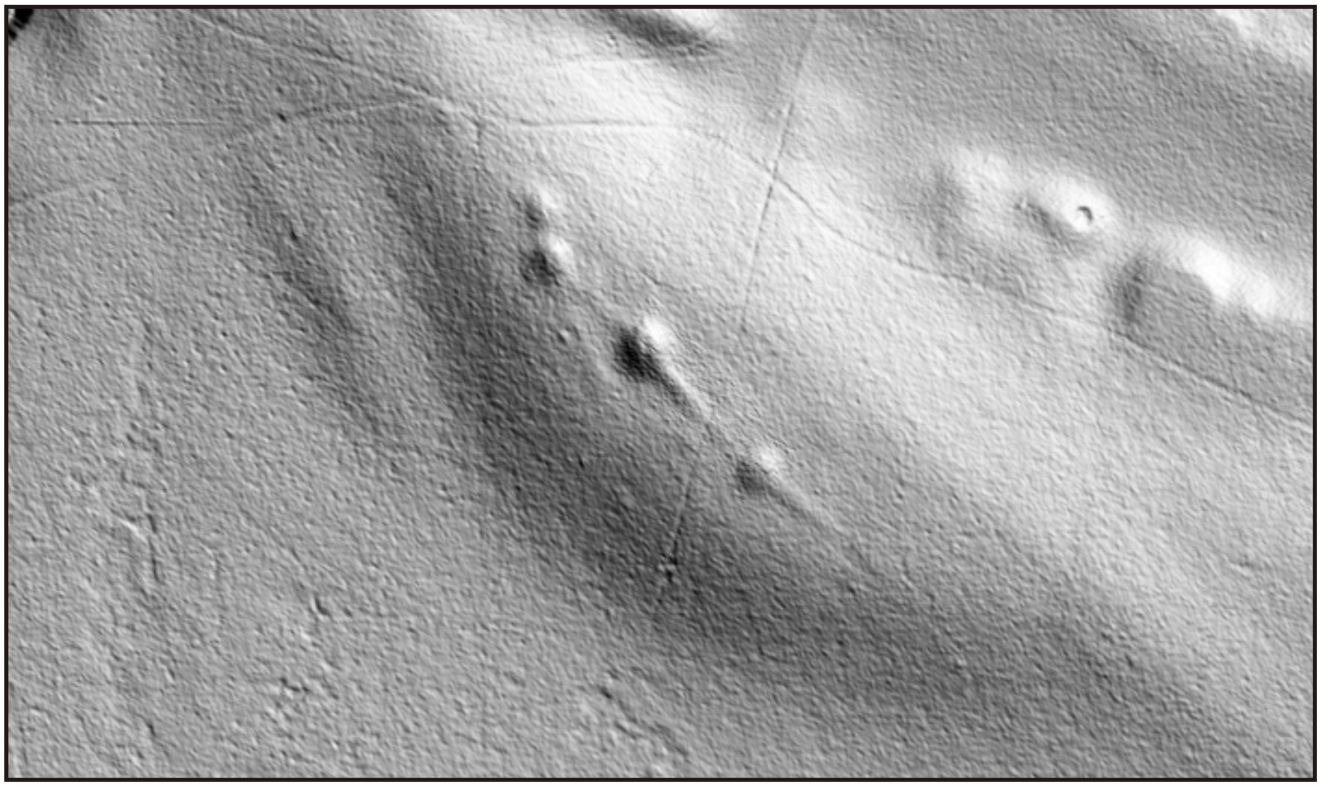
An Archaeological Survey of Prehistoric Mortuary Sites in Beadle, Spink and Clark Counties, South Dakota



PREPARED FOR:
State of South Dakota State Historic Preservation Office
Pierre, South Dakota

By:
David Maki, Sigrid Arnott, and Geoffrey Jones
Archaeo-Physics, LLC
Minneapolis, Minnesota

FINAL REPORT
August, 2016

ARCHAEO-PHYSICS

SHALLOW SUBSURFACE GEOPHYSICAL SURVEY

Report of Investigation Number 236
Archaeo-Physics, LLC
4150 Dight Avenue South #110
Minneapolis, MN 55406
(612) 379-0094 info@archaeophysics.com

An Archaeological Survey of Prehistoric Mortuary Sites in Beadle, Spink and Clark Counties, South Dakota

REDACTED COPY

Report of Investigation 236

Prepared by Archaeo-Physics LLC

for

The State of South Dakota State Historic Preservation Office.

By David L. Maki, Sigrid Arnott and Geoffrey Jones

2016

Table of Contents

CHAPTER 1. INTRODUCTION 2
LEGAL AND MANAGEMENT CONSIDERATIONS 2
BURIAL PROTECTION AND CONTACT PERSONS 3
PROJECT OVERVIEW 5
TRIBAL, AGENCY, AND LANDOWNER CONSULTATION 6
CHAPTER 2. CULTURAL CONTEXT OF BURIAL PRACTICES AND ARCHAEOLOGY OF THE PROJECT AREA 8
CHAPTER 3. OVERVIEW OF RESULTS 15
SITE TYPES 15
PLANNING AND MANAGEMENT RECOMMENDATIONS 15
REDEFINED AND UPDATED SITE BOUNDARIES 17
BEADLE COUNTY SUMMARY 18
SPINK COUNTY SUMMARY 20
CLARK COUNTY SUMMARY 21
UNSURVEYED SITES 22
CHAPTER 4. BACKGROUND RESEARCH: SOURCES, METHODOLOGY, AND RESULTS 23
RECORD SEARCH 23
CHAPTER 5. GIS MAPPING AND LIDAR VISUALIZATION METHODOLOGY 27
GIS MAPPING 27
LIDAR MAPPING 27
RESULTS 29
CHAPTER 6: FIELD SURVEY METHODOLOGY 30
LANDOWNERS 30
STAFF 30
SURVEY PROTOCOLS AND PROCEDURES 30
DATA COLLECTION 31
REFERENCES CITED 32

Chapter 1. Introduction

American Indian occupation of South Dakota dates back more than 10,000 years. Over this time, countless burials have been made, many within burial mounds or beneath cairns, and often grouped in cemeteries. Since people of European descent began settling in the late 1800s, these unrecorded burials and cemeteries have been gradually degraded through agricultural activities, road building, gravel mining, construction, and other earth-moving activities. These processes, combined with lack of documentation, have made the burial mounds increasingly difficult to identify and protect, especially as development and supporting infrastructure continues to grow. This archaeological and cultural landscape project studied and surveyed previously recorded mortuary archaeological sites within Beadle, Spink, and Clark Counties in order to provide the most up-to-date information regarding their condition, location, and site boundaries.

Legal and Management Considerations

South Dakota state law protects all human burials regardless of cultural affiliation, even outside marked cemeteries. Those that predate European settlement have been difficult to identify, accurately map, and protect. Mortuary sites are also invaluable cultural resources that once damaged or destroyed can never be replaced. Thus, for the last seven years the South Dakota State Historic Preservation Office (SHPO) has contracted with archaeologists to locate, map, and record mortuary sites outside of registered cemeteries. The result of this long-term survey project is the creation of accurate records of these sites so that they may be considered and avoided in land-use planning and protected by long-term planning.

Definitions:

- **Human remains** are any physical remains of human bodies, most typically bones, bone fragments, and teeth. **Skeletal remains** are human bones.
- **Burials** are places where people purposefully placed human remains. Most burials are made in **cemeteries**: places set aside for human burial.
- Many burials were made in **burial mounds** or **mounds**. These are earthworks that were constructed above burials, or within which later burials were made. In many cases these have been impacted by plowing and other disturbances, and may not be readily recognizable.
- C**airns** or piles of stones may cover burials. Though cairns do not always cover human remains, there is a high correlation with burials and they were therefore treated as burial sites for this study.
- Offerings and grave goods are called **funerary objects**.
- **Primary burials** are typically located at the base of mounds at or below the original ground surface. They represent the burial of an intact human body.
- S**econdary burials** were reburials of bones gathered together and buried after decomposition of the flesh. These were often placed in the upper levels of burial mounds from years to centuries after the original mound was constructed.
- Places of burial are generally called **mortuary sites**.

South Dakota Law states that: "Disturbing human skeletal remains or funerary objects," except under authority of law enforcement or the state archaeologist, is a Class 6 felony even if the burials are located outside a registered or marked cemetery (Source: SD State Law 1990, 34-27-26 ch 6, § 6). In order to prevent disturbance, the South Dakota SHPO hopes that providing information to planning departments regarding unmarked burial locations will ultimately help landowners act as stewards of these important cultural sites and avoid the hardship of dealing with inadvertent discoveries during construction.

The first step in avoidance of burial sites is improved documentation. The South Dakota SHPO contracted Archaeo-Physics LLC in 2015 to relocate, accurately map, and fully record prehistoric burial sites in Beadle, Spink, and Clark counties based on existing recorded sites in the files of the South Dakota Archaeological Research Center. Sigrid Arnott served as the principal investigator and David Maki as the project manager. The project was conducted in consultation with Tribal Historic Preservation Offices.

Burial Protection and Contact Persons

To protect burials, site-specific results are in a separate document from this document, which is released to county planners and general public.

The shape files provided to Beadle, Spink, and Clark County planners will identify sections or quarter sections where mortuary sites were identified. Should permits for any kind of earth disturbing activities be applied for, the planning departments should contact the South Dakota SHPO or the SD ARC. Activities that have the potential to disturb human remains include construction, site development, agricultural terracing, shelter belt installation, gravel mining, or infrastructure development. Willful disturbance of burial sites is a felony.

South Dakota State Historic Preservation Officer:

Amy Rubingh - *Review & Compliance Archaeologist*
Amy.Rubingh@state.sd.us
605-773-8370

South Dakota Archaeological Research Center Staff

Jim Haug, Director and State Archaeologist
(email: **Jim.Haug@state.sd.us**)

Jim Donohue, Asst. State Archaeologist
(email: **Jim.Donohue@state.sd.us**)

Mike Fosha, Asst. State Archaeologist
(email: **Mike.Fosha@state.sd.us**)



Figure 1: An unusually large burial mound identified in the 2015 survey was outside the current site limits and next to an active farmstead . A burial mound of this magnitude represents the effort of a large farming village. Most mound sites were found near good farmland in flood zones. Accidentally impacting a burial mound of this size could result in a landowner being responsible for the costly retrieval and reburial of hundreds of human burials.



