A GEOSPATIAL ANALYSIS OF THE NORTHEASTERN PLAINS VILLAGE COMPLEX: AN EXPLORATION OF A GIS-BASED MULTIDISCIPLINARY METHOD FOR THE INCORPORATION OF WESTERN AND TRADITIONAL ECOLOGICAL KNOWLEDGE INTO THE DISCOVERY OF DIAGNOSTIC PREHISTORIC SETTLEMENT PATTERNS

A Thesis
Submitted to the Graduate Faculty
of the
North Dakota State University
of Agriculture and Applied Science

By

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In Partial Fulfillment of the Requirements
for the Degree of
MASTER OF SCIENCE

Major Department:
Sociology and Anthropology

December 2019

Fargo, North Dakota

North Dakota State University
Graduate School

Title

A Geospatial Analysis of the Northeastern Plains Village Complex: An Exploration of a GIS-based Multidisciplinary Method for the Incorporation of Western and Traditional Ecological Knowledge into the Discovery of Diagnostic Prehistoric Settlement Patterns

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The Supervisory Committee certifies that this ***disquisition*** complies with North Dakota State University's regulations and meets the accepted standards for the degree of

MASTER OF SCIENCE

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ABSTRACT

This thesis research analyzes how Traditional Ecological Knowledge (TEK) can be used to understand extant Northeastern Plains Village (NEPV) settlement strategies in aggregate for the purposes of subjoining a subsequent verification metric to the current archaeological classification system used to describe NEPV associated sites. To accomplish this task, I extracted Traditional Ecological Knowledge from ethnographic sources for comparison to geospatial, geostatistical, and statistical analyses. My results show that the hierarchical clustering exhibited among NEPV sites is congruent with first person narratives of habitation and resource collection activities occurring in the pre-Reservation period (before AD 1880) within the research area. This study emphasizes the importance of the incorporation of Traditional Ecological Knowledge into material typological classification schemes for archaeological sites which are convoluted by high rates of cultural transmission.

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LIST OF ABBREVIATIONS

ANOVA ....Analysis of Variance

DEM...Digital Elevation Model

DFA..Discriminant Function Analysis

GIS ....Geographic Information System

NAD83..North American Datum 1983

NAVD88...North American Vertical Datum 1988

ND...North Dakota

SHPO ....State Historic Preservation Office

NDSWC ....North Dakota State Water Commission

NEPV ....Northeastern Plains Village Complex

TEK...Traditional Ecological Knowledge

TIN..Triangular Irregular Network

USCB ....United States Census Bureau

USGS ....United States Geological Survey

UTM...Universal Transverse Mercator Projection

CHAPTER ONE: INTRODUCTION

The Northeastern Plains Village Complex (NEPV), AD 1200-1700, is an archaeological subcomponent of the Plains Village Tradition. This complex is situated in the Northeastern Periphery of the Northern Glaciated Plains between the Upper Basin of the Missouri River Trench and the Prairie Parkland Ecoregion. These people were semi-agriculturalists who lived in villages sometimes containing permanent structures. The settlements were either partially or fully fortified with earthen defensive rings and occasional bastions (SHPO 2016:B.42-43; Toom 2004:4). There are a number of suspected Northeastern Plains Village Complex sites – though only twelve are listed in the North Dakota Preservation Plan as such - and all are located along the shores of Devil's Lake to the north, the James River to the west, and the Sheyenne River to the east. Similar sites are known from the Minnesota-South Dakota border near Big Stone Lake and Lake Traverse, but are excluded from this research due to an intended focus on North Dakota State Historical Preservation Office (SHPO) data.

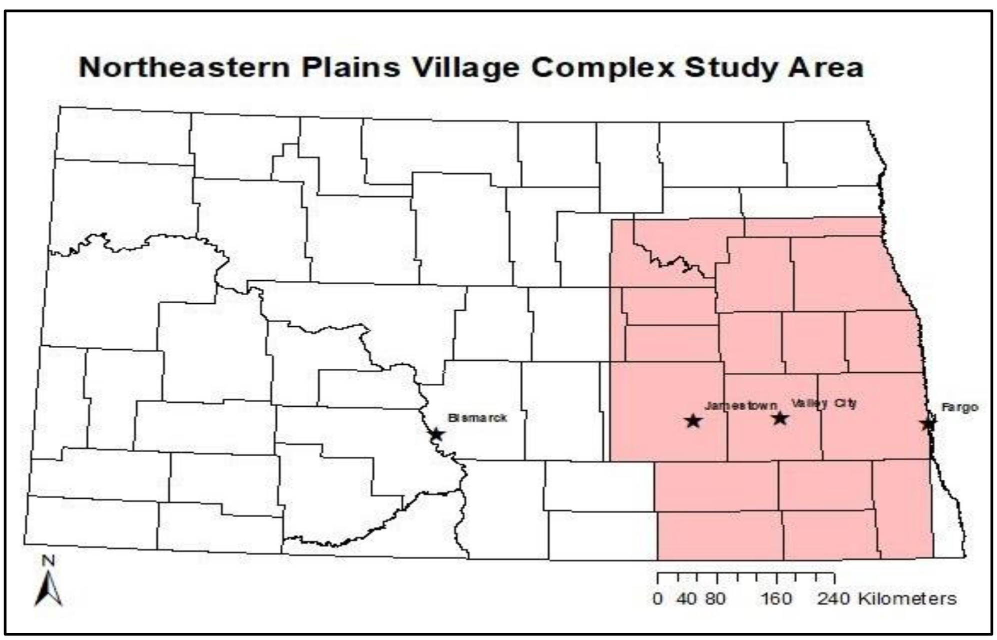

Figure 1: The geographic extent of this research (shaded area).

In addition to being semi-sedentary light agriculturalists, the people of the NEPV Complex produced stylistically diagnostic ceramics which share a similarity with those of Cambria, Sandy Lake, and Stutsman wares (SHPO 2016:B.43). The high occurrence of Knife River Flint found during the excavations of a majority of NEPV Complex sites suggest a strong trade affiliation with the Mandan, Hidatsa, and Arikara (Mitchell 2013; SHPO 2016:B.58-B.60). This mixture of cultural traits exacerbates the difficulty of assigning an ethnographic heritage to this region.

Previous NEPV research has been material and technology-centric in its approach, with a focus on such items as ceramics, chipped-stone, catlinite artifacts, and mortuary mounds/goods. (SHPO 2016:B.42-B.43; Michlovic and Schneider 1993; Michlovic and Swenson 1998). While archaeological materials are lightly referenced in this research, the primary focus here is the geospatial analysis. This involves the use of ArcGIS software to highlight the unique ecological attributes exhibited at each of the habitation sites. This study will include an intersite comparison of spatial attributes to determine which, if any, could be contextualized as representative of what Berkes defines as Traditional Ecological Knowledge or "a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and their environment" (TEK, see Chapter Three; Berkes 1998:8).

Significance of the Study

Anthropological research in eastern North Dakota began in the early 20th century with the ethnohistorical movement, which sought to document the lifeways of those last surviving individuals who could remember living freely on the Great Plains before being forced onto reservations after AD 1860 (Bowers 1963; Waheenee and Gilbert Wilson 1921). Post-1960s ethnographers continued with these earlier scholastic efforts by attempting to translate the various social and ceremonial attributes of Great Plains groups into temporal terms, in an effort to explain cultural development over time.

However, the people I am studying pre-dated the ethnohistoric movement. While we may never truly know who the people of the NEPV Complex were, the goal of this research is to thoughtfully engage with both ethnohistory and first-person ethno-biographies for comparison to the spatial attributes NEPV Complex sites as described by archaeologists in the field. This research provides an opportunity to statistically measure the attributes of the accepted NEPV sites next to and along with the suspected ones for the purposes of providing a more definitive baseline of attribute information related to the NEPV Complex.

Statement of the Problem

This research began as an attempt to answer one of the many research questions listed in the Archaeological Component of the North Dakota State Preservation Plan (SHPO 2016:B.50-52) which asks, "What are the differences in settlement strategies occurring between the James and Sheyenne River Valleys during the Northeastern Plains Village Complex period?" Before that question can be answered, however, it was necessary to identify a population of sites that could be confidently attributed to the NEPV Complex so that a discrete comparative analysis could be completed between both locations. I discovered that there were disparities between the site listings offered in previous research; though, they all seemed to independently agree that their lists of contending sites adhered to the general baseline description for inclusion into the NEPV Complex [see Chapter Two]. I will analyze the spatial elements of their settlement system in order to provide another piece of information outside of normal archaeological material or technological comparisons – for which sites can be vetted for their membership to the NEPV Complex.

Summary of Conceptual Framework

In addition to contributing to the external research regarding settlement strategies and patterns in the Great Northern Plains Region, more specific questions regarding the nature of the NEPV settlement ideology need to be addressed. This study seeks to determine if the membership of an NEPV Complex site can be accessed via the use of Traditional Ecological Knowledge gleaned from groups known to concurrently reside near present-day Eastern North Dakota. To make those determinations, the following must be considered:

1. Is Traditional Ecological Knowledge spatially observable in prehistoric archaeological sites?
2. How is Traditional Ecological Knowledge evidenced in specific site attributes?
3. Will a TEK-informed, ethnographic coding strategy serve as a viable strategy for bolstering current diagnostic strategies in archaeology?

Thesis Organization

Following this introductory chapter, Chapter Two outlines the Culture History of the Northeastern Plains Village Complex. It seeks to summarize all of the previously reported geographical and temporal data with the attributes from the geospatial data to give the a clear, consolidated, and updated definition of the NEPV Complex used in this research.

Chapter Three emphasizes the value of the using Traditional Ecological Knowledge as a theoretical framework in Human Ecology. It discusses the progression from its controversial beginnings in the field to its contemporary basis in the formation of methodology used in environmental preservation efforts. Chapter Four serves as extension of Chapter Three and is strictly dedicated to outlining how an existing TEK-informed, ecological preservation model is problematized, then used as the basis for introducing ethnobiographic information into archaeological settlement pattern research as a surrogate for contemporary TEK informants, also known here as the Revised Sci-TEK Technique.

Chapter Five details the specific research objectives of this thesis, including the specific methods and verification procedures employed. These methods are the revised Sci-TEK Technique, summary attribute comparisons, a comparative Ripley's K-Function analysis, a study in site-mound intervisibility, and a logistic regression analysis of site attributes. For the process of method verification, those comparisons will be also conducted against a random-sample population of the same size. Also, a logistic regression is conducted as a validation procedure to determine the relationship, if any exists, between the modern population and the existence of known NEPV Complex sites.

In Chapter Six, the results of the methods from the previous chapter are discussed, with preliminary interpretations of those results included. The specifics regarding the use of particular GIS techniques are mentioned here. And finally, in Chapter Seven, I conclude this study by exploring broader questions relating to the settlement patterns of the inhabitants of the Northeastern Periphery of the Northern Glaciated Plains and provide specific guidance for the conduct of future research.

CHAPTER TWO: CULTURE HISTORY

The Northeastern Plains Village Complex is a Late Prehistoric cultural entity and represents the first known attempt at maintaining a Plains Village lifeway in the region [Figure 1] (Anfinson 1982; Michlovic and Schneider 1993; SHPO 2016:B.47; Toom 2004:282-283). The NEPV Complex is contemporaneous with the Terminal Middle Missouri to the west (Winham and Calabrese 1998), the Initial Coalescent to the south and west (Johnson 1998), the Psinomani Complex in central and northern Minnesota (Arzigian 2008), and other non-incorporated Sandy Lake groups who were dispersed on the northern and eastern Plains periphery (SHPO 2016, Gregg 1994).