Figure 2: Burial mounds continue to be impacted by looters who dig up burials in search of artifacts. This trench was dug within the last 5 years after an archaeological survey identified the site. Artifacts are extremely rare in South Dakota's burial mounds but measures must be taken to protect locational information to prevent the ongoing desecration of burials. Sigrid Arnott and Kent Good, Sisseton-Wahpeton archaeologist

.Note that our survey was not a definitive burial, cultural resources, or archaeological survey. It was designed only to revisit previously identified mortuary sites and assess their boundaries and condition. Many burial sites surely exist that have not been identified. The procedure for unanticipated discovery should always be followed in the event human remains are encountered. High potential areas for burials are ridges and knolls above bodies of water or on the edge of the Coteau and James River. Burial sites are associated with habitation sites, located in areas rich in natural resources with fresh water. On the edge of the Coteau, burial sites are usually located on the highest locations on the edge of the landform, especially next to springs and lakes. However, unidentified burials may exist in any location.

Avoid
The easiest way to prevent damage to sites is avoidance. We have worked to create better site boundaries in order to make burials easier to avoid. Burials often are in cemeteries and frequently surround mounds, thus we recommend a buffer of 30 meters (~ 100 feet) around identified burial mounds or cairns. Burials have been recorded outside mortuary earthworks at two mound sites in the project area, 39SP0011 and 30SP0012. For this reason, avoidance of the entire site is recommended, not just visible mounds.

Survey
In some cases we could not secure permission for access to survey site areas. Where survey was not possible, we have often redefined old site boundaries based on LiDAR imagery. Prior to development, the site area should be surveyed by archaeologists familiar with disturbed mound sites. LiDAR data with UTMs has been provided in this report to guide future survey. Non-invasive geophysical methods could be employed if the targeted area is well-defined. In a best-case scenario, the reported mortuary site can be identified through pedestrian survey and then avoided.

Monitor
Sometimes the topographic expression of mounds has been so degraded by plowing or development that their location cannot be absolutely determined. Human remains, however, still may be preserved. If there is reason to believe a burial is within a parcel but the location cannot be delineated, the proposed development should be monitored by archaeologists and tribal monitors.

Project Overview

The first goal of this project was to use methodologically current identification and assessment methods to study previously recorded prehistoric sites that had not been surveyed within the last 10 years (i.e. before 2005). Some of the sites were last surveyed by a person with archaeological training more than 100 years ago. Many others were identified before accurate means of recording location, such as accurate GPS, was available. This project used the earliest maps (dating back to 1884), later survey results, and current light detection and ranging (LiDAR) aerial laser scanning data to completely define what was known of each mortuary site.

The results of the historical record search were used to guide field survey. Survey consisted of walking over sites looking for signs of mortuary features in areas identified as high potential by the record search and by landforms identified in research and the field. A more detailed description of the sources and methods used, including LiDAR mapping, use of geographic information system (GIS) software, and field methods follows in the methodology section. The results and site documentation can be found in the main body of the report.

Tribal, Agency, and Landowner Consultation

The success of this project is entirely due to the generous cooperation of private, tribal, state, and federal agencies and local stakeholders—especially private landowners. Several meetings prior to the survey phase of the project helped define parameters of the survey and reporting. Both counties provided extensive assistance in locating current landowner contact information.

The contractor also informed all nine tribes within the State of South Dakota as well as two in Minnesota, one in North Dakota, and one in Wyoming about the project via email and letter. In addition, the principal investigator personally contacted by via phone as many THPOs as possible. A meeting was arranged at the South Dakota SHPO in Pierre on September 23, 2015 with telecommuting provided to accommodate all consulting tribes. In-person attendance was limited to the SHPO representative Amy Rubingh, and the Archaeo-Physics staff. Grace Goldtooth-Campos of Lower Sioux Agency in Minnesota and Brian Molyneaux representing Lower Brule attended via telephone. Steve Vance the Cheyenne River THPO, Dianne Desrosiers, and Jim Whitted of the Sisseton Wahpeton Oyate (SWO) THPO office served as special consultants on this project, specifically in issues of survey and reburial protocol.

Because of very real concerns that unauthorized use of the results of this study could be used to guide looters, county planners will be provided with burial information only at the quarter section level.

The tribal consultants requested that any suspected human bones or funeral items be reburied on site unless there was concern that they were recent or that they might attract looters. In the few cases where plowing, erosion, or rodent burrows had brought bone fragments or non-diagnostic ceramic sherds to the surface at known archaeological mound sites, they were recorded and reburied in situ with a tobacco offering. In one case we contacted both Steve Vance, the Cheyenne River THPO, and the SWO THPO in order to properly rebury in a mound that is within a cultivated field.

Archaeo-Physics also coordinated with South Dakota Game and Parks and numerous private landowners to successfully complete this project.

Survey on all state lands including one state park and one game-production area was done under a state archaeological license. Access to state lands was facilitated by Katherine Ceroll, regional director at Fort Sisseton State Park, and Christopher Goldgade, Game, Fish and Parks Regional Program Manager – Habitat. In total, two surveyed sites in Spink County were entirely or partially on state-owned land. No artifacts or human remains were found on any lands. The South Dakota Archaeological Resource Center staff also assisted by providing shape files of mortuary sites, discussing protocols, and assisting in the record search. Katherine Lamie, the repository manager at the South Dakota Archaeological Research Center (SDARC), provided assistance with background information on some burials and facilitated the field mitigation of exposed of human remains at a township road with the SWO THPO staff. Jane Watts of SD ARC completed the record search and provided additional assistance in finding sources.

Local landowners were extremely generous in allowing access to thousands of acres of land and ultimately made the project a success. Landowners were initially contacted by letter and subsequently contacted by phone and/or email. This project also required considerable door-knocking. After letters were sent out we were able to make contact with all landowners except two by phone, email, or door-knocking. We were often assisted in the process by other landowners who had better contact information than we could gain through published sources. Many landowners had special requests of the surveyors, assisted with survey needs, and provided insightful observations regarding sites on their lands. Landowners generously allowed access, acted as guides to sites, provided assistance in survey, shared insights regarding archaeology, and, most importantly, have acted as stewards of the sites and burials on their lands. Special thanks to Tony and Barb Klute, Zacke Waldner, Don Miner, Keith Decker, Wilber Dvorak, Randall Maddox, Brad Tchetter, Fred Roseneau, and Julia Mass.

Chapter 2. Cultural Context of Burial Practices and Archaeology of the Project Area

Most of the project area falls within an archaeological zone known as the James River Basin, although there were two sites in Clark County on the Prairie Coteau or Prairie Lakes Region. Well over 100 burial mounds have been recorded in the James River Basin. In addition, there are some known instances of human burials beneath stone cairns, such as at one site in Clark County where human bones were found in a rodent burrow next to a stone cairn on a bluff top. A brief history of burial practices follows to provide context for the results of the project.

Paleoindian

The earliest human inhabitants of North America are known as Paleoindians. The Paleoindian period lasted for 4,000 years between 12,000 and 8,000 years Before Present (BP) (Winham and Hannus 1991). Paleoindians survived in an extreme climate that developed followed the melting of glaciers that had completely covered the area. As the weather gradually warmed, a harsh landscape was revealed. Blocks of ice hundreds of feet thick carved deep depressions into the earth that filled with glacial melt and became icy lakes. Thin topsoils supported a boreal or snow forest dominated by black ash, birch, alder, and spruce.

In this setting humans throughout North America appear to have shared a common set of cultural traits. Survival depended upon traveling in groups to hunt large mammals that thrived in the colder climate. Finely made Paleo stone tools have been found in South Dakota but there are no recorded PaleoIndian burial sites. The nearest burial dating to this period has been found in Browns Valley, Minnesota.

The Browns Valley Man burial was discovered in 1933 when local collector William Jensen found a stone tool in gravel spread on the driveway to his grain elevator and then traced its source to a gravel pit that was being mined for road material. A skeleton covered with a powder of red ochre with finestone tools was found in a pit visible in the wall of the gravel pit. The grave had been deeply dug into an ancient gravel beach ridge that had formed along the rough shores of Glacial Lake Agassiz before soil had accumulated. The skeleton was later dated using the radio-carbon method to 9,000 years BP. The date fit with the type of grave goods recovered and the supposition that soil had not yet developed on the ancient beach (Anfinson 1997: 31-32).

Red ochre covering the burial appears to be common to most burials discussed from Paeloindian through Northern Plains Woodland peoples – introducing its cultural significance and relation to the geology of the landscape, etc. could be helpful in establishing the continuity/development of burial practices.

A similar style of burial was found with the Aznick Boy found in Montana in 1968. This skeleton of a small child from about 12,600 BP was also found covered in red ochre with a collection of tools made from stone and bone. DNA analysis of the skeleton in 2014 determined that the burial was of a two-year-old boy genetically ancestral to Native American groups in Central, South, and North America (Rasmussen et. al. 2014).

It was not expected that Paleoindian burials would be found in this survey, as they are extremely rare, tend to be deeply buried, and have limited surface expression.

Plains Archaic

The Plains Archaic Period dates to ca. 8,500-2,500 BP. During this period the climate became warmer and drier, leading to changes in the types of plants, fish, and animals that people could gather or hunt. People continued to move around, but became more closely tied to smaller areas where they developed deeper connections to the land and knowledge of local sources of food. As part of this process, local cultures developed their own distinctive types of tools.

Burial practices, however, appear largely unchanged. The few identifiable Archaic burials in the region are usually primary burials of bodies covered with red ochre, sometimes found with stone tools (Bruce et. al. 2010: 23, Anfinson 1997:47, Hannus 1985).

The Hilde Site 39LK0007 in Lake County is an example of a late Archaic (also called Middle Plains Archaic or Prairie Lake Archaic) burial site. It was accidentally discovered in 1981 and subsequently destroyed by the landowner during the next few years. During excavation of a gravel ridge using heavy machinery, graves were discovered with skeletal remains and grave goods carbon dated to approximately 3800 before present. (Anfinson 1997: 46;Hannus 1985). The remains of 17 to 18 people were removed from the site by the landowner. Some burials, including children, were primary, with entire skeletons found as they were buried soon after death with Archaic-style stone tools (including possessions such as unfinished and unused tools) on the bodies. Other burials were secondary; that is, the bones were gathered together and buried after decomposition of the flesh. Red ochre was associated with some of the burials. Because the landowner dug up the sites with a front-end loader, much information regarding the burials was destroyed. No mounds were associated with the site, which was on a gravel ridge overlooking Lake Madison (Hannus 1985).

Even though the site was largely destroyed by haphazard excavation, some patterns are obvious from the notes of archaeologists who visited the site. Like other Archaic cemeteries, burials were found with stone tools and covered with a powder of red ochre. Primary burials contained the skeletons of single individuals. Bundles of bones from secondary burials were found both alone and with other individuals.

Secondary burials were likely the results of the inability to bury bodies during winter months when the ground was frozen, while primary burials would have been made during warmer seasons. Multiple secondary burials suggest that those who died during the winter were brought to this site over several years to be buried together in spring after the ground thawed. Thus, these late Archaic burials provide evidence that a local group had an established cemetery used through time at a spring or summer home base.

There was little expectation of encountering Archaic burials during survey, although they may be associated with stone cairns. Burials from this period could be inadvertently found, most likely on gravel ridges overlooking a body of water (Arzigian and Stevenson 2003: 76-79, Hannus 1985).

Northern Plains Woodland

The Northern Plains Woodland is a western variation of the Woodland Tradition that developed farther east in the Mississippi River Valley. In the Prairie Lakes and James River Regions the Woodland Tradition dates from 2,200 BP (or 200 BC) to 900 Common Era (CE). As in other

regions, the Woodland Period is marked by the introduction of ceramic storage and cooking vessels, often with conical bases, increased presence of plants in the diet, including some plants from gardens, and new styles of chipped and ground stone tools. The new tool types are associated with new ways of procuring and processing food. With the introduction of the bow and arrow, people began making smaller stone points for arrow tips and perhaps hunting a wider variety of animals. Large grooved mauls may be associated with the processing of buffalo bones and other changes in the tools are related to the increase of plants raised in gardens or gathered.

Construction of earthen burial mounds is usually a hallmark of the Woodland Tradition. Mound sites were places where either a lone mound of earth or a grouping of mounds were constructed by piling up topsoil into circular forms over graves. Mounds were originally conical but many have eroded down becoming lower rounded earthworks spread over a larger circumference. Most mound sites in the region are on the highest ground in the vicinity and overlook permanent water sources such as lakes, streams, and springs. These watery places are also the locations of semi-permanent camps, and thus the mounds are also closely correlated to places where water provided sustenance.

Our surveys have also identified many buffalo wallows in association with burial mounds and rock alignment and cairn sites. The connection of western woodland peoples with buffalo was deep and appears to have extended to the burial traditions. The Sonata burial complex is linked to the peoples of the Woodland Tradition beginning around 100 to 150 CE (Johnson and Johnson 1998: 220-221). Most Sonata burial sites have been identified on the Missouri and James Rivers in South Dakota, where burials were made in groups of mounds associated with camps (Johnson and Johnson 1998: 220-221). Inside the mounds, Sonata burials were usually made in rectangular subfloor tombs with secondary or dismembered burials. Red ochre was put over the human remains, and funerary items were sometimes placed within the burials. Grave goods were often things that could have been obtained only by trade, such as obsidian from Montana or Wyoming, exotic shells from as far as the Gulf, and native copper from the Lake Superior Basin. Although these general burial patterns were common throughout the Upper Midwest, Sonata burials were unique in that the people also incorporated the ritual use of bison within the funeral tradition. Bison carcasses, skulls, and bones within the burial mounds reflect a culture whose destiny was closely linked to that animal.

Burials removed from 39SP0011, Dirt Lodge Village in 1980 prior to bridge construction dated to the late Woodland Randall Phase, although they were found in association with Historic Dakota features (Warner 2011: 7).

Plains Village-North Eastern Plains

Around 1,000 A.D., cultural changes began to take place in the region as people, particularly groups living in the Missouri River Basin, began to shift to a more fixed pattern of living in earthlodges within semi-permanent villages that relied on corn agriculture as well as hunting and gathering. In South Dakota people established these villages almost simultaneously across both the Missouri River Basin and the Northeastern Plains, in an area including the James River now within eastern South Dakota and Western Minnesota (Johnson 2007: 168). In the west, Initial Middle Missouri occupations seem to have originated at Late Woodland sites (Johnson 2007: 168, 172).

The rapid change to an agricultural way of life was probably due to a shift toward warmer conditions with higher precipitation in a period known as the Neo-Atlantic climatic episode (Johnson 2007: 168). This weather shift may have brought conditions that allowed women to begin planting the three sisters—corn, beans and squash—brought from the Eastern Woodlands out onto

the Plains. The adjustment to a more fixed way of life with a greater reliance on large-scale gardening brought major shifts in a way of life that affected diet, cuisine, and other aspects of life throughout the plains.

Plains Villages were often above the floodplain, while extensive gardens were on the fertile lower terrace (Johnson 2007). Mitchell (39DV0002), a National Historic Landmark and Plains Village site on the James River, was settled in the earliest period of village settlement in South Dakota, with C-14 dates from roughly 650 to 1,000 A.D. (Haberman 1981: Johnson 2007). Some earthlodges were semi-subterranean and appear as house pits, but there were also circular surface-level sod-covered lodges that, once collapsed, may look like mounds.

In this survey, burial mounds were found within two sites with what could be remains of earthlodges, 39SP0011 (known as both Council Grounds Mounds or Dirt Lodge Village), and 39BE0094. There are documents, oral history, and archaeological characteristics that link Dirt Lodge Village to the Woodland Period, the Initial Plains Village Tradition, and the Historic Dakota (Haberman 1981:39-41). At both 39SP0011 and 39BE0094, the gardens appear to have been on the river floodplain, burial mounds on the rim of the terrace tops, and possible earthlodges farther back on the upper terrace.

There is little evidence that Plains Villagers practiced mound burial, although it is possible that they may have buried their dead in the surface levels of existing burial mounds (Lehmer 1971). Instead, burials in these villages may be found in pits or possible cemeteries.

Many of the Plains Villages were abandoned around 1200 A.D. perhaps due to changes to cooler and drier climate, though other villages were occupied throughout the nineteenth century (Haberman 1981: 14) and some earthlodges may have been built into the twentieth century (Pauls 2005: 57).

Plains Village, Dakota, and Early Historic Native American Settlement

Beginning around 1600, European goods were traded into the general area with the arrival of European and American explorers and traders such as La Vérendrye, who came into the region in the 1730s and documented Mandan, Hidatsa, and Arikara living in villages (Johnson 2007: 194). Epidemics and cooler weather, such as that resulting from the Little Ice Age, led to dramatic population loss, sometimes of entire villages.

By the 1830s, the influx of European-Americans and presence of the American Fur Company, combined with both European and Indigenous pressure from the east and waves of small pox epidemics led to a period of chaos and reorganization in the Dakotas. The Oceti Sakowin are composed of the seven council fires of the allied Lakota and Dakota whose territory varied but generally was centered on bodies of water from Mille Lacs Minnesota, up the Minnesota River to Big Stone, Lac Qui Parle and Lake Traverse and then west to the Prairie Lakes on the Prairie Coteau. The Minnesota Dakota bands of the Oceti Sakowin were pushed west especially by European settlers in Minnesota in the 1850s. There is also evidence that Arikara and Omaha villages in the project area were displaced by nomadic Dakota bands, particularly the Yankatonnai and Yankton. The Wapekute and other bands from Minnesota also sought refuge at Dirt Lodge Village (39SP0011) in the 1860s. These groups, who came from villages that had long-standing burial mound traditions, would have continued to bury their dead in the established burial mounds

in James River area into the late nineteenth century. There is evidence that in the nineteenth century, and perhaps earlier, some Siouan groups adapted to the Plains Village tradition of building sod covered houses—particularly at Dirt Lodge Village, the village of Drifting Goose, and the scout's villages built near Fort Wadsworth. When abandoned these might erode into low mounds and look something like burial earthworks.

A single mound or mound site could have been used by different cultural groups over hundreds or possibly thousands of years. At 39SP0011, for example, there is evidence from three mound sites outside the village area that some occupants preferred to construct burial mounds outside the living space, while others buried their dead within the village habitation area. In fact, Woodland period burials have been found at Dirt Lodge Village in areas that are near but not in mounds (Haberman 1980).

The French scientist Joseph Nicollet explored the Dakotas in the 1830s and gave a description of a typical mound site used by living groups: "On leaving the lakes we climb a conical hill which crowns the crest of the nearest elevation. It has served, and still serves, as the cemetery for the Sioux. From the summit of the hill of the dead...one sees that (a group of lakes) occupies the base of a beautiful and large basin..." (Nicollet 1976: 64).

Mounds were built overlooking water not just for the spectacular views, but because living people, the mourners, lived by lakes, rivers, and wetlands. Families built mounds where they could see them from their homes during long mourning periods. As a Minnesota missionary explained: "Why do the Dakotas prefer these mounds as the places of deposit of their dead? I answer: First that it may be seen from a distance all around. As they wail morning and evening they can conveniently look to the abode not only of the body of their departed friend, but as many of them believe, one of the spirits also" (Riggs 1872:118).

Since most villages were located near good sources of water, the association of mounds with water is not just symbolically significant. Mound sites were in sight of villages and villages were next to water; thus, mound sites tend to overlook water. Archaeology corroborates this, showing an almost exact correlation of mounds to villages in Minnesota (Anfinson 1984). A similar pattern is also evident in the project area.

Mounds were built over burial chambers dug into the original ground surface or burials made on the ground surface. Later burials were made into mound fill. For this reason, it cannot be assumed that removal of one skeleton, or even all of the above ground parts of a mound, means that no human remains are preserved.

Sometimes mound sites are found in dense concentrations within particularly significant cultural landscapes. For this study, a dense concentration of mounds was found surrounding the significant cultural center at the Council Grounds or Dirt Lodge village on the James River at 30SP0011 and 39SP0012.

Nineteenth Century Native American Burials

As the above quotes show, the Dakota were still using burial mounds in the early historic period. Most accounts indicate that the bodies were wrapped tightly in robes or bark and placed on a raised scaffold for the first burial. A secondary burial was made at a later date when the remaining bones were bundled up and interred. Often the burials were made in existing mounds associated with the ancestors, and the bones of their relatives were frequently buried in older mounds after exposure on nearby burial scaffolds (Anfinson 1984). In Spink County, Lester Black informed Howard that he had seen a mound with an intact wooden pole in the center in the late nineteenth or early twentieth century (Howard and Black 1947).