Environmental Setting

Geography

The Northeastern Plains is a geographical subarea of the Northern Great Plains and is situated adjacent to the eastern side of the Missouri River Trench. It incorporates all of the eastern halves of both North and South Dakota, as well as the northwestern portion of Iowa, the western part of Minnesota, and the entirety of the Souris and Assiniboine River drainages in southern Saskatchewan and Manitoba. The ecology of the research area is highly diverse and consists of two zones of glaciated plains and the Lake Agassiz Basin/Plain. The majority of the research area is contained within the northern portion of the Northern Glaciated Plains proper and the Lake Agassiz Plain ecoregions within the United States. It is bordered on the northeast, east, and west by Aspen-Parkland ecotone, thin margins of the North Central Hardwood Forests of Minnesota, and the Northwestern Glaciated Plains ecoregion, respectively (Auch 2010).

The Northern Glaciated Plains is a north to south trending ecoregion situated across the eastern portions of North and South Dakota. It has a continental climate with cold winters and warm summers, with an average precipitation rate of approximately 510 to 610 millimeters per year. The sub-humid climate contributes to the ecoregion's classification as a transitional grassland, which contains a mixture of both tall and short prairie grass species. As this geologic landform is still considered to be immature, the watersheds are underdeveloped throughout the region, and there are sizable numbers of wetlands, prairie potholes, and glacially-formed lakes (Auch 2010).

Where drainage systems formed, the biotic diversity of the area developed along with them into Riparian or Valley Ecological Complexes (Meehan et al. 2014: Morgan 1979:180-182). These ecological complexes served as a ready-made transportation network through the region, which facilitated light resource production, long-distance trade, and annual seasonal travel (Walde et al. 1995:14; Watrall 1976:46). On the eastern border of the research area lays another ecologically diverse zone – the Aspen-Parkland ecotone – which may have served as the most significant contributing ecological factor for cultural encroachment onto the eastern periphery of the plains (Meyer and Epp 1990:326; Syms 1977:11; Walde et al. 1995:13).

Paleoclimate

Several major climatic oscillations occurred in this region during the NEPV Complex period. These are the Scandic, the Neo-Atlantic, the Pacific, and the Neo-Boreal episodes (Gregg 1994:73). The Plains Village Tradition developed in the Tri-State region of Southwest Minnesota, Western Iowa, and Eastern South Dakota at a time when the warm and dry Scandic Episode (AD 400-750) gave way to the warm and moist Neo-Atlantic Episode (AD 750-1250) (Laird et al. 1996:899). The Neo-Atlantic episode (AD 750-1250) presented average to warm temperatures with higher levels of precipitation (Gregg 1994:79). By comparison, the Pacific episode from AD 1250-1550 that followed brought drought conditions to the Great Plains; this would have affected crop cultivation practices and presented a reduced overall biomass for the region (Gregg 1994:88). About midway into the Pacific Episode (AD 1250-1550), the region began to experience a period of cooler overall temperatures and copious annual rainfall. This "Little Ice Age" (AD 1450-1850) persisted into the Neo-Boreal Episode (AD 1550-1883) (Laird et al. 1996:899). The Neo-Boreal episode from AD 1550 to AD 1750 returned more favorable climate conditions to the Plains population; however, the influx of disease and regional faunal habitat displacement interrupted any resurgence in Native population after AD 1500 (Gregg 1994:95).

The Northeastern Plains Village Complex (NEPV) Defined

Prior to the NEPV Complex, groups practicing a Late/Terminal Woodland Tradition occupied the area (Syms 1978:69-75; Syms 1979). Archaeologically, the NEPV Complex is defined as Plains Village sites that exhibit evidence of part-time horticulture, a heavy dependence on bison hunting, distinctive ceramics, and the use of small, fortified settlements dating from about AD 1200 to 1700 (Anfinson, 1982; Michlovic and Schneider 1993; Toom, 2004). Gregg authored this more detailed archaeological definition for the North Dakota State Preservation Plan:

> The Northeastern Plains Village Complex is characterized by technologically and stylistically diagnostic ceramics, high frequencies of KRF [Knife River Flint] in chipped stone assemblages, regular occurrence of catlinite artifacts, semi-sedentary village settlement, earthen mound mortuary features, and Devils Lake-Sourisford mortuary goods. People lived in semi-settled ways of life based out of small residential villages. They hunted and gathered and did some gardening for food, but

their gardening appears to not have been as intensive as that of the Middle Missouri or Coalescent Villagers. (SHPO 2016:B.47)

Preceding the Stutsman Focus – whose diagnostic type-site is the Hintz site (32SN3; ca. AD 1700s) north of present-day Jamestown – the NEPV Complex is subdivided into three periods: Early NEPV (AD 1200-1300 [Table 1]), Middle NEPV (AD 1300-1600 [Table 2]), and Late NEPV (AD 1600-1800 [Table 3])(Toom 2004). The transition between the Early and Middle period is marked by a shift in ceramic manufacturing style, whereas the transition from the Middle to the Late Period is punctuated by the intrusion of European goods into the area (Toom 2004:283&285). Of the 32 NEPV sites used in this study, eight are ditch fortified villages (25%), four are unfortified villages (12.5%), and the remaining 20 sites (62.5%) are open campsites. Though the most researched NEPV Complex sites are the fortified, semi-sedentary villages, the most common site-type recorded for the NEPV Complex is evidenced by the typically open campsites located near the James River and Devil's Lake, which appear to be summer encampments with little to no gardening activity (Toom 2004:283). Fortunately, the list of NEPV Complex sites which cannot be dated via radiocarbon dating or the more traditional ceramic seriation dating methods is comparatively low; those sites are listed in Table 4 below.

Ceramic vessels of the NEPV Complex are "typically globular-shaped with strong neck and shoulder expression," with a "typically everted rim form" (Toom 2004:286). NEPV Complex ceramics consist of three styles: Lisbon, Buchanan, and Owego wares. Lisbon wares possess a cord roughened exterior, Buchanan wares exhibit a check stamped appearance, and Owego wares have a check stamped treatment (Toom 2004: 286). Lisbon ware is the dominant ceramic expression in the Early NEPV sites (Toom 2004:286). The Middle NEPV observes the shift from Lisbon style to Owego and Buchanan styles, with some residual Lisbon ware still in use (Toom 2004:287). Owego and Buchanan ware styles were still being produced in the Late NEPV, but a number of Middle Missouri ceramic styles began to enter the region (Toom 2004:289). Toom highlights a specific rim treatment – channeled lips, used in the Early NEPV – as the potential connection between the NEPV Complex and the later Scattered Village Complex observed at the confluence of the Missouri and Knife Rivers (Toom 2004:287).

Current Typological Debate

The archaeological community is still engaged in debate regarding which sites are to be included in an official site-type roster for NEPV. In her 1987 research, Swenson offered the first 16 sites for inclusion in the NEPV. More than a decade later, Toom (2004) wrote *Northeastern Plains Village Complex Timelines and Relations* which, though well-regarded within the community, was solely focused on 14 new sites rather than the ones originally brought forth by Swenson. In the late 2000s, Michlovic presented for inclusion sites located within the Bend region of the Sheyenne River, near the Ransom Mound Group; some of these sites were included in Toom's earlier work [Shea site], while others were not [Nelson site] (Michlovic 2008).

For this research, it is assumed that all of the sites brought forward by these archaeologists are correct in their assertions of site membership in the NEPV archaeological complex. The combined result is total of 32 sites which are independently verified by seven archaeologists. Because this archaeological debate is not yet settled, it is assumed that this list of potential sites will change as more research is completed. Therefore, the list of sites used in this research is not meant to be exhaustive. The sites used are simply a representative sample of what is currently assumed to be the Northeastern Plains Village Complex.

The ethnographic considerations used for this research are a different matter altogether, and are explained at length in Chapter Four, *A Revised Sci-TEK Technique*.

Analysis of NEPV Site Configuration and Architecture

The site types most commonly associated with the NEPV Complex are campsites, unfortified villages, and ditch fortified villages. Based on the shapefile data provided by the North Dakota Preservation Office, the campsites (n=20), which are defined by a lack of internal depressions or external fortifications, vary in size between 1000 m^2 and 263,000 m^2. The majority of the campsites included in this research (74%) are located on the low to mid river terraces within the floodplain zone. The remainder are located on elevated terrain such as ridges or bluffs adjacent to river valleys. Conversely, the unfortified village sites of the NEPV (n=4) contain a number of house depressions ranging from two to four each and vary in size between 5000 m^2 and 145,000 m^2; a majority (75%) are located on the upper terrace/bluff landforms of the river valleys. Finally, the ditch fortified sites (n=8) of the NEPV are smaller on average, but range widely in size – between 910 m^2 and 168,800 m^2. Whereas the majority of the unfortified village sites are located within the highest elevation zones of the riparian topography, the ditch fortified village sites are more equally distributed between the floodplain and upper terrace/bluff landform locations. Further, with the exception of the six large house depressions observed at the Hendrickson-III site (32SN403), none of the other ditch fortified village sites included within this study exhibit semi-subterranean depressions as part of their architecture. Excavations completed at the Shea Site (32CS101) exhibit archaeological evidence of postmolds, and therefore point to a specific type of superstructure used in lodge construction (Michlovic, Michael and Fred E. Schneider 1988; Michlovic, Michael and Fred E. Schneider 1993). However, unlike the lodges constructed in the unfortified villages of the Middle NEPV Complex, those lodges are not semi-subterranean in nature, but built on the surface of the prairie

(Michlovic, Michael and Fred E. Schneider 1988; Michlovic, Michael and Fred E. Schneider 1993).

List & Chronology of NEPV Complex Sites

Table 1: List of Early NEPV Complex Sites.

Site Name	Site Number	Avg. C14 Date	Site Type	Reference
Makacenga	32SN57	AD 1212	Campsite	Gregg et al. 1987:73; Picha and Gregg 1993:209
Tahuka	32SN113	AD 1259	Campsite	Toom 2004b
Horner-Kane	32RY77	AD 1282	Campsite	Toom 2000:4.26
Kirschenman-III	32SN247	AD 1285	Campsite	Toom 2003:4.4
Quast	32LM234	AD 1288	Campsite	Schneider 1982: 121; Schneider 2002:44
Irvin Nelson	32BE208	AD 1298	Campsite	Toom 2004e
Schultz	32RM215	Not dated	Campsite	Wood 1963
Gohner-I	32SN215	Not dated	Campsite	Swenson 1987
Beeber	32LM235	Not dated	Campsite	Swenson 1987
“Dickey” Site	32LM27	Not dated	Campsite	Swenson 1987
Lake Coe	32ED85	Not dated	Campsite	Toom et al. 2007

List of consolidated Early NEPV site information as described in referenced source.

Table 2: List of Middle NEPV Complex Sites.

Site Name	Site Number	Avg. C14 Date	Site Type	Reference
Gohner-I	32SN215	Not dated	Campsite	Swenson 1987
Beeber	32LM235	Not dated	Campsite	Swenson 1987
Naze	32SN246	AD 1354	Campsite	Toom 2004c
Irvin Nelson	32BE208	AD 1356	Campsite	Toom 2004e
Ituhu	32SN110	AD 1355	Campsite	Gregg et al. 1987: 267; Picha and Gregg 1993:209; Toom 2004d
Hendrickson-III	32SN403	AD 1403	Ditch Fortified Village	Good et al. 1977: 18; Schneider 1982: 123; Schneider 2002: 44
Greenwood Village	32SN58	Not dated	Unfortified Village	Gregg et al. 1987
Shea	32CS101	AD 1448	Ditch Fortified Village	Michlovic and Schneider 1988:11; Michlovic and Schneider 1993: 124
Schultz	32RM215	Not dated	Campsite	Wood 1963
McCleary	32LM243	Not dated	Campsite	Swenson 1987
Seefeldt Village	32LM101	Not dated	Ditch Fortified Village	NDCRS Site Form, Purcell 1979
Hendrickson-II	32SN402	Not dated	Ditch Fortified Village	Swenson 1987
Chappell-II	32LM244	Not dated	Campsite	Swenson 1987
"Dickey" Site	32LM27	Not dated	Campsite	Swenson 1987
Lake Coe	32ED85	Not dated	Campsite	Toom et al. 2007

List of consolidated Middle NEPV site information as described in referenced source.