There is also some evidence that mounds were built into the nineteenth century. For example, a C-14 date of primary materials at the base of Fingerson mound in western Minnesota was recently dated to circa 1850, and the landowners stated that Dakota family members came back to the visit the burial mound even after they were removed to reservations (Mather 2004:98). Before this mound was scientifically dated to the mid nineteenth century, it was assumed to be associated with the Woodland Sonata complex because of the presence of a headless buffalo calf and absence of objects of European American manufacture (Wilford et.al. 1969:42). Reexamining previous archaeological information with modern dating methods may indicate that chronological divisions are less meaningful that long-term burial traditions among persisting cultural groups.

History of Archaeology in Beadle, Spink, and Clark Counties

Even in the nineteenth century, it was recognized that mounds were under threat by expansion of European-American development. A romanticized interest in the so-called "Mound Builders" and desire to record earthworks led to both the partial destruction through excavation and also the recordation through careful survey and mapping.

Although it may now seem obvious that living peoples had a connection to the burial mounds that they lived near and used, this idea was hotly debated in the nineteenth century. Many subscribed to the theory that a superior race of Mound Builders (believed to perhaps be refugees from Atlantis or giants from Wales) had built the earthworks before being defeated by uncivilized primitives too ignorant to continue the mound-building tradition (Silverberg 1968). These "savages" were considered the ancestors of the living Native Americans. In the early 1870s, the president of the Chicago Academy of Sciences published *Prehistoric Races of the United States of America*. This overtly racist book endeavored to use Indian skull measurements as proof that the "degraded and lazy" American Indians could not have created symmetrical mounds (Silverberg 1968: 157-160).

In the 1880s and 1890s, Alfred J. Hill, a wealthy English-born businessman and amateur archaeologist and phrenologist in St. Paul, Minnesota, sent out requests for any information regarding earthworks in Minnesota, Wisconsin, and the Dakotas. Hill was a member of the Minnesota Archaeology Committee at the Minnesota Historical Society (MHS) with a curiosity about regional antiquities (Dobbs 1991). Many of the replies to his request for information came from Hill's colleagues, railroad surveyors who witnessed mounds as they were prospecting railroad routes in Minnesota and the Dakotas.

In 1880, Alfred Hill met T.H. Lewis, another amateur archaeologist with survey skills, and the two formed the Northwest Archaeological Survey headquartered in St. Paul (Winchell 1911). Hill gave Lewis the leads he had received, along with railroad passes and money for fieldwork, and Lewis began the most extensive privately funded survey of burial mounds in American history (Dobbs

1991:4). Over the next five summers, he documented more than 17,000 mounds at more than 2,000 mound and village sites in the states around Minnesota (Dobbs 1991:4). More than 671 sites were documented in South Dakota alone (Anfinson 1997: 25, 130, Finney 2001).

Lewis and Hill intended that the final result of the survey would be an elaborately illustrated book. Because of the current fascination with the Mound Builders, such books were best sellers of the day, and Lewis was careful not to give away enough information that anyone else could use his notes to reconstruct the sites and locations (Dobbs 1991). Lewis also collected and purchased artifacts and human skulls for himself and Hill (Hill papers, MHS).

In 1884 and 1891, Lewis traveled to Spink County using Hill's leads to map several mound sites clustered around Redfield. W. H. Over later conducted limited research in the area, probably in the 1920s. Unfortunately, Over's survey work in Spink County was only minimally documented, but he did provide good legal descriptions of the Turtle Creek Mound group (39SP0012) near Dirt Lodge Village (39SP0011). Excavations of a mound there evidence his lack of rigorous training. He removed a child's burial and did not collect it but left only the most minimal notes, making it difficult to reconstruct what was destroyed, reburied, or preserved by the excavators (Over in Sigsted and Sigsted 1973).

Since the passage of preservation laws in the 1960s, primarily the National Historic Preservation Act of 1966, some archaeological studies have been performed to avoid damage of significant sites for federal undertaking. Most of the archaeological surveys done under Section 106 of this act in Beadle, Spink, and Clark Counties have been limited in scope.

The large-scale surveys of the James River in the late 1970s and early 1980s were significant undertakings done outside of Section 106 that contributed to a better understanding of the regional archaeology (Haberman 1979, 1980, Rood and Rood 1983, Keller and Keller 1983). The results of these surveys were the most important source of data for this survey. In all cases where access was permitted, we were able to locate the mound groups documented by these surveys completed 30-35 years ago. Because these surveys took place before GPS, the mounds had been hand mapped with the assistance of 1:24,000 scale maps. In many cases we found that the transfer of that information into GIS had understandably shifted the site locations slightly. LiDAR imagery was particularly helpful to identify where the sites should be accurately re-mapped. At several sites, we found that there were additional mortuary features well outside the current boundaries.

Chapter 3. Overview of Results

A total of 47 sites with potential to have burials that originated before European-American settlement were found in the site files for Beadle, Spink, and Clark counties. We received permission to survey 25 sites, positively identifying 97 mortuary features. Many more mound features were positively identified in LiDAR reconnaissance leading to the documentation of well over 100 burial features. Considering that most mounds contain multiple burials, the effect of the survey is that hundreds or even thousands of human burials are now well-documented, to be avoided and protected.

Site Types

The mortuary sites included mound sites, cairn sites, and burials. As per the scope, historic cemeteries were not investigated for this project.

Mounds are places where topsoil is mounded up on prominent landforms in conical or linear shapes over burials. Burials may be primary (of a body) or secondary (of skeletal remains) in subsurface pits, at-surface burials, in stone or wood-lined chambers, or in bundles in the mound fill. Historic burials, sometimes in wooden coffins, were also made in mounds.

Cairns are arrangements of stones that may cover and protect human remains. Cairns may be associated with burials from any time period from Archaic to Historic, with caches at village sites, or they may be ritual sites and are sometimes found near mound sites and stone circles. Because it is impossible to determine whether cairns are burials without excavation, they are all treated as potential burials. Sometimes farmers may have covered cairns with rock piles when clearing fields, obscuring the original function. However, there are indications that some cairns were created through traditional sacred practices. Location is also significant, as, like mounds, ancient cairns are often found in groups on prominent ridges and are often deeply sodded and lichen-covered on exposed surfaces. The stones are small enough that they could be moved without the help of machines.

Burials can be difficult to find without subsurface testing, especially when the vegetation cover on the ground is thick. For this survey, village sites with records of burials were surveyed to identify possible burial features including cairns, depressions, or mounds.

Planning and Management Recommendations

The final reporting task was to provide the current information on all the sites and make recommendations for their management. This long-term project under SHPO sponsorship has established the following recommendations:

- **No Further Work**
- **Monitor**
- **Evaluate**
- **Survey**
- **Protect**

For this project we added two additional recommendations:

- **Redefine** (and Update)
- **Consult**

Protect
We make a recommendation of **Protect** for all sites that have evidence of any intact burial features, since experience shows that they have high potential to preserve human remains. In some cases we were able to **Redefine** these sites and provide more accurate site boundaries. Sites may merit protection both because they visibly convey an association to past traditional cultural values and/or because they represent an unmarked human burial area. In all cases where archaeological survey and/or background research identified any solid evidence of a burial site, a recommendation of **Protect** is made to prevent future disturbances of human burials. In the rare cases where a known burial cannot be avoided, the recommendation would be to **Mitigate** within the legal framework defined by the State of South Dakota.

No Further Work (NFW) is recommended in cases where survey and research determined that the burial site has been destroyed, that all human remains have been removed, or that there is no evidence to suggest that a given parcel has any greater likelihood of containing a burial site than the surrounding parcels. Even in cases where there is little to no current visible topographical expression of burial mounds, our experience has consistently found that subsurface burial chambers or human remains may be preserved at disturbed sites. For example, burials have been found at 39SP0011 and 39SP0012 outside of mounds and within heavily plowed down mounds. Extensive plowing is the most common reason that mounds become difficult to identify, but the surveyors also identified mounds with human remains in a heavily disturbed road right-of-way in Beadle County. Therefore a recommendation of **No Further Work** can only be made when it is established that the site is completely destroyed or never was identified within a parcel.

Monitor is recommended in situations where erosion or disturbance is so great that mounds or burial locations cannot be identified or cannot all be known, but there is reason to suspect that burials or human remains may still be in a defined area or parcel. In these cases a burial place has been previously identified in the past, but the locations were not adequately recorded and/or subsequent ground disturbance has made the site difficult to assess by surface survey.

In the case that a recommendation of **Monitor** is made, an archaeologist with a permit from the Office of the State Archaeologist should be on site at all times of ground disturbance. Granting of this permit will be followed by notification of all tribes so that they may participate in the monitoring, and creation of a plan for treatment in the case of discovery. The plans will be made with the participation of the State Archaeologist, the developer or landowner, the designated tribal representative, and city or county planners. Pre-planning allows for a defined course of action to be followed and reduces the chances of emergencies should human remains be identified.

Evaluate was originally recommended for sites with no mortuary elements identified during survey. For this project, no sites were recorded that have no potential as burial sites.

Survey is the recommendation for areas that could not be surveyed, but evidence indicates a mortuary feature survives. For this project **Survey** is most commonly recommended sites that could clearly be seen in LiDAR imagery or had records of a site, but could not be verified due to lack of landowner permission. Sites with a recommendation of **Survey** should not be developed without prior archaeological survey to identify and delineate the area of potential burials.

Redefine Because LiDAR gives us the ability to more accurately identify mound locations and survey verified many new mounds, we also make the recommendation of **Redefine**. In many cases the currently existing site boundaries had to be made with minimal information, usually a vague legal, and without accurate maps. Earlier surveyors had less accurate mapping tools and shape files had to be created based on their sketch maps.

By using LiDAR, historic maps, and original notes in a Geographic Information System (GIS) in combination with survey, we were usually able to identify the originally intended site and often additional mounds outside current site limits. In some cases where access to the survey was not granted, we were still able to use GIS to redefine more specific possible site areas based on landforms and site descriptions. In these cases we provide recommendations so that the ARC and SHPO can adjust the boundaries to accurately delineate the landform that has mortuary features and probable burials. The methodology for defining new site boundaries is discussed in more detail in the methodology section. A recommendation of **Redefine** indicates that the new information should be **Updated** in shape files and site forms.

Consult American Indian burials and cemeteries on public lands or affected by public projects are in need of management plans, including site protection and more sensitive treatment. The best course of action in these cases is to simply **Consult** with local tribes that have an interest in the treatment of ancestral burials and with archaeologists who have experience with site protection planning. Consultation is recommended for management of all burial places on public land. Private landowners also consult with tribes and these positive relationships are already ongoing.