Table 3: List of Late NEPV Complex Sites.

Site Name	Site Number	Avg. C14 Date	Site Type	Reference
Hintz	32SN3	Not dated	Unfortified Village	Wheeler 1963
Horner-Kane	32RY77	AD 1645	Campsite	Gregg 1994:4.24
Sharbono	32BE419	Not dated	Campsite	Schneider 1986; Schneider 1988
Chappell-II	32LM244	Not dated	Campsite	Swenson 1987
"Dickey" Site	32LM27	Not dated	Campsite	Swenson 1987
Lake Coe	32ED85	Not dated	Campsite	Toom et al. 2007

List of consolidated Late NEPV site information as described in referenced source.

Table 4: List of Unknown Period – NEPV Complex Sites.

Site Name	Site Number	Avg. C14 Date	Site Type	Reference
Martin	32LM239	Not dated	Campsite	Swenson 1987
Chappell	32LM240	Not dated	Campsite	Swenson 1987
Schmoker	32LM241	Not dated	Campsite	Swenson 1987
Kirschenmann-II	32SN221	Not dated	Campsite	Swenson 1987
Nelson	32RM402	Not dated	Ditch Fortified Village	Michlovic 2008
Peterson	32RM401	Not dated	Ditch Fortified Village	Michlovic 2008
Lake Tewaukon	32SA211	Not dated	Unfortified Village	Springer 2016

List of consolidated Unknown NEPV site information as described in referenced source.

Scholarly Consensus on NEPV Settlement System

Contrary to the debate regarding site inclusion in the NEPV, the debate regarding the settlement system of the NEPV is universally accepted to be an admixture of Plains Woodland nomadism and Plains Village sedentism, where smaller migratory groups coalesced over time into larger sedentary groups as their primary food source – the American bison – became more scarce (Toom 2004:294; Henning and Toom 2003:215-216; Mitchell 2013:101-163; Holley and Michlovic 2013:14-15). As a result of this admixture of settlement systems observed within the region, the identification of a singular settlement system paradigm based solely on architectural metrics for the NEPV has been problematic due to their adaptability in settlement types (SHPO 2016:B.41-B.43). What remains consistent despite any particular settlement choice is their continued dependence on the bison as a primary food source and the specific technologies used in the collection, transport, processing, and storage of that resource.

As stated above, previous research has focused solely on the material aspects of the archaeological record, whereas various ethnographers have recorded the stated and observed needs of people in cultures from the region. The intention here in this research is to bridge the gap between what is universally accepted to be factual by both archaeologists and cultural anthropologists through an improvised ecological model; the Revised Sci-TEK Technique, which is explained in the following chapter. The result of which will provide an introspective perspective via the ethnographic data to the NEPV settlement system model not previously accounted for by the archaeological materials themselves.

CHAPTER THREE: THEORETICAL FRAMEWORK

Traditional Ecological Knowledge (TEK)

What was identified by social anthropologist Tim Ingold as a type of skill-based, ecocultural inheritance (Ingold 2000:315-322) is also referred to by Berkes in his book titled *Sacred Ecology* as Traditional Ecological Knowledge (TEK), or "a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and their environment" (Berkes 1998:8). As an Applied Ecologist, Berkes was focused on creation of an interface between the social and natural sciences, especially where modern ecological preservation efforts were concerned. This study seeks to apply his ideas to the prehistoric settlement patterns of the NEPV Complex.

Early Debate on Indigenous Choice in Human Ecology

The 1982 Johnson and Behrens article titled, "Nutritional Criteria in Machiguenga Food Production Decisions: A Linear-Programming Analysis" early on sought to incorporate Indigenous choice into food production decisions by weighing the nutritional balance of the curated foods against their production cost. This challenge to previously held human ecological paradigms drew overwhelming resistance within the field and was immediately classified as reductionist in its application. The common fear was that if the food production methodologies of a more "technologically simple" group of people were explained by the most "labor-efficient solution" (Johnson and Behrens 1982:167-170), then the end result would be the promotion of a description of humanity which is "improbably divorced" from the environment and ultimately reduced to pure "biological phenomena" (Bamonte 1983:115-116). Not all of their contemporaries agreed. For example, Jean-Paul Lescure (1983); highlighted the ongoing tension between Structuralists and Cultural Ecologists by noting that Johnson and Behrens' multidisciplinary perspective rendered all previous theory-based conflicts obsolete through their process of tacking back and forth between theoretical frameworks. It was through this and similar research that the more introspective, person-centric approaches of the 1990s gained acceptance.

The Renaissance of Indigenous Perspectives in Ecological Stewardship

The environmental conservation efforts of the 1990s ushered in a renaissance of Indigenous-based theoretical perspectives which sought to organize western conservation efforts around decentralized methods of environmental stewardship and to highlight ecological interconnectivity, a drastic alteration to the top-down and large-scale regulatory schemes then practiced by conservationists. This new focus on Indigenous knowledge, centered on the individual, led to the development of theoretical framework based on two core concepts: all things are interconnected and all things are interrelated (Pierotti and Wildcat 2000:1334-1338). Within this TEK-based framework, humans are not solely considered to be the stewards of the environment in which they live, but rather find themselves existing as another creature engaging themselves within the landscape (Pierotti and Wildcat 2000:1334; Ingold 2000:5-6 & 42-43).

In the earliest part of the decade, scholars such as Madhav Gadgil and Fikret Berkes had presented a loose collection of ideas upon which they wanted to base this new perspective, but they and others in the field were still unsettled regarding issues of the translation of Indigenous knowledge-making schemes into western ecological paradigms, how to effectively model the transmission of spatial knowledge, and how to proceed without the undue assignment of absolute efficiency on all matters of the Indigenous environmental experience. The last of these was handled quite simply by eliminating the absolute need for Indigenous infallibility by insisting that the stewardship of the landscape is that of a long-term process and not necessarily constrained to singular incidents of success or failure (Berkes et al. 2000:1252-1255; Sponsel 2001:159-174). As for the how the new paradigms were to be constructed, Gadgil and Berkes were insistent that ecologists transition away from typical western-scalar ecological knowledge-making schemes to the use of ecosystems-related Indigenous terms, primarily as a means of projecting and otherwise incorporating those built-in cultural meanings into those respective places and spaces. This provides the basis for an inductive approach and is especially true where the incorporation of TEK concepts are considered for ecological restoration and development (Berkes et al. 1998:409-415).

One practical example of this idea is illustrated by Berkes and Davidson-Hunt's 2006 article *Biodiversity, Traditional Management Systems, and Cultural Landscapes: Examples from the Boreal Forest of Canada*, where the authors promote the Anishinaabe perspective of a multifunctional landscape as a biodiverse sphere being actively stewarded through varied cycles of use and maintenance. The common perception of Western forest managers regarding wilderness zones at-large as grand homogenized masses is greatly contrasted by this Indigenous example of landscapes as a series of resource patches, some of which are large and others small. Through the production of patches, gaps, and ecotones, the Anishinaabe enhanced and conserved a wide range of biotic diversity through each successive ecological stage (Berkes and Davidson-Hunt 2006:35-38).

Lastly, regarding knowledge transmission, Berkes, Colding, and Folke began with the premise that indigenous conservation methodology varies greatly from that of western conservationists in that indigenous "knowledge and institutions require mechanisms for cultural internalization" (Berkes et al. 2000:1256). Rituals, ceremonies, and other like traditions serve a dual function in Native society; they are the mechanisms though which those ecological practices become internalized, and they simultaneously serve as the as the primary method for the intergenerational transmission of said practices (Berkes et al. 2000:1258-1259). Consequently, every time the ritual or ceremony is reproduced, those ecocultural practices are reaffirmed and retransmitted.

TEK as a Theoretical Framework

Indigenous knowledge, also known here as Traditional Ecological Knowledge (TEK), is defined as a cumulative body of knowledge and beliefs handed down through generations by cultural transmission about the relationship of living beings with one another and with their environment. Though long-distance trade and land transformative practices such as farming existed, the average group's dependence on resources within catchments of only a few hundred square kilometers incentivized the development and maintenance of resource sustainability practices for their immediate environment. This would include the potential for the selective manipulation of biodiversity on the landscape, resulting in an increase in the "patchiness" of resources found within their catchment area (Gadgil et al. 1993:151).

TEK has been used as the theoretical basis for numerous ecological management and policy development projects, ranging from the analysis of the relationship between the US and Canadian Governments and the Inuit peoples on the Alaskan Wilderness for the purposes of creating International Policies (Watson et al. 2003:6-10), to the formation of digital cartography products which seek to either internally enhance local ecocultural knowledge (Chambers et al. 2004:20-22) or serve as an external means for Indigenous peoples to address and achieve political goals (Chapin et al. 2005:620).

In archaeological research, the integration of TEK has been difficult to incorporate due to a myriad of factors, including: modern development, large –scale migration (pre- and post-colonization), and the intergenerational information gap caused by reservation efforts that disrupted the continuity of indigenous oral histories. The closest anthropological representation of this type of research is Oetelaar's research regarding the relationship between human agency and ecology (Oetelaar 2014) and Sundstrom's ethnoastronomical research concerning indigenous sacred sites (Sundstrom 1996). In both examples, anthropologists merged ethnographic (conveyed as TEK) and geographical data to create an ecological narrative which was also supported archaeologically.

A TEK-based framework has everything to do with positionality and what evidence is given primacy over others. In this research, primacy is given to the first-person phenomenological perspective of the individual telling the story. The result, is the development of a theoretical checklist [of sorts] of notable places, spaces, geographic features, and/or resources, etc., that have been recognized as important settlement system attributes by informants who were likely to have interacted with the places and spaces in question archaeologically. Therefore, the value added here is that previous assumptions made regarding the human ecology of this research area would be affirmed or denied based on the details of said informant testimony.

A number of environmental rehabilitation projects led by Matthew B. Bethel in the coastal region of Louisiana provide an example of a definitive methodology for the incorporation of TEK from a population of modern local informants, which will serve as a baseline for the methodological development process explored in the next chapter.

CHAPTER FOUR: METHODOLOGICAL PROBLEMITIZATION AND DEVELOPMENT – THE SCI-TEK TECHNIQUE

Introduction

The goal of this chapter is to create a decision-support model which seeks to integrate the spatial attributes – associated with archaeological settlement pattern research – with the Indigenous ecocultural perspective gleaned from ethnobiography and mimics an enthnoecological model developed by environmental scientists. It is also the intent of this research to provide a baseline model for later development of a predictive settlement paradigm for the Northeastern Plains Region. This method borrows from the Sci-TEK Technique, developed by Bethel his team (2011; 2014) as a "more comprehensive method of assessing ecological change that can benefit both ecosystem and human community sustainability" (Bethel et al. 2011:557). Bethel's Sci-TEK Technique, at its core, is a methodology for quantifying and qualifying data which are to be later used as parameter information in statistical algorithms (e.g., discriminant function analysis, logic models, etc.). In the sections that follow, Bethel et al's (2011; 2014) use of the Sci-TEK Technique is problematized within the field of Natural Resource Management, tailoring the method to accommodate the archaeological needs of this thesis research. Further, the potential advantages of incorporating a TEK-based theoretical approach for exploring settlement distributions are outlined in comparison to a theoretical focus on a more processual, environmentally deterministic framework. Lastly, a new archaeologically-based Sci-TEK Technique is outlined for use in the research of settlement pattern distributions.