Redefined and Updated Site Boundaries

Creating new, more accurate site boundaries was one of the more challenging aspects of this project. Many sites were defined before topographic maps or GPS were available. More accurate site boundaries created for this project used a full suite of resources in GIS. Because the mortuary features currently visible may represent just a fraction of the area that might have been used in past cemeteries, a larger site area is useful to prevent inadvertent disturbance of human remains and to define a culturally significant landscape element.

Visible features, usually mounds, determined the landform that was used as a cemetery; a buffer of 30m (roughly 100 feet) was then drawn around each mound. Where the buffer intersected with a steep slope the buffer was pulled in, otherwise the contour line that it touched was followed to define a polygon. In cases where past researchers had used this technique, we found that the boundaries were much more accurate than when they relied on a GPS reading to define a mound periphery.

In some cases we could not survey a parcel, but we had aerial, LiDAR, topographic, and documentary information not available in the past, sometimes combined with observations from adjacent parcels. In these cases we made recommendations for revised site boundaries using the information available to us. These boundaries serve to define areas of greater burial mound potential than surrounding landforms and allow landowners to guide preservation decisions. This information can also be used to make current management recommendations and guide future survey. The process of defining site limits is not an exact science and boundaries can be considered works in progress that can be refined as more information becomes available. Shape files and recommendations for new site boundaries will be provided to the SHPO and ARC for finalization. This general method is recommended for all mound sites that are resurveyed or identified.

Beadle County Summary

The record search for Beadle County identified a total of 22 sites. Our team gained permission to survey 9 of these sites. Seven of the sites were mound sites and the remaining two were reported to have rock cairns. We surveyed a total of 53 cairns or mounds as well as additional stone circles. At some of the rock cairn sites we were able to relocate the site area including stone circles but perhaps not the originally identified stone cairn. At all the mound sites we were able to locate the mounds, although they were sometimes outside the existing site boundaries. At most of the mound sites we identified additional mounds and recommend new site boundaries to encompass additional burial features.

Most of the mounds and cairn sites were located along the edge of the James River, sometimes in long, linear north-to-south sites. A few of the mounds were truly enormous, particularly at 39BE0014, the Miner Mound site, where some mounds were the size of small hills and bear witness to what must have been large populations with enormous capabilities to move earth. Large mounds were also found at 39BE0046, although that site has been seriously impacted by a township road.

Some previously documented mortuary sites could not be accessed during the survey for this project because landowners did not consent to survey. However, we conducted a literature search and did LiDAR analysis of all the sites, which are included at the end of this section. We only provide full map documentation in cases where our research made discoveries that are beyond what is easily available, and/or will affect our recommendation to redefine site boundaries. In some cases LiDAR analysis was used to simply assess the integrity of the sites by documenting a lack of disturbance by plowing.

Table 1: Summary of Results for Beadle County

SITE No.	Site type	2015 Survey	RECOMMENDATIONS
39BE0014	mound burial	Yes	Redefine, Survey Mound 8, Protect
39BE0015	mound burial	Yes	Redefine, Survey, Protect
39BE0025	mound burial	No	Redefine, Survey, Protect
39BE0029	mound burial	No	Redefine, Survey, Protect
39BE0027	mound burial	Yes	Redefine, Survey, Protect
39BE0035	cairn	No	Survey, Probably historic rock pile
39BE0046	mound burial	No	Survey, Consult, Protect
39BE0048	mound burial	Yes	Survey, Protect
39BE0054	mound burial	No	Redefine, Survey, Protect
39BE0055	mound burial	No	Redefine, Survey, Protect
39BE0056	cairn	No	Survey, Protect
39BE0057	mound burial	No	Survey, Protect
39BE0060	burial	No	Survey, Protect
39BE0061	cairn	No	Survey, Protect
39BE0062	mound burial	No	Redefine, Protect
39BE0064	mound burial	Yes	Redefine, Survey, Protect
39BE0069	cairn	Yes	Survey, Protect
39BE0072	cairn	No	Survey, Protect
39BE0073	mound burial	Yes	Redefine, Evaluate, Protect
39BE0076	cairn	No	Redefine, Protect
39BE0092	cairn	Yes	Redefine, Protect
39BE0094	mound burial	Yes	Redefine, Survey, Protect

Spink County Summary

A total of 20 mortuary sites were listed for Spink County and 14 sites surveyed. Some sites were so large that they had multiple landowners and multiple sites within them. For example 39SP0003 has three sites, 39SP0012 has three sites, and 39SP0011 is very large and has four landowners. Two sites, 39SP0269 and 39SP0272, were identified within the last 10 years and thus were not surveyed. Four sites could not be surveyed due to lack of landowner permission. Sometimes multiple landowners owned the same site, or parts of sites were in crops and landowners requested that we not enter those areas, so entire sites could not be accessed. In these cases, we surveyed as much as possible and recommend future survey should the area be considered for development.

A total of 64 mortuary features have been reported in Spink County in the past. Our teams surveyed at least 36 mounds and cairns, some of which were newly identified, at the 14 sites. Most of the sites are clustered along the upper terrace edge of the James River. The junctures of smaller tributaries into the James River were particularly prized locations, although mound and cairn sites are also found on hilltops at some distance from the river.

Table 2: Summary of Results for Spink County

Site No.	Site type	2015 Survey	Recommendations
39SP0002	mound burial	Yes	Redefine, Survey, Protect
39SP0003	mound burial	Yes	Redefine, Survey, Protect
39SP0004	mound burial	No	Survey, Protect
39SP0006	mound burial	Yes	Destroyed, No action
39SP0009	mound burial	No	No further work, Monitor
39SP0011	mound and burial	Yes	Redefine, Survey, Monitor, Protect
39SP0012	mound burial	Yes	Redefine, Survey, Protect
39SP0015	mound burial	Yes	Redefine, No action
39SP0019	mound burial	No	Survey
39SP0024	mound burial	Yes	Redefine, Protect
39SP0037	mound burial	Yes	Redefine, Protect
39SP0051	mound burial	Yes	Redefine, Protect
39SP0061	mound burial	Yes	Redefine, Protect
39SP0145	cairn	No	No further work
39SP0146	mound burial	Yes	Redefine, Protect
39SP0149	not a mound	Yes	No further work (at 39SP0015)
39SP0154	historic	Yes	Redefine
39SP0250	mound burial	Yes	Protect
39SP0269	Burial/cairn	No	Survey
39SP0272	cairn	No	Survey

Clark County Summary

Clark County has the least number of mortuary sites, only four. This is mostly the result of few previous archaeological surveys and a dispersed site distribution pattern, few federal undertakings development. The lack of recorded sites does not indicate a lack of sites. In fact, our limited survey indicates that low modern development and population density means that sites are often large and intact.

It is anticipated that there are numerous unrecorded sites around prairie lakes on the Coteau and on exposed bluff tops and the edge of the Coteau des Prairie that have simply not been identified. The two sites that we did survey, 39CK0003 and 39CK0010, both had numerous unidentified resources outside the current site boundaries, were unplowed, and in excellent condition. In the future, these areas will be under pressure for wind farms and must be surveyed with an eye to understand the resources, which may not always be located near water and can be easily obscured by grass. Our survey, for example, was hampered by excellent growth of grass.

Table 3: Summary of Results for Clark County

Site No.	Site type	Surveyed 2015	Recommendation
39CK0001	mound	No	No further work
39CK0003	cairns	Yes	Survey, Record new site, Protect
39CK0004	cairn and burial	No	Survey, Protect
39CK0010	cairns and stone circles	Yes	Protect

Unsurveyed Sites

Some previously documented mortuary sites could not be accessed during the survey for this project because landowners did not consent to survey. However, we conducted a literature search and did LiDAR analysis of all the sites, which are included at the end of this section. We only provide full map documentation in cases where our research made new discoveries that are beyond what is available on the existing site form, and/or will affect our recommendation to redefine site boundaries. In most cases, the sites with additional documentation are mound sites where mounds were visible in the LiDAR. In some cases LiDAR analysis was used to simply assess the integrity of the sites by documenting a lack of disturbance. Because this is only suggestive of condition and cannot be used to assess a non-mound site there are no graphics.

Table 4: Unsurveyed sites

Site Number	Site type	Recommendation
39BE0025	mound	Redefine, Survey, Protect
39BE0035	cairn	Survey, Probably historic rock pile
39BE0048	mound	Survey, Protect
39BE0054	mound	Redefine, Survey, Protect
39BE0055	mound	Redefine, Survey, Protect
39BE0056	cairn	Survey, Protect
39BE0057	mound	Survey, Protect
39BE0060	burial	Survey, Protect
39BE0061	cairn	Survey, Protect
39BE0062	mound	Survey, Protect
39BE0072	cairn	Survey, Protect
39BE0076	cairn	Survey, Protect
39SP0004	mound	Survey, Protect
39SP0009	mound	No further work
39SP0019	mound	Survey, Protect
39SP0145	cairn	No further work
39SP0269	burial	Survey, Protect
39SP0272	cairn	Survey, Protect
39CK0001	mound	No location, No further work, Remove?
39CK0004	cairn and burial	Survey, Protect

Chapter 4. Background Research: Sources, Methodology, and Results

Record Search

Because archaeological prospection has taken place within the project since 1884, there were a variety of sources that were searched to inform this study. The single most important source of information regarding site locations was the Archaeological Resources Management System (ARMs) site files maintained by the South Dakota Archaeological Research Center (ARC) and available at the online database of sites (http://hawken.sdsmt.edu/). This database was searched to identify all prehistoric mortuary sites within the project area, with additional searches identifying some potential mound sites that had been reported by landowners. Site files accessed this way are cited as ARMS they were all accessed in August of 2015.

Shape files of all sites classified as cemeteries, mound sites, cairns, or sites with reported burials were provided by ARC. Following the scope of work, Historic era cemeteries and sites identified within 10 years were removed from study. The shape files were integrated into the project GIS with topographic, LiDAR, and aerial imagery.

ARC was hired to supply additional site file information from the paper files as well as CRM (Cultural Resource Management) reports that mentioned burial sites within the project area. These reports were reviewed to understand the archaeological background and to incorporate documentation of previous investigations into site histories. The repository manager Katherine Lamie also provided primary materials regarding burial sites in the project area. Previous paper site forms are cited from the year they were updated.

Historic Government Land Office (GLO) maps were sometimes searched to identify pre-settlement conditions. Although burial mounds are not shown on these maps, they sometimes show Indian villages and historic trails. These maps were also used to search land patents, since original landowner's names were sometimes associated with sites. The records were found at the GLO website: http://www.glorecords.blm.gov/default.aspx. We also reviewed historic and current 1:24,000 USGS topographic maps to understand land changes in some areas. These maps were found at http://ngmdb.usgs.gov/maps/TopoView/viewer/ - 12/44.9236/-98.7170.