Bethel's Sci-TEK Technique

Bethel et al's use of the Sci-TEK Technique is outlined in their 2014 research. They selected an ecological feature (in this case, Barataria Basin) as the baseline research focus for their preservation study. They then submitted inquiries to all Indigenous groups in the area who they perceived as having social, cultural, and economic links to that feature. Once the groups affected by the proposed restoration project were determined, a peer selection process was used to democratically select representatives from those groups to serve as local TEK experts for the study. The selected TEK experts were tasked with setting the agenda for the data collection plan as a strategy to eliminate collection bias by the research team. Once the survey was conducted and data collection was complete, those results were openly coded into categories created to best reflect the concerns initially raised by the TEK experts. Those categories were then reviewed by the TEK experts and verified as being representative of the goals of the original data collection plan.

Through the creation of an overview/consensus map of the research area, gaps in the data collection were identified and the various collection locations prioritized according to ecological restoration expectations. Areas on the map which exhibited significant congruence between the TEK experts were then categorized using an expert rank index (ERI), which tracked the functions of “agreement and emphasis” (Bethel et al 2014:1087) for the ecological attributes involved. Those values were subsequently used to represent specific variables within a logic model (for more detail, see Bethel et al. 2014 or Balram et al. 2004). The results of the logic model were then used to focus the collection of pertinent GIS data into a formation of numerous feature classes (polygons, lines, points, etc.) thought to best explain the collected data. Those map layers were then ranked (or weighted) using an “analytic hierarchy process” (Bethel et al 2014:1088) which incorporated the ranking considerations provided earlier in the process by the TEK experts (ERI).

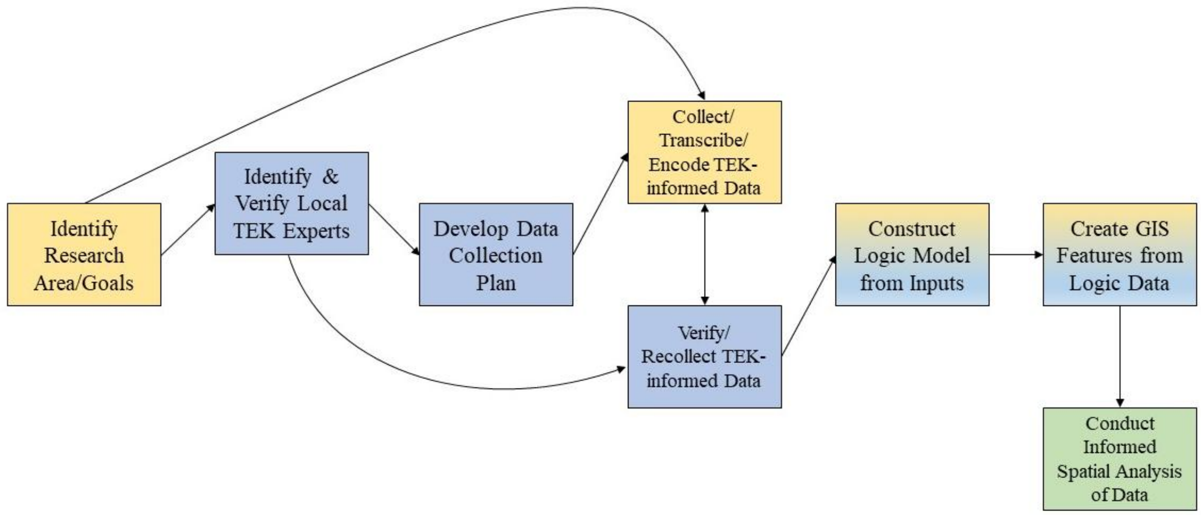

Figure 2: Flow Chart of the Sci-TEK Technique as translated from Bethel et al. 2014.

Problematization of the Sci-TEK Technique

As detailed in their 2014 research, Matthew Bethel led an interdisciplinary team in the development of a logic model which sought to expound upon the initial version of the Sci-TEK technique (Bethel et al. 2011) by coding the inputs of numerous local informants for the purpose of generating weighted outputs, which were then used to create a geospatially-informed conservation policy. For the purposes of this thesis, the logic model used in Bethel et al. 2014 (also referred to as the "Collaborative GIS Method" in Balram et al. 2004) is not fully considered here due to its heavy dependence on the abundance of testimony from multiple local agents serving as the basis for its raw (aka openly described) algorithm inputs (Bethel et al., 2014:1086). Instead, published information collected from informants by ethnographers in the field from the early 20th century is used as this method's openly coded input information. Selected citations from those works which reference specified ecological phenomena was then axially (aka compared via table) coded into scientific attribute categories best suited to describe those phenomena, e.g., the name of a commonly understood geographic location, the Indigenous delineation between a marsh, slough, or pothole, etc.

Whereas Bethel's logic model included independent verification of the axially coded data wherein the informants themselves were provided an opportunity to scrub the inputs before proceeding (Bethel et al., 2014:1086-1087), that step is excluded from this version of the Sci-TEK technique due to the nature of the information used. In other words, Bethel's direct access to local informants, in concert with their post-research goals and expectations, has made their use of historical ethnography unnecessary. Further, the affected stakeholders (and their descendants) can readily be identified and incorporated into that process, the consequences of which directly impact their day to day lifeways (Bethel et al., 2014:1085-1087). For the Northeastern Plains, however, the results of pre-historic and proto-colonial migrations in the region make it impossible to execute Bethel's logic model as prescribed due to the lack of contemporary stakeholder testimony from those who would have lived undisturbed in the region since the archaeological period in question.

As previously indicated, ethnobiographic data was used in lieu of the local informants accessed by Bethel and his team as those volumes house the last remnants of the Indigenous voices who lived freely on the Great Plains before being violently forced onto reservations. The ethnographic data to be used in the thesis research was as specific to the perceived inhabitants of the region as possible for the archaeological period in question. Second, with those selected ethnographies and a scarcity of primary source material, only that material which fit the definition of being a secondary ethnographic source was considered for use as surrogate informant data (e.g., direct transcriptions of oral histories, edited biographies, etc.).

Theoretical Considerations

In his 2010 article, Eric Jones attempts to investigate proto-historic Haudenosaunee settlement choice using Settlement Ecology Theory, a framework which seeks to examine the relationships between individual settlement locations and the natural and/or cultural landscape features which are located nearby. While previous archaeological and ethnohistorical studies had "compiled a comprehensive list of potential [spatially related] factors," most of those factors were dismissed due to having too narrow a focus or a lack of empirical evidence in support of those attributes (Jones 2010:3; my brackets). What is being expressed by Jones is representative of a larger consensus held within the community of settlement ecology: Where theoretical framework development is concerned, preference would ultimately be given to data derived from firsthand Indigenous accounts, provided those accounts were capable of meeting the qualification threshold for empirical data (e.g., verifiable, provable, etc.). I do not intend to discount the volumes of research supporting this position. What I instead suggest in the paragraphs that follow is that those methods informed by environmental determinism have the potential to pair well with those perspectives that are fundamentally TEK-based for the formation of an empirically sound, multi-perspective approach in the analysis of Indigenous settlement ecology.

Serving as the primary TEK-based research example for this thesis is Linea Sundstrom's (1996) work which examines the adoption of sacred landscapes by proto-historic Plains migrant groups and the subsequent development of sacred spaces within those contexts. Her methodology was exclusively focused on the examination of oral histories, ethnography, and other historical documents (such as deerskin maps) for the purpose of illustrating the depth at which the sacred mythos and cosmologies of the Kiowa, Cheyenne, and Lakota overlapped within the context of the Black Hills landscape.

What this example does well, especially when placed in direct comparison to Eric Jones' settlement research above, is specifically highlight the limitations in scope of both approaches. For example, in its attempt to be considerate of the associated ethnographic data for its settlement attribute selection, the Settlement Ecology model used in Jones' research often tethers itself strictly to the presence or absence of an ecological feature as an archaeological correlate of social, economic, and/or political behavior (Jones 2010:4-9; Kohler 1988:19; Hasenstab 1996:17-18). While this method may adequately explain potential ecological and anthropological correlations at the small scale, e.g., within a specific settlement area or between a select few settlements within the same geographic feature (e.g., Coteau de Prairies), the strength of this methodology begins to diminish at larger geographical scales due to the potential patchiness of those referenced ecological features. The result of Sundstrom's research is markedly different in nature, as it seeks to conceptualize an ideology which is otherwise incorporeal and bind it directly to the material world using Indigenous-identified sacred spaces and places. In this researcher's mind, the methodologies resulting from both theoretical frameworks are complementary and can be used in conjunction with one another by employing the Sci-TEK Technique as a vehicle for this new method's implementation.

A Revised Sci-TEK Technique

The first step in this methodological process is the identification of a research question [Figure 3]. The primary research question was derived from a series of questions listed in the North Dakota State Historical Society's Archaeological Component regarding settlement pattern differences between the James River Valley and the Sheyenne River Valley in North Dakota (covered at length in the next chapter). In an effort to be more specific regarding research goals and expectations, the Northeastern Plains Village (NEPV) Complex was selected to confine the thesis research within a workable context and time frame. The next step was to identify, through a cultural-historical literature review, those cultures which could possibly have associations with the archaeology of the NEPV Complex. This included ethnographic literature covering several

Indigenous groups, including the Mandan, Arikara, and Hidatsa; the Standing Rock Sioux; the Cheyenne; the Yankton & Yanktonai Sioux of the Coteau de Prairies region; groups from the Dakota of the Minnesota River Valley; the Anishinaabe (particularly the Ojibwe) of the Minnesota Parklands/Turtle Mountains; the Woodland and Plains Cree of Ontario and Manitoba; and the Assiniboine of the Northern Parklands and Great Plains regions. The review of regional ethnographic information was further reinforced through the evaluation of settlement systems associated with the archaeologies of the Plains Village Tradition, i.e., the Middle Missouri, the Coalescent, the Devil's Lake-Sourisford, and the NEPV Complex. Select archaeologies of the Late Plains Woodland of Western Minnesota and Eastern North Dakota were also reviewed for this purpose. Through this extensive process, it was determined that only the ethnographies relating to the Hidatsa (ancestral), the Yanktonai, and the Dakota would be considered to serve as Sci-TEK sources.

In Bethel's Sci-TEK model, a peer selection process was used to determine group representation as local TEK experts during the research project. Given the difficulties in conducting research relating to the settlement patterns and strategies of a specific prehistoric archaeology where the associated culture is largely unknown, an emphasis was made on the purposeful inclusion of lost Indigenous voices from all relevant cultures that could be verified – perhaps not as the actual people of the NEPV Complex, but as cultures suspected to directly influence the people of the NEPV Complex. Traditional Ecological Knowledge, which is gleaned from those ethnographical accounts via oral histories, recorded origin myths, and autobiographies, was evaluated, organized, and used to define and frame the categories of site attribute data used in subsequent spatial analysis.

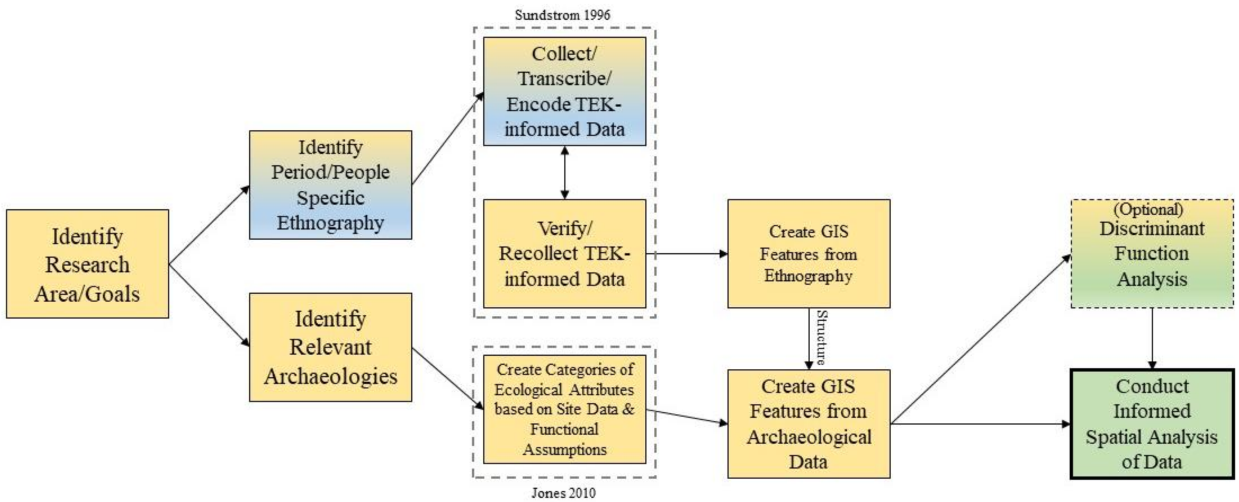

Figure 3: Revised Sci-TEK Technique for use in Archaeological Spatial Analysis by Daniel Lindsey

For the archaeological site data associated with the NEPV Complex, the methodology outlined in Jones' 2010 research was used to organize the associated site metrics into categories [Table 5] that mimic the TEK-informed categories established in the previous step; this included a standardized list of physiographic attributes, such as viewshed size, average slope at settlement, majority slope at site, modal aspect at site, distance to fresh water, and others (Jones 2010:7). The results from both of these steps – ethnographic and archaeological attribute coding – were combined into a joint list of ecological landscape features used in conjunction with existing data for formation of GIS feature classes and in the performance of subsequent geospatial analysis.

The Application of the Revised Sci-TEK Technique

As discussed in the previous chapter, the Revised Sci-TEK Technique was employed here as a methodology of highlighting relevant Indigenous voices captured in print during the salvage-ethnographic research boom of the early 20th century. Whereas local informants were used in the original process, a curated selection of ethnobiographies and ethnography was used here during the conduct of this research as a substitute. In the literature review leading up to the completion of this thesis research, the ethnohistorical data for all of the culturally distinct groups located in and adjacent to the research area were scrutinized for instances of oral history or mythos which could position the group within the research area between AD 1200-1800. Of the eight cultural groups researched, e.g., the Mandan, the Arikara, the Hidatsa (Proper & Ancestral), the Cheyenne, the Yankton/Yanktonai & Santee Dakota, the Assiniboine, and the Plains Cree, only the oral histories of the Yankton Dakota and Ancestral Hidatsa were determined to positively position members of these groups within the research area during the archaeological period. That said, it is entirely possible that smaller bands from other groups listed did inhabit the research area. However, records of those oral narratives were not discovered during the limited course of this research.

Once the specific ethnographies were vetted and selected, the process of searching each volume began at length with a focus on terms related to concepts of and related to the landscape or the environment, e.g., *wood*, *water*, *earth [dirt]*, or *bison*. Once that round of searching was complete, a secondary manual search was conducted relating to terms known to be associated with cultural [or architectural] importance, e.g., *village*, *house*, *camp*, and *stage*. Lastly, a tertiary manual search was conducted for words believed to be associated with concepts of spiritual importance, e.g., *hunt*, *death*, *burial*, or *song*. Once a search term was identified within the text, the pages preceding and following the term were analyzed to provide context to the term, then if the quotes containing the search term were of contextual value, they were then itemized and axially-coded [Table 5] to inform this research of two specific GIS techniques most appropriate for use in the analysis of NEPV Complex site-related attributes; those techniques were Intervisibility and Ripley's K-Function Analysis.

For example, in Waheenee (1921) there is a passage which describes the placement of a person's body – who at the time was believed to be deceased – in the burial grounds proximal to their village. Days later, when Yellow Elk awoke from his comatose state, he was close enough to the village to attract others to his aid by calling out to them (Waheenee 1921:10). While this example does not provide an exact distance [as other examples do] in relationship to the village, it does stress the importance of the connectivity between the two locations, and thus may be expressed through the range of intervisibility between the village site and the nearest mound location. Intervisibility in ArcGIS uses a Triangular Irregular Networks (TIN) surface and two individual point features to determine if any portions of the terrain obscure the sightline of one specified geographic location to another. By determining if a sightline relationship between mounds and sites associated with the NEPV Complex exists, it would effectively validate both the oral histories used in this research and the mortuary practices believed to be associated with NEPV archaeologies.

Table 5: Traditional Ecological Knowledge results gleaned from Ethnobiographical sources.

TEK Quote	Sci-TEK Axial Coded Input
"The two populations [Hidatsa & Mandan] visited back and forth even though they lived 150 miles apart; each group assisted the other in the performance of ceremonies and rejoiced when the other had won military honors; individuals moved from one group to the other to live without discrimination" (Bowers 1963:251).	Distance between distinct groups (Political boundaries, extent of overall resource area, etc.)
"Since the purpose of these winter camps was to conserve wood and to spare the game ranging near the summer villages, great reliance was placed on the game killed during the winter both for food at the time and for a surplus supply to be taken back to the villages in the Spring when normally the herds were away from the river on the summer range" (Bowers 1963:186).	Attributes of Winter Camp (Catchment Size, Proximity, etc.)
"We could not go to get water at the river [Spring thaw]; but Red Blossom crept into the entrance way and filled a skin basket with snow" (Waheenee 1921:28).	
"I have been telling you how the cache pit was used for storing things for winter; but I do not mean that it was of no use in summer time. In early spring we put into a cache pit two big packages of dried meat and a bladder full of bone grease" (Waheenee 1987:87-97).	
"In some instances [based on tribal political divisions], the [winter] camps were many miles apart, at other times only a few hundred yards apart" (Bowers 1963:39).	
"We thus came to the woods [to collect firewood], about a mile and a half from the village" (Waheenee 1921:86)	
"The summer camps were situated on grassed terraces above the wooded bottoms and out of reach of floods" (Bowers 1963:47).	Attributes of Hunting Camp (Catchment Size, Proximity, etc.)
"A wigwam of weather-stained canvas stood at the base of some irregularly ascending hills [near the river valley's edge]" (Zitkala-Sa 2019:3).	
"Here [on the bank of the Missouri River], morning, noon, and evening, my mother came to draw water from the muddy stream for our household use" (Zitkala-Sa 2019:3).	
"[For the Spring hunt] We pitched our tent on a bit of rising ground from which we scraped the wet snow with a hoe" (Waheenee 1921:139).	
"My tribe had come up river to hunt buffaloes and we stopped at Rising Water Creek to make fires and eat our midday meal" (Waheenee 1921:133)	

TEK-related attributes derived from Ethnographic Research

Table 5: Traditional Ecological Knowledge results gleaned from Ethnobiographical sources (continued).

TEK Quote	Sci-TEK Axial Coded Input
"The [hunting] camp was always placed near good water, either a large spring or a creek, and a supply of wood from which to construct the drying frames [stage]" (Bowers 1963:54)	Attributes of Hunting Camp (Catchment Size, Proximity, etc.) [con't]
"In former times [understood in context to mean pre-coalescence], it was often customary to go out 100-200 miles from the village to cure meat and hides, leaving behind an older woman of each household, the small children, and enough older men to defend the village from burning" (Bowers 1963:50).	
"Old Hidatsa informants who had been to the shoreline areas of Devils Lake to the east where they formerly lived, claimed that they had seen the burial mounds of their old people who formerly lived there" (Bowers 1963:170).	Burial Treatments (Type, Proximity, etc.)
"According to tradition, the Hidatsa more frequently buried their dead outside of the village than did the Awaxawi or Awatixa" (Bowers 1963:76)	
"That night the villagers heard a voice calling to them from the burying ground" (Waheenee 1921:10)	
"Setting the pail of water on the ground, my mother stooped, and stretching her left hand out on the level with my eyes, she placed her other arm about me; she pointed to the hill where my uncle and my only sister lay buried…Since your father too has been buried in a hill nearer the rising sun" (Zitkala-Sa 2019:5).	
"After an uncertain solitude, I was suddenly aroused [from inside her mother's house] by a loud cry piercing the night. It was my mother's voice wailing among the barren hills which held the bones of buried warriors" (Zitkala-Sa 2019:41-42).	

TEK-related attributes derived from Ethnographic Research (continued)

The TEK information reflected in the above Table [Table 5] reflects the sum total of the ethnographic resources found within the following 1,298 pages of ethnographic material: Bowers (1963, 407 pgs), Gilmore (1987, 225 pgs), Oneroad et al. (2003, 214 pgs), Waheenee and Wilson (1921, 189 pgs; 1987, 129 pgs), and Zitkala-Sa (2019, 134 pgs). Sources that were reviewed but not included are: *The Assiniboine* by Robert H. Lowie (1909, 270 pgs), *History of the Santee Sioux* by Roy W. Meyer (1968: pgs 1-47 only), *Indians of the Plains* by Robert H. Lowie (1954, 204 pgs), and *Plains Indian Autobiographies* by Lynne W. O'Brien (1973, 44 pgs).

The nature of the overall settlement pattern expressed between all of the ethnobiographic and ethnographic examples suggests that the three different habitation site types annotated therein, i.e., summer, winter, and hunting sites, were potentially geographically nested [or hierarchically clustered] throughout the landscape with regularity based on Indigenous ecocultural perceptions and seasonal expectations (Bowers 1963; Waheenee 1921; Zitkala-Sa 2019; from Table 5 above). The ethnography also suggests that those habitation site types radiate out from a permanent habitation zone, thus, a Multi-Distance Spatial Cluster Analysis [or Ripley's K-Function] was selected as a methodology to test whether or not the NEPV Complex site locations exhibited a statistically significant distribution of sites, e.g. dispersion, clustering or random. To provide a visual illustration of this core habitation area, which includes a habitation site, one or more burial areas, and a fresh water source, please refer to Figure 4 below.