Antiquarian Archaeology Sources

The earliest record of archaeological sites came from T.H. Lewis. These records are very important because they were made before wide scale site destruction through agricultural cultivation.

T.H. Lewis Notes and Contemporary Survey

Theodore H. Lewis came to the area in 1884 and 1891 as part of the Northwestern Archaeological Survey described above. The archaeological surveys of T.H. Lewis were an important source of information for this project. Lewis recorded 5 groups of mound sites in Spink County (in notebook 31 page 30 and Notebook number 10, pages 22, 24, 26, 28). The page numbers were used to identify the mound groups on the base map and in our text. Earthwork sites were associated with official sites in Spink County at 39SP0006 (Capitol Hill Mounds), 39SP0012 (two sites at the Turtle Creek Mounds), and 39SP0015 (an unidentified enclosure and mound). One site has not been relocated.

Lewis' surveys are recorded in his unpublished field notes, which are available on microfilm at the Minnesota Historical Society in the Collection of the Northwest Archaeological Survey (NAS). Although a typewritten transcript of Lewis' notes prepared in the 1930s was also consulted, use of the original notes avoided possible transcription errors and provided better insight into Lewis' original intent in cases of ambiguity.

The Lewis notes were never considered a final draft and were always intended to be accurately plotted at a later date by Hill for a book. A plot of the "Spink County Golgatha" at 39SP0015 was probably made by Hill and a copy is in that site file. Lewis wanted to keep the site details secret until he could write up the background of the sites, resulting in very little narrative description or information about the general landscape, since the notes provided only enough information for another person to plot the sites but not be able to "steal" the information (Dobbs 1991:10). Thus, the objective of Lewis was to record as many sites as possible and not to accurately place the earthworks on the landscape.

These original notes were made in field notebooks with tables of survey data on the left side and rough schematic sketch maps of the mound groups on the opposite page. Each page has one to three mound sites recorded with very cursory explanations, such as "Exc." for excavated and double circles for flat-topped mounds. The orientation of Lewis' sketch maps on the pages is completely arbitrary and inconsistent, and it cannot be assumed that north is at the top of the page or that groups on the same page will have the same orientation. There was also no attempt to draw sites to scale, although the relative positions and forms of the earthworks are roughly correct.

Plotting Earthworks from Lewis' Notes

The process of creating maps from Lewis' tables for this project was accomplished by using vector drawing software (Corel Draw) to draw each earthwork site at a scale of 1:1000. Each mound was positioned following the bearings and distances in Lewis' table (Figure 1). In cases where his notes were ambiguous, alternate plots were made of different possible interpretations. Usually his compass bearings are relative to magnetic directions. The magnetic declination was estimated as 11.2° east at Fort Sisseton in 1894, and this declination was used to correct the plots to true north.

In all cases the plots from the 100+-year-old notes created the first accurate maps of site configurations and alignments of several Lewis mound groups. Each unique group of mounds could be visualized as a small constellation that we were able to accurately place on the correct landform. This process was somewhat assisted by Lewis' vague depictions of the general landform and his rare notations regarding the distance to a nearby lakebed. In the below example, the Turtle Creek Mounds (39SP00122) are drawn in relation to a creek bed (the James River) (NAS Notebook 10:24). Most often, it is the site location that is ambiguous in the Lewis notes. In the days before topographic maps or plat maps were available, it would have been extremely difficult for Lewis to know exactly where he was. The legal descriptions seem to be based on close guesses, and his errors are not consistent.

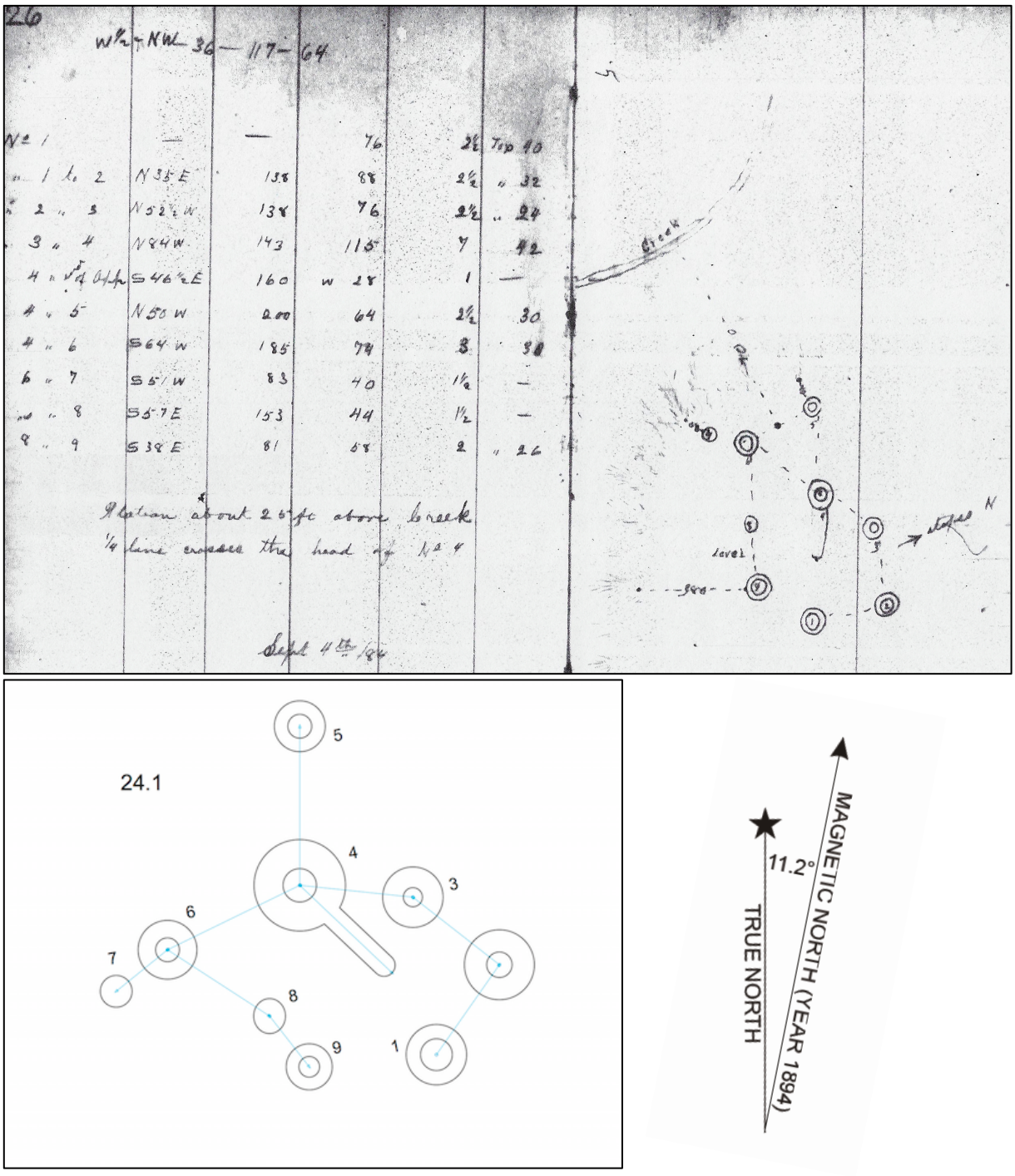


Figure 3: Microfilm copy of Lewis notebook #10, page 25 and plot made for 39SP0012. This image shows original notes and sketch map (above) and the corrected plot (below). Notes show mound number, bearing, and distance in the first three columns. The last three columns record diameter, height, and condition. Lewis provided very little contextual information beyond an estimate of elevation above unnamed lake and a rough depiction of the landform. Note that the sketch is not oriented with north at the page top.

Lewis and LiDAR

Where earthworks recorded by Lewis can be re-located, his surveys have usually proven to be within reasonable precision and contain relatively few errors (Dobbs 1991, Arnott and Maki 2013, Arnott et. al. 2013, Maki, Arnott and Jones 2015). Despite this, archaeologists have often struggled to interpret the Lewis notes and accurately identify where sites are located since his original methods and intent have been difficult to determine due to ambiguous and sometimes erroneous information.

When we found the right general area, we then used mound site plots to look for a matching mound site in the LiDAR imagery. Mound groups plotted from the Lewis survey data each had unique "signatures" that were often a near perfect fit with existing earthworks as identified with LiDAR. In nearly every case of ambiguous records, both inter-site mound positions and general site locations could be clarified or corrected by comparison with the imagery. LiDAR made Lewis relevant again.

Lewis was a keen and discerning observer, which has ironically caused some confusion. Because he frequently was able to detect more mounds than other surveyors after him, his mound counts are usually higher.

Lewis' level of precision is consistent with the use of an open surveyor's compass and chains or tapes. As a trained surveyor his level of accuracy is very good, but the quality of his surveys was sometimes compromised by haste. Open traverses led to some degradation in accuracy and occasionally a failure to detect serious errors in recording angles or measurement. LiDAR imagery allows the modern researcher to identify and correct discrete errors in bearing or distance within mound groups.

Lewis' compass bearings are usually relative to magnetic directions. In some instances his bearings deviate from the actual mound site alignment by several degrees in either direction, although the error is consistent across the site.

Where mound groups could be found, they could usually be identified with confidence, because the Lewis plots were a nearly exact fit with both the identifiable mounds and the landform. Even on cultivated land, subtle expressions of plowed-down mounds were often apparent in LiDAR-derived imagery even when they were not visually detectable on the ground. For example, during previous research at Marshall County site 39ML002, the northernmost mound–which has been plowed and is masked by brush–is more easily visible in LiDAR than on the ground.

Single mounds were more difficult to identify since they did not have unique signatures. Even where an apparent mound was located, it could not be identified with certainty as the one recorded by Lewis in the absence of other patterning.

By using the corrected plots of Lewis notes this project was able to integrate information from the 1890s, before sites had been seriously impacted by agricultural activities and erosion, into a modern survey. Combined with LiDAR, these notes allowed us to make a more accurate survey of sites that have been damaged in the last 120 years.

Chapter 5. GIS Mapping and LiDAR Visualization Methodology

GIS Mapping

At the outset of the investigation an interactive GIS mapping infrastructure was developed using open-source QGIS (Version 2.8.2-Wein) software. All project mapping and (missing?) was conducted using the following coordinate reference system: NAD 83, GRS 1980 ellipsoid, UTM Zone 14N, in meters (EPSG: 26914).

GIS map layers included: 1) shapefiles defining archaeological sites containing known or suspected mortuary features and CRM areas; 2) 1:24k seamless USGS quad maps and indexes; 3) 30 meter digital elevation model (DEM) for all three counties; 4) Township, Range and Section cadastrals; 5) National Agricultural Imagery Program (NAIP) color aerial photos from 2014 at a resolution of one pixel per meter.; 6) the national hydrography dataset (NHD) including all lakes and streams; 7) protected area land ownership defining federal, state and tribal lands; 8) federally recognized American Indian reservations and off-reservation trust land areas; and 9) LiDAR shaded-relief imagery covering all mortuary sites and high-probability areas. LiDAR imagery in the GIS system consisted of four independent layers that differed in lighting direction and a local relief model layer. Light source azimuths were from the NW, NE, SE, and SW (see below for discussion). The site and CRM shapefiles were provided by Terri Bruce, the South Dakota State Historical Society GIS coordinator. The South Dakota Archaeological Resource Center provided support with site shape files.

LiDAR Mapping

LiDAR data were used to conduct a pre-field survey reconnaissance of sites and high-probability areas. The recent availability of LiDAR data has revolutionized regional archaeological investigations by allowing archaeologists to depict micro-topographic patterning over large areas, resulting in the identification, assessment, and documentation of cultural resources within the natural and human-altered landscape (Arnott et al. 2013a, 2013b; Artz, et al. 2013; Maki 2013, Maki et. al. 2014; Riley et al. 2010). For this reason, LiDAR is fast emerging as a cost-effective method of archaeological reconnaissance and adjunct method for assessment.

LiDAR shaded-relief imagery was used as the primary visualization method during this reconnaissance. Shaded-relief imagery is relatively easy to produce and is computationally less intensive than more advanced methods, allowing us to rapidly generate imagery covering large areas. Interpretation of shaded-relief imagery is relatively intuitive, but analysis should never solely rely on imagery illuminated from a single artificial light source azimuth. Doing so can result in missing significant archaeological features that are either entirely saturated or hidden in shadow. Features may also lack expression if their geometry lies parallel with the artificial light source. For this reason the GIS system was constructed using LiDAR shaded-relief maps illuminated from four different light source azimuths (NW, NE, SE, and SW).

Once identified, potential archaeological features were subjected to advanced LiDAR visualization and analysis methods for archaeological prospection (Bennett, 2011; Bennett, et. al., 2012; Challis, et al., 2008, 2011; Hesse, 2010; Kokalj et al. 2011; Stular et al. 2012). These methods included:

- Shaded-relief visualization using additional light-source azimuths.
- Examination of constrained-shading imagery to understand relative variations in surface topography.
- Utilization of high-pass background subtraction filtering (also known as trend removal or local relief modeling). This visualization method suppresses large-scale topographic variation while enhancing small-scale microtopographic patterning. The size of the smoothing filter was adjusted depending on the local landscape. Relatively large window sizes (20 to 40 m) were used on flat terrain, while smaller window sizes (5 to 20 m) were used in steep or complex terrains, or in situations where the intended target was spatially small, such as cairns. This method works extremely well in relatively gentle terrain but can introduce artifacts (artificial features) in steeply sloping terrain or in areas surrounding acute archaeological features.
- Examination of terrain slope imagery. Terrain slope is defined as the magnitude of the vertical gradient, or the first derivative of the DEM. This method works well on sloping terrain where features may be located in areas that are otherwise too saturated or shaded to view.
- Examination of sky view factor (SVF) visualizations. This method computes the size of the visible sky. SVF has the advantage of producing no saturations and provides a clear distinction between protruding features and depressions. However, the method can produce a "washout effect" on flat terrain with subtle features.
- Examination of solar insolation models. This is a calculation of the amount of solar energy received at the ground surface. Both direct and diffuse insolation was calculated and these were combined to produce maps depicting the total solar isolation.

Raw discrete response LiDAR data from the project area were downloaded in compressed LAZ format from the USGS Earth Explorer archive (http://earthexplorer.usgs.gov/). The data were collected during the James River NRCS LiDAR project in 2010. The nominal data sample density was one laser pulse (sample) per square meter, although measured sample densities varied throughout the project area from between 0.7 and 1.2 samples per square meter. These sample densities were generally sufficient for mapping burial mound features in open terrain but were not sufficient for effective mapping of features in forested environments, on steeply sloping terrain, or for mapping small features such as cairns. Data were available for all regions within the project area.

Raw LAZ point clouds were parsed using LAStools software and exported as comma separated variable (CSV) files that included discrete responses from buildings, the ground surface, control points, and reflections from water. The CSV files were gridded using the method know as kriging, and displayed using open source System for Automated Geoscientific Analyses (SAGA) software and/or SURFER surface mapping software (Version 10.4). LiDAR images created from the gridded data were exported to QGIS as georeferenced raster images at a resolution of one pixel per square meter.

Results

LiDAR used in conjunction with the other data sources, including documentary sources, was central to the success of this project. Having several layers of data allowed us to crosscheck between map sources and LiDAR imagery to identify possible sites within or near larger site boundaries. Sometimes features appeared to be lone mounds, but aerial photography showed that they were clumps of vegetation, silage piles, or other modern features.

Real mound sites were almost always on the most prominent local landforms. Toggling between the LiDAR and topographic layers was crucial to determine whether potential mortuary features were on high potential landforms. The LiDAR imagery was also helpful in locating past trails and sometimes villages. Both these site types helped us understand the complexities of the ancient landscape and the areas of the highest potential and cultural significance.

The imagery also helped us identify threats and past impacts to sites. In most cases the greatest damage comes from plowing. When we were aware that a site had been plowed in the past, we expected to find lower and larger mounds that would be difficult to see. LiDAR also shows looter pits, erosion, and road cuts, and helps distinguish between natural and cultural features as well as historic and precontact site signatures.

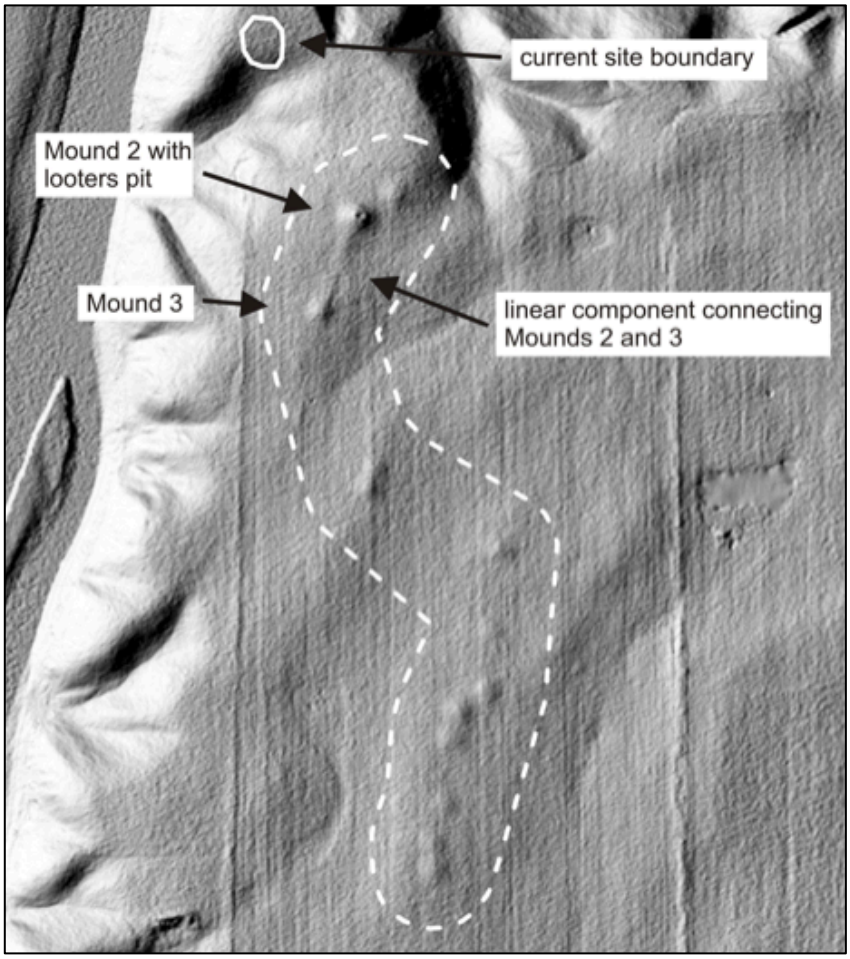


Figure 4: LiDAR imagery of a previously identified site. The current site is circled at the top of the figure. Because it was mapped before accurate GPS, it was miss-placed on the map. Mound 2, was probably the site that was meant to be mapped. A looters pit is visible in the burial mound.

A large series of burial mounds representing a community's cemetery with family burial plots id visible in a linear arrangement along the bluff edge.

North to South plowing scars are visible over most of the site.

Chapter 6: Field Survey Methodology

Landowners

The first step before survey was to identify and contact private site landowners using plat maps and information from the Beadle, Clark, and Spink Counties assessor's offices. Only addresses are available from the county and not all phone numbers could be found for landowners. We made at least two attempts to contact all landowners. Some landowners never responded, some gave permission to survey, and some denied access. Landowners were often sources of excellent advice regarding archaeological resources and sometimes acted as guides. State and public lands were surveyed under archaeological licenses with permission from managers.

Staff

Archaeo-Physics had two survey teams. Sigrid Arnott teamed with Mike Wise and David Maki teamed with Andrew Wise so that the principal investigator and project manager were able to supervise in the field at all times. These teams had several weeks of experience with mound survey from working on dozens of sites for the Survey of the Marshall and Day County in 2014 and on numerous mound sites in Minnesota.

Survey Protocols and Procedures

Prior to field survey we consulted with tribal representatives regarding survey protocol on burial sites. Much of the consultation was in one-on-one telephone conversations that were somewhat private in nature. In general, however, the protocols were as follow. First, it was understood that the human remains represented people that had been buried with the proper traditional rituals in the past and should surveyors encounter human remains it was our responsibility to respect the original rites and simply rebury with a simple offering of tobacco and sage. In one case, we sought guidance due to complications and reburial proceeded with no issues. Second, sites were to be entered with respect by surveyors who were not under the influence or menstruating. Third, no devices that generated energy waves were to be used. Although we did use receptive devices to capture GPS, we refrained from making telephone calls or texting on top of mound or cairn sites.