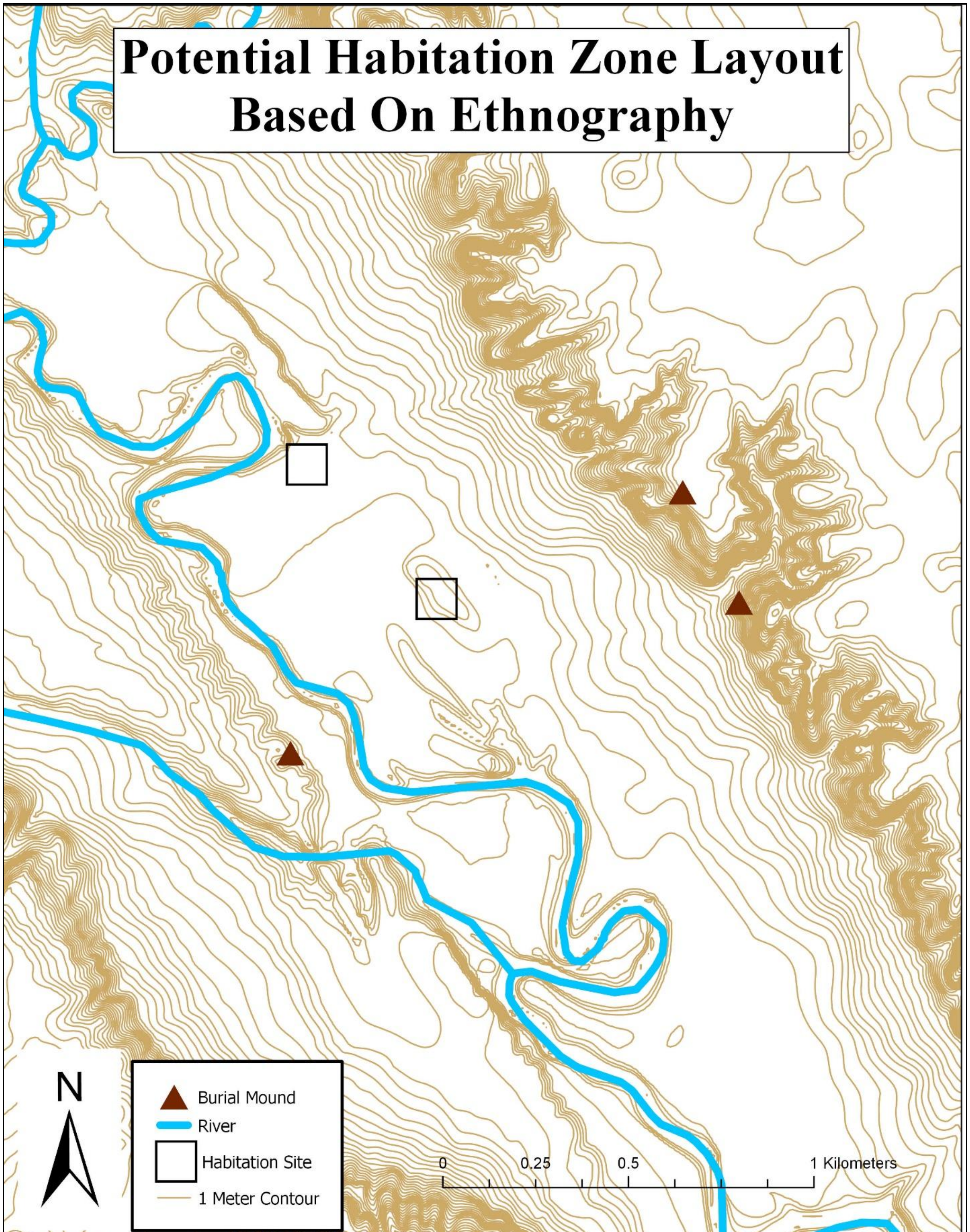

Figure 4: Example of a theoretical habitation zone layout based on summary ethnography

CHAPTER FIVE: RESEARCH OBJECTIVES AND METHODS

Research Objectives

Previous archaeological studies for the NEPV Complex in this region were almost exclusively limited in scope to site-specific survey and excavation with rare focus on the geospatial relationships of those sites beyond the features of those occupations. To add to this continuing anthropological conversation, this research seeks to quantify and qualify the ecological attributes of NEPV Complex sites.

The primary goal of this research is to determine how Traditional Ecological Knowledge gleaned from the ethnography of groups known to reside near present-day Eastern North Dakota aligns with the ecological attributes of NEPV Complex sites. This will be facilitated by the spatial analysis of TEK-derived information in ArcGIS to ultimately determine if the Traditional Ecological Knowledge is spatially observable within the landscape proximal to the currently accepted site boundaries. This recognition of a human affected landscape beyond the scope of present-day site boundaries would add yet another layer to the understanding of settlement strategies and to improvements in the classification of archaeological components yet to be discovered. The secondary goal of this research is to use a multidisciplinary methodological approach for analysis in order to limit the potential for analyses that are too ecologically deterministic.

Further, the preservation efforts for all of the sites stewarded by the ND SHPO are cataloged and digitally maintained in a similar GIS database to that used in this research. Thus, when complete, the information generated will naturally integrate into the digital archaeological holdings at the state level for continued use.

Validation Procedures

To ensure the data produced by this research was accurate and valid, two measures of statistical validation were used to ensure that the outputs of these methodologies. The first is a linear regression procedure borrowed from Hill (2009) that seeks to discern whether a correlation exists between the locations of modern population centers and those of the NEPV sites; suggesting that modern development could be the reason for archaeological site discovery.

Preferably, this type of research would only be attempted after a complete review of all of the known permitting for the urban, rural, and infrastructure development projects within the research area was conducted. Where this is problematic in North Dakota is that there is no guarantee this type of review would be any more accurate than the one used within this thesis given the circumstances surrounding the absolute nature of landownership rights within the state, the antagonistic relationship between North Dakota landowners and government regulation, and the absolute lack of external reporting and enforcement capabilities within the rural locations. Simply put, there is no singularly perfect circumstance where a population of prehistoric sites can truly be vetted for geographical independence in North Dakota. However, what this test seeks to do is provide a baseline for which other measures can be later added in order to develop better accuracy.

The second validation procedure is the incorporation of a random/control population of sites - similar in number and mean size to those found in the NEPV Complex - to verify that the sites associated with the NEPV Complex exist where they do as the result of a complex system of choices versus being randomly established. For the purposes of this research, those random sites will be machine generated and any similarities between those sites and the known archaeological sites is purely coincidental.

Verification of Correlation between Modern Populations and NEPV Site Locations

For this procedure, US Census data representing the population for each Township within the study area was downloaded from the United States Census Bureau website and imported into ArcGIS. A table was created listing all of the Townships within the study area (n=754), with columns listing the Total Population for each Township and the Total Number of NEPV Complex sites collocated in those same bounded township areas [see Appendix A]. That table was then imported into Minitab – a statistical analysis program – for use in a linear regression procedure. A cloropleth map was also produced in ArcMAP to visually display the overlay of site density versus population density (Figure 5 below).

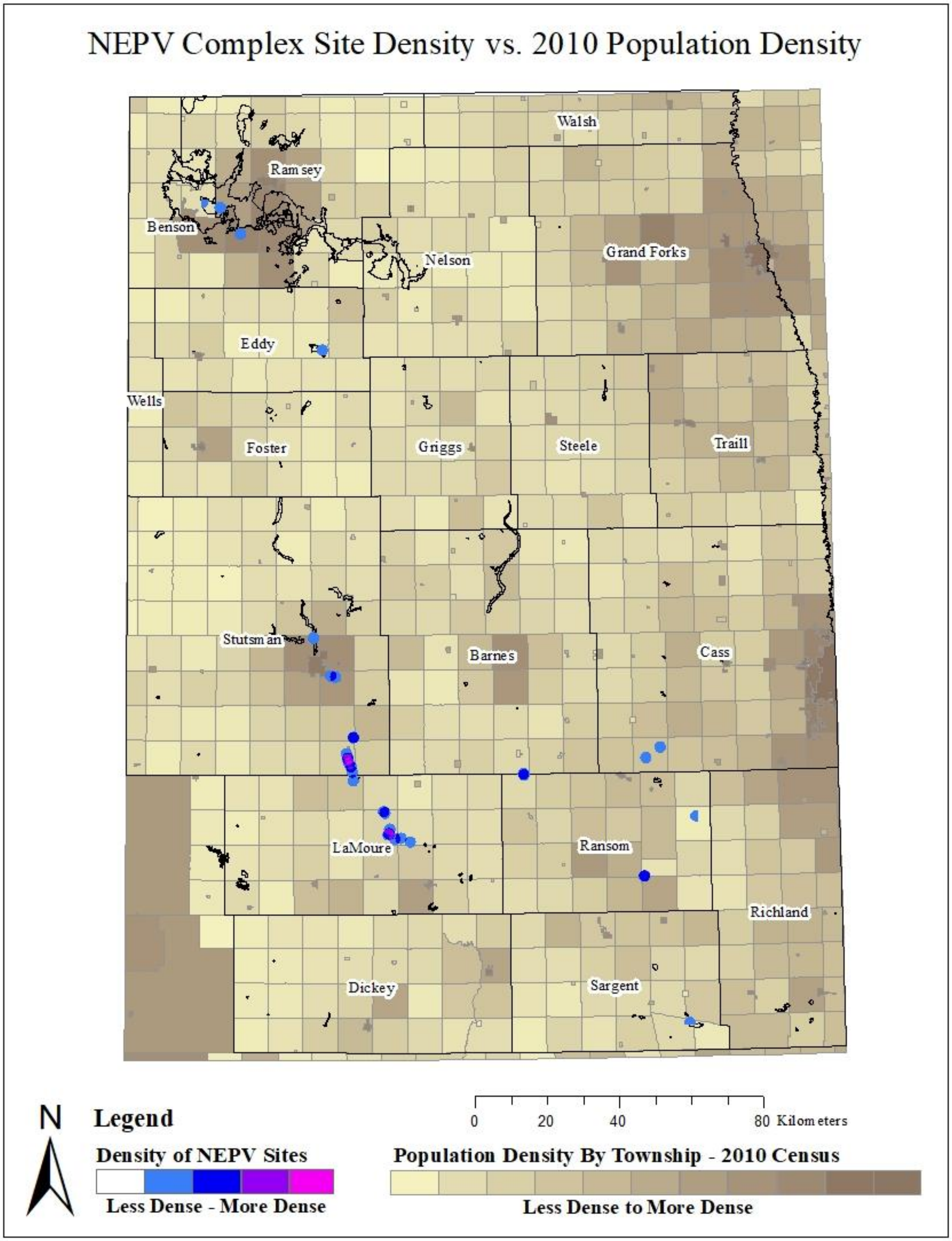

Figure 5: Comparison of a 2010 Census Choropleth and NEPV Complex Site Density

The NEPV Complex sites were selected as the Response variable and the Total Population for each township was selected as the Predictor. The resulting values for this validation procedure was $R^2 = 0.01\%$ and a p-value of 0.834. Thus, the low R^2 value in conjunction with the high p-value suggests there is no correlation between the population of a North Dakota township and the number of NEPV sites found there.

The Use of a Random (Control) Population

Using the Generate Random Points tool in ArcGIS, 32 new point features were generated within the confines of the research area. Those point features were then given a buffer which mimics the mean area represented by the NEPV Complex sites; in this case it was approximately 62,295 m^2. Once a suitable buffer was established, those features were then exported and displayed as their own polygon feature class representing the full site boundaries of a random [or control] population of sites [Figure 4]. Wherever attribute comparisons were conducted, the population of randomly generated points was included by default in those comparisons.

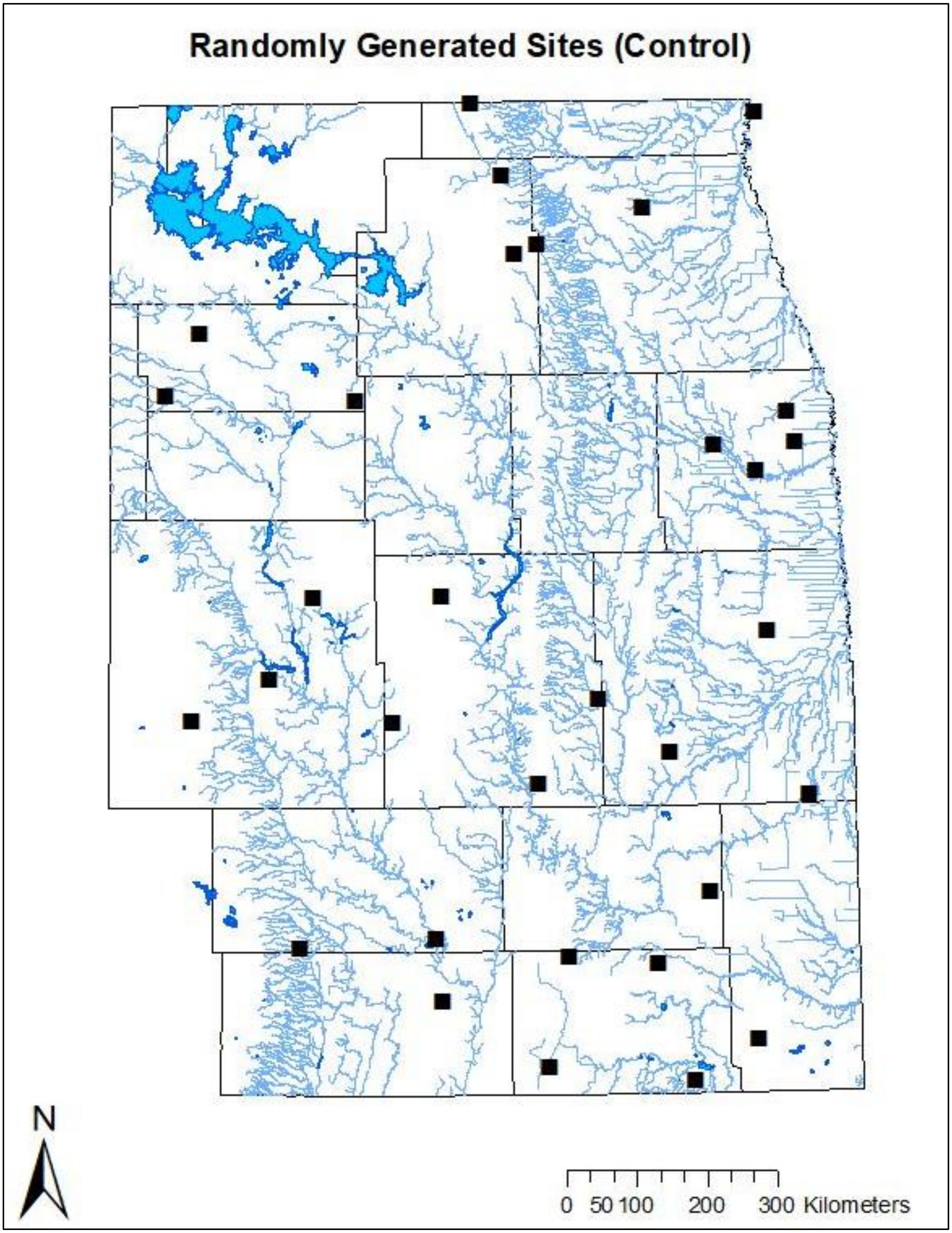

Figure 6: Map of Random Sites used in this research

Methods

Geospatial Analysis

Procurement of Data and Preprocessing

For the eastern portion of North Dakota, a series of twelve, 1/3 arc DEMs were downloaded from the United States Geological Survey (USGS) website with a NAD83/NAVD88 projection. Those DEMs were imported into ArcGIS, subsequently merged using the Raster Merge tool in ArcMap, and then trimmed using the Clip tool to the research area in Eastern North Dakota.

The feature classes representing all of the NEPV associated archaeology was received from the ND State Historic Preservation Office, and included shapefiles and an associated Excel workbook, which also contained more detailed site information than that provided within the shapefile features. For each of the 32 NEPV Complex site locations included in this study [see Figure 5], the representative polygon feature class was redrawn using a georectified .TIFF image of the latest site report map [including verbal descriptions] provided in each site report. This is because the State Historic Preservation Office data included an additional buffered distance outside of the site's boundary for preservation purposes; this editing measure ensures that only the true NEPV Complex site boundary is used for spatial and statistical comparisons.

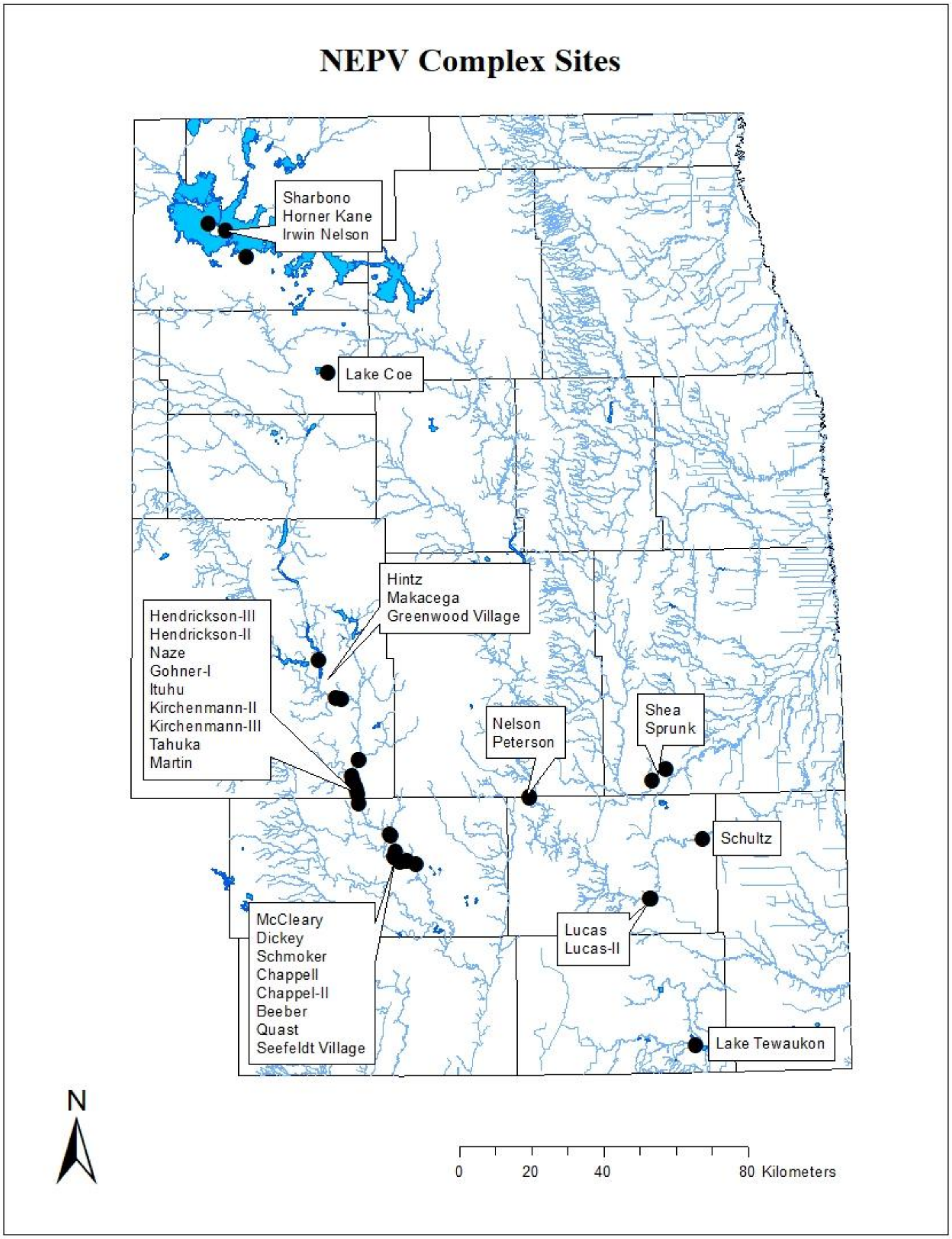

Figure 7: Map of the NEPV Complex sites used in this research

This approach, however, was not applicable for use with all of the mound burial sites located within the study area due to the sheer volume of sites (401 total mound sites). Some of the shapefiles representing the mound sites were annotated by ½ mile x 1 mile polygons and therefore did not have resolution to provide for accurate site to site analysis; as described in an earlier subsection in Chapter Four, The Application of the Revised Sci-TEK Technique. Through an exploration of the mound data and a comparative study by Cherie Haury (1990), it was determined that mound locations with site polygon areas smaller than 20,000 m^2 were the most likely to accurately reflect the actual boundaries of the mounds they represent. This delineation in mound site size effectively created two populations for use in statistical analysis. The smaller group of mounds – less than 20,000 m^2 - was used for the Intervisibility study [Figure 6], and the larger, original population of Mounds sites [Figure 7] was used for regional attribute comparisons between the 32 NEPV Complex sites and a population of 32 randomly generated control sites.

The files representing the 1:100,000 polyline and polygon data of every assessed lake, river, and stream for Eastern North Dakota was downloaded from the North Dakota Department of Health – Division of Water Quality website. With consideration to the time period studied, all of the man-made reservoirs contained within the data were removed and left represented by the stream or river system which supplies them. Further, for each of the 64 total NEPV Complex and Random (Control) sites, every polyline stream or river feature within two miles of each site location was redrawn – using the imagery basemap layer in ArcGIS – to reflect the center of the waterway at an improved 1:3,000 scale. This ensured that any later analysis which included water features was conducted at a higher resolution than originally provided by the Division of Water Quality data.