Archaeological survey followed a preliminary LiDAR reconnaissance to identify mounds, possible sites, or the highest probability landforms to survey. Field maps were prepared for each site and annotated while in the field. We used standardized field notebooks to record site data and annotated photos with location information as we surveyed. For each site we loaded site boundaries, high potential areas, and mound locations, when available, into smartphones with GPS and BackCountry Navigator software. This allowed for more rapid navigation to sites and mound localities. As we gained experience in the local settings it became easier to identify where burial sites were most likely to be found in the landscape and how they would look. At mound sites we walked over the ground and looked for artifacts, human remains, stone alignments or arrangements and surveyed the viewsheds. Mounds were frequently found at the best vantage points and often overlooked the best habitation locations.

Data collection

The survey was targeted to identify burial features and 100% percent coverage of the larger sites was not feasible. It is important to note that the surveyed areas have had a mortuary survey but not an archaeological survey. In no cases should the survey be considered adequate for a Section 106 of the National Historic Preservation Act of 1966 cultural resources identification process.

Site boundaries, mound dimensions, and site limits were defined using the full suite of information collected in the field in combination with LiDAR and topographic information. Exact mound dimensions and locations were captured from the LiDAR imagery. This allowed us to use consistent measurement techniques from site to site even when visibility was affected by local vegetation. In general the horizontal measurements may be slightly larger than would be observed in the field because LiDAR can detect the mound base that may not be apparent in the field. Mound elevations were determined by digitizing at least ten points on mound tops to determine a maximum elevation, then subtracting the average digitized elevations from at least three points surrounding the base of the mound.

References Cited

Anfinson, Scott
1984 Cultural and Natural Aspects of Mound Distribution in Minnesota. *The Minnesota Archaeologist* 43(1):3-30

1997 *Southwestern Minnesota Archaeology: 12,000 Years in the Prairie Lake Region.* Minnesota Prehistoric Archaeology Series No. 14. Minnesota Historical Society, St. Paul.

Arnott, Sigrid, and David Maki
2013 Phase I Archaeological Survey of the Proposed Greater Minnesota Transmission Natural Gas Line from Miesville to the Prairie Island Indian Community, Dakota and Goodhue Counties, and Assessment of the Buffalo Slough Mound Group (21GD074), Goodhue County, Minnesota. *Archaeo-Physics Report of Investigations # 187.* Prepared for the Bureau of Indian Affairs and the Prairie Island Indian Community.

Arnott, S., Jones, G. and D. Maki
2013 *National Register of Historic Places Nomination Form for Indian Mounds Park.* United States Department of the Interior, National Park Service, Washington DC

Artz, J., Emilia, L. D., Bristow D., and W. Whittaker
2013 *Mapping Precontact Burial Mounds in Sixteen Minnesota Counties using Light Detection and Ranging (LiDAR)*.Contract Completion Report Office of the State Archaeologist, The University of Iowa, Iowa City.

Arzigian, Constance and Katherine Stevenson
2003 *Minnesota's Indian Mounds and Burial Sites: A Synthesis of Prehistoric and Early Historic Archaeological Data.* The Minnesota Office of the State Archaeologist, St. Paul, MN

Bennett, R.
2011 *Archaeological Remote Sensing: Visualization and analysis of grass-dominated environments using airborne laser scanning and digital spectra data*. Dissertation submitted in partial fulfilment of the requirements for the degree 'Doctor of Philosophy', awarded by Bournemouth University, University in Poole, England.

Bennett, R., Wilhelm, K., Hill, R., and A. Ford
2012 A Comparison of Visualization Techniques for Models Created from Airborne Laser Scanned Data. *Archaeological Prospection*. Volume 19, p. 41-48.

Buechler, Jeffrey V. and Steve Keller
1983 *Volume I, James River Survey, Beadle, Davison, Hanson, Hutchinson, Sanborn & Yankton Counties, South Dakota,* 1977 - 1979. CIS No. 68a (68-I). Archaeological Research Center, Rapid City, SD. ARC Archive No: ESD-0005

Challis, K., Kokali, Z, Kincey, M, Moscrop, D. and Howard, AJ
2008 Airborne lidar and historic environment records. *Antiquity* 82, 318: 1055-1064.

Challis, K., Paolo F., and M. Kincey
2011 A Generic Toolkit for the Visualization of Archaeological Features on Airborne LiDAR Elevation Data. *Archaeological Prospection*. Volume 18, p. 279-289.

Dobbs, Clark
1991 The Northwestern Archaeological Survey: An Appreciation and Guide to the Field Notebooks. The Institute of Minnesota Archaeology, Minneapolis, MN. Minnesota Historical Society Microfilm Collection. Cat. Number M549

Finney, Fred
2001 An Introduction to the Northwestern Archaeological Survey by Theodore H. Lewis. *The Minnesota Archaeologist* 60: 13-29

Haberman, Thomas
1980a *Volume II, James River Survey, Spink and Beadle Counties, South Dakota.* CIS No. 68b (68-II). Archaeological Research Center, Rapid City, SD. ARC Archive No: ESD-0006

1980b Archaeological Test Excavations at 39SP11, Spink County, South Dakota. CIS No. 29. Archaeological Research Center, Rapid City, SD. ARC Archive No: ASP-000

1981 Historic Aspects of the Dirt Lodge Village Site in Spink County, South Dakota. *Journal of SD Archaeological Society,* V.7, RNL-0018. Vermillion, SD: RNL- 0018. ARC Archive No: RAJ-0010

Hannus, Adrien
1985 Site Form (update) for the Hilde Site 39LK0007. Accessed online at the South Dakota State Historical Society, Archaeological Research Center, Archaeological Resources Management System database access at <http://hawken.sdsmt.edu/arms/printform.php?siteno=39LK0007> on February, 20, 2015

Hesse, R.
2010 LiDAR-derived Local Relief Models – a new tool for archaeological prospection. *Archaeological Prospection*. Volume 17, p. 67-72.

Howard, James H., and Lester Black
1947 *James River Valley Sites: A Reconnaissance of Sites Located in Spink County, South Dakota, Along the Banks of the James River and Its Tributaries.* Archaeological Research Center, Rapid City, SD. ARC Archive No: ASP-0001

Johnson, Craig; Ahler, Stanley A.; Haas, Herbert; Bonani, Georges
2007 *A chronology of middle Missouri Plains village sites.* Smithsonian Contributions to Anthropology; no. 47, accessed at < https://repository.si.edu/handle/10088/14802>

Kokalj, Ž., Oštir, K., Zakšek, K
2011 Application of sky-view factor for the visualization of historic landscape features in lidar-derived relief models. *Antiquity* 85, 327: 263-273.

Lehmer, Donald
1971 An Introduction to Middle Missouri Archaeology. Anthropological Papers, No. 1. NPS, Washington, D.C.

Lewis, T.H.
1884, 1890 Original Field notebooks in the Northwestern Archaeological Survey Collection. Minnesota Historical Society Microfilm Collection. Cat. Number M549

Maki, David.
2013 *A Geophysical Survey at the Wood Lake Battlefield Monument Site: LiDAR and Sub-surface Geophysical Investigations at the Site of the Final Battle of the U.S. Dakota War of 1862, Yellow Medicine County, Minnesota.* Archaeo-Physics Report of Investigation #196, Minneapolis, MN.

Maki, David, Sigrid Arnott, and Michael Bergervoet
2014 *A Geophysical and Archaeological Assessment of the Buffalo Slough Mound Site (21GD74): A Precontact Burial Mound group in Goodhue County, Minnesota.* Archaeo-Physics Report of Investigations #214, Minneapolis, MN.

Maki, David, Sigrid Arnott, and Geoff Jones
2015 *An Archaeological Survey of Prehistoric Mortuary Sites in Marshall and Day Counties, South Dakota.* Archaeo-Physics Report of Investigations #215, Prepared for the South Dakota State Historic Preservation Office.

Mather, David
2004 The Headless Buffalo Calf: an Archaeological Mystery. *The Rake*, December 2004

2007 *Grand Mound National Historic Landmark Nomination.* United States Department of the Interior, National Park Service, Washington D.C.

Nicollet, Joseph
1976 *Joseph Nicollet on the Plains and Prairies: The Expeditions of 1838-39 with Journals, Letters, and Notes on the Dakota Indians.* Translated from the French and edited by Edmund Bray and Martha Coleman Bray. Minnesota Historical Society Press

Northwestern Archaeological Survey (NAS)
1880-1895 Survey Field notebooks and Related Volumes. Minnesota Historical Society Microfilm Collection. Cat. Number M549

Over, W.H.
1940 *Indian Mounds and Villages of South Dakota Known to Date, June, 1940.* State University Museum, Vermillion, SD. On file at the Archaeological Research Center, Rapid City, South Dakota.

Pauls, Elizabeth
2005 Architecture as a source of cultural Conservatism: Gendered Social, Economic, and Ritual Practices Associated with Hidatsa Earthlodges. IN *Plains Earthlodges*, Donna Roper and Elizabeth Pauls, eds. University of Alabama Press, Tuscaloosa

Rasmussen, Morten, Sarah L. Anzick, Michael R. Waters et. al.
2014 The genome of a Late Pleistocene human from a Clovis burial site in western Montana. *Nature* 506:225-240

Riley M, Artz, J., Whittaker W., Lillie R., and A.Sorensen
2010 *Archaeological Prospection for Precontact Burial Mounds Using Light Detection and Ranging (LiDAR) in Scott and Crow Wing Counties, Minnesota. Contract* Completion Report1768. Office of the State Archaeologist. University of Iowa, Iowa City.

Riggs, Samuel
1902 Mounds of the Minnesota Valley; By Rev. S. R. Riggs. *Collections of the Minnesota Historical Society, Vol I.*: 117-120. Minnesota Historical Society, St. Paul

Silverberg, Robert
1968 *Mound Builders of Ancient America: the Archaeology of a Myth.* New York Graphic Society Ltd. Greenwich Connecticut

Štular, B.,Kokalj, Ž., Oštir, K., Nuniger
2012 Visualization of lidar-derived relief models for detection of archaeological features. *Journal of Archaeological Science* 39: 3354-3360.

Sundstrom, Linea
1993 Fragile Heritage: Prehistoric Rock Art Sites of South Dakota. National Register Nominations. South Dakota State Historical Society Press and Black Hills National Forest. ARC Archive No: RNR-0016