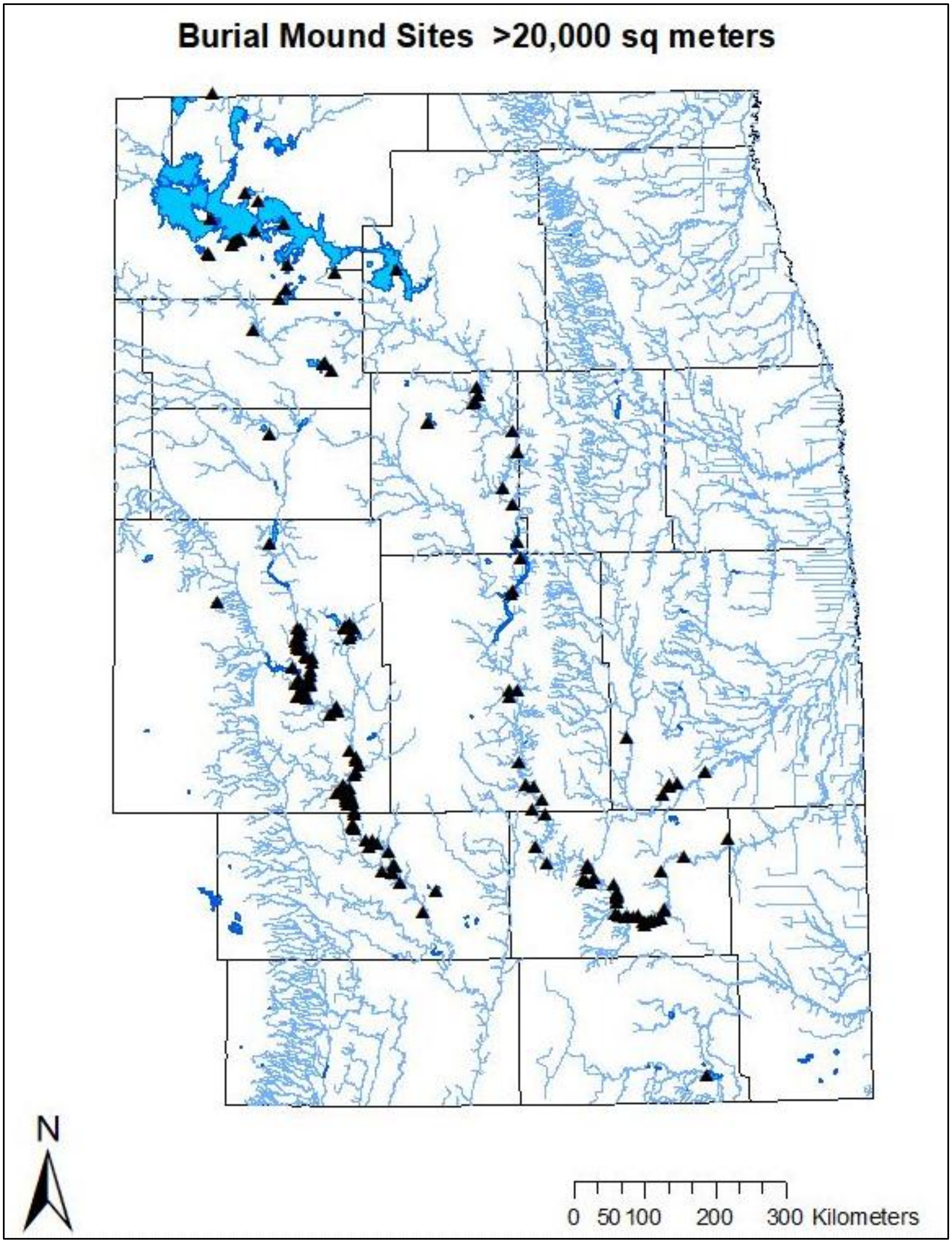

Figure 8: Map of Mound sites which are less than 20,000 sq. meters in area

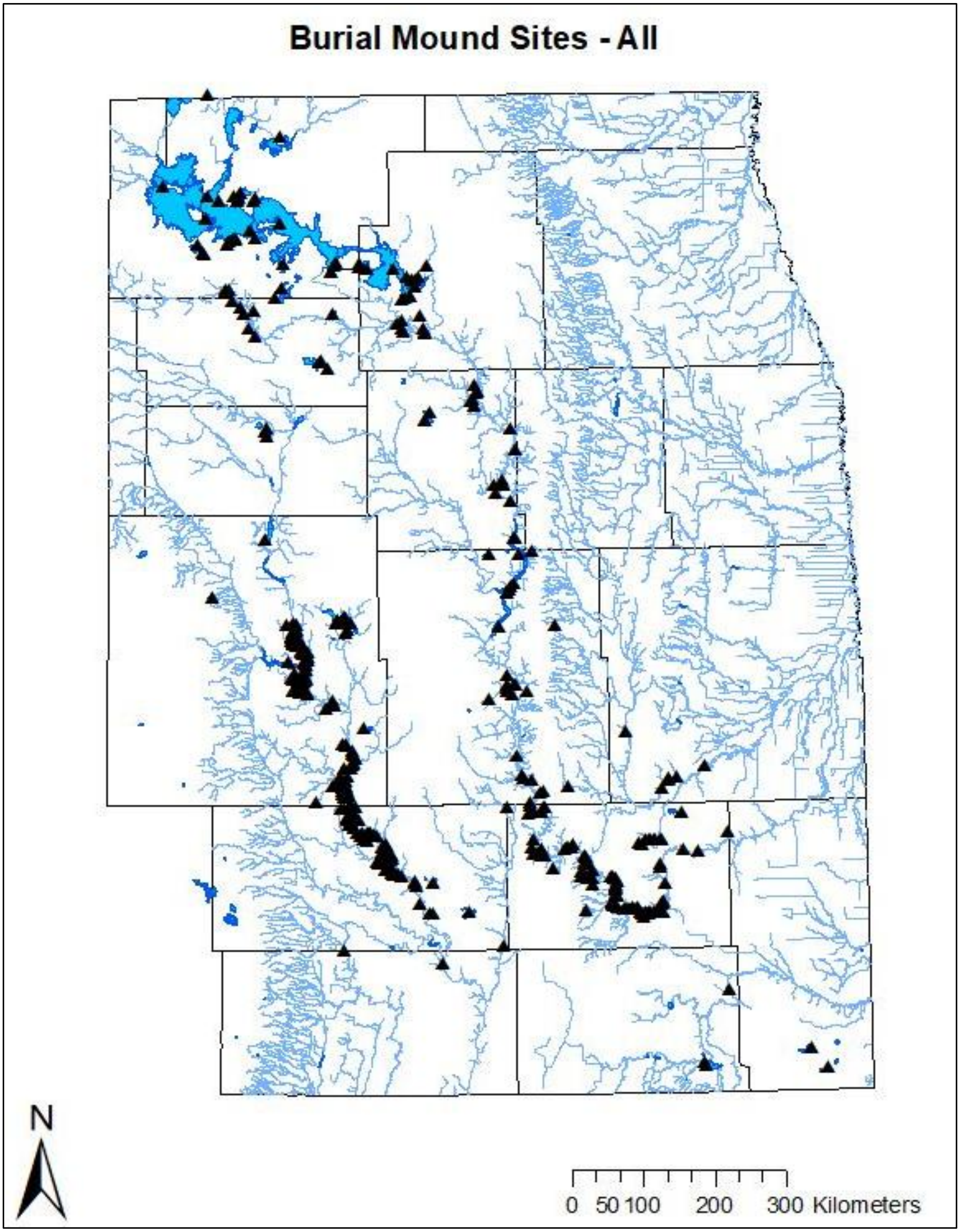

Figure 9: Map of All Mound sites located within the research area

Information regarding the locations of specific sacred locations in Eastern North Dakota was largely unknown. Linea Sundstrom provided me with her listing of sacred North Dakota sites used in her own research. Once received, those sites were then scrutinized for the cultural affiliation and temporality, in addition to their actual location information for both accuracy and relevance. Of the thousands of sacred sites included on the database, a vast of majority of those were geolocated west of the Missouri Escarpment, and therefore not eligible for regional consideration. Of those that were located in the study area, yet another large portion either referred to battlefields or mythologies which were not contemporaneous with the period of study. Each sacred site with potential, especially those with or referring to physical landmarks on the landscape, were afforded extra scrutiny given the nature of humans to repeatedly embed new meanings on old places (Sundstrom 1996; also the synopsis of Sundstrom's entire catalog of work). What remained was a listing of fourteen sacred sites [Figure 8 below] which were geographically sound and also the most likely to have persisted from AD 1200 and onwards.

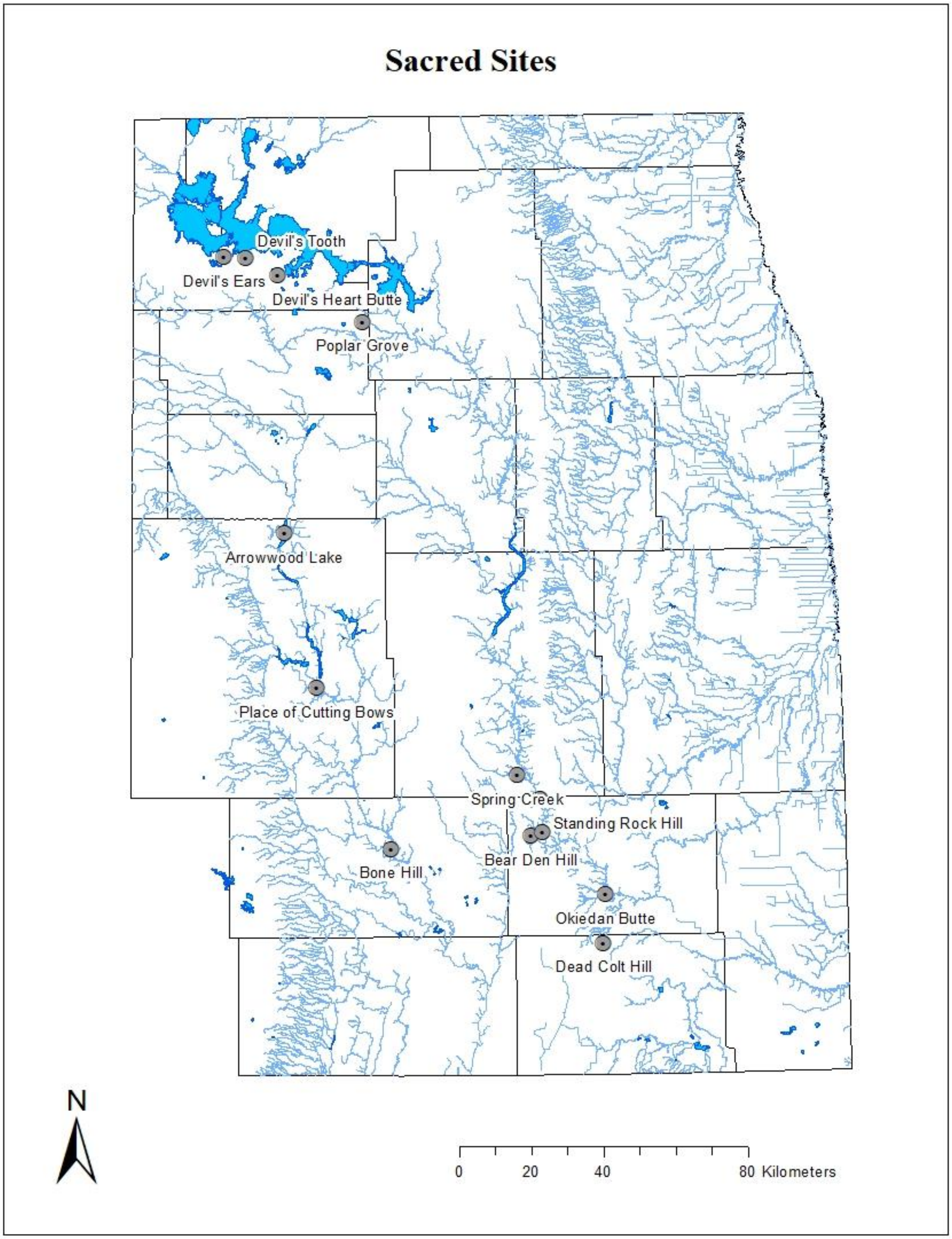

Figure 10: Map of Known Sacred Sites within the Research Area

Ripley's K-Function Analysis

Ripley's K-Function is a spatial analysis tool which is used to describe the distribution of point patterns by counting the number of specified features over a defined space. Over multiple simulations, it establishes the bounds of a random distribution envelope though which it displays [in a linear fashion] the concentration of those features at varying distances and scales (Conolly and Lake 2006:149-186). This tool is being used to evaluate the spatial distribution of NEPV sites within the research area for comparison to TEK-derived data regarding settlement preferences. It is important to note, geostatistical methods like Ripley's K-Function *in vacuo* fall short of understanding human settlement strategies without the aid of covariates. This analysis is being used in isolation *strictly* to determine the statistical significance of the NEPV sites' distribution.

Using the Multi-Distance Spatial Cluster Analysis (Ripley's K-Function) tool, the point feature class for the NEPV Complex sites was selected as the Input Feature Class. The Number of Distance Bands was set to the maximum number of 100 and the Confidence Envelope set at 999 Permutations, meaning that 999 sets of point values were randomly placed within the research area in addition to the specified Input Feature Class. Lastly, because a rectangular shaped bounded region was specified as the User Provided Study Area, the Ripley's Edge Correction Formula was used to handle calculations for permutations near the edge of the research area. This procedure was replicated once more using the same parameters, with the exception of replacing the Input Feature class with the point feature centroids of the mound sites polygon feature class. The Ripley's K-Function analysis was not conducted for the randomly generated population of sites due to the automatic inclusion of random points by the ArcGIS toolset.

Site-Mound Intervisibility

Initial ethnobiographical research suggested that the people of the NEPV lived within close proximity to their burial sites. In an effort to explore the validity of this TEK-derived information further, a small scale Intervisibility study for the NEPV and mounds sites located along the James River and 23km to 45 km to the SSW of the city of Jamestown, ND was conducted. Of all of the sites located there, they naturally aggregated into two groups. The most northerly group, named herein as Intervisibility Group #1, contains nine NEPV Complex sites and 28 Mound sites [Figure 9]. The second group, which is located south of this first group and named Intervisibility Group #2, contains only 13 Mound sites, but also eight NEPV Complex sites.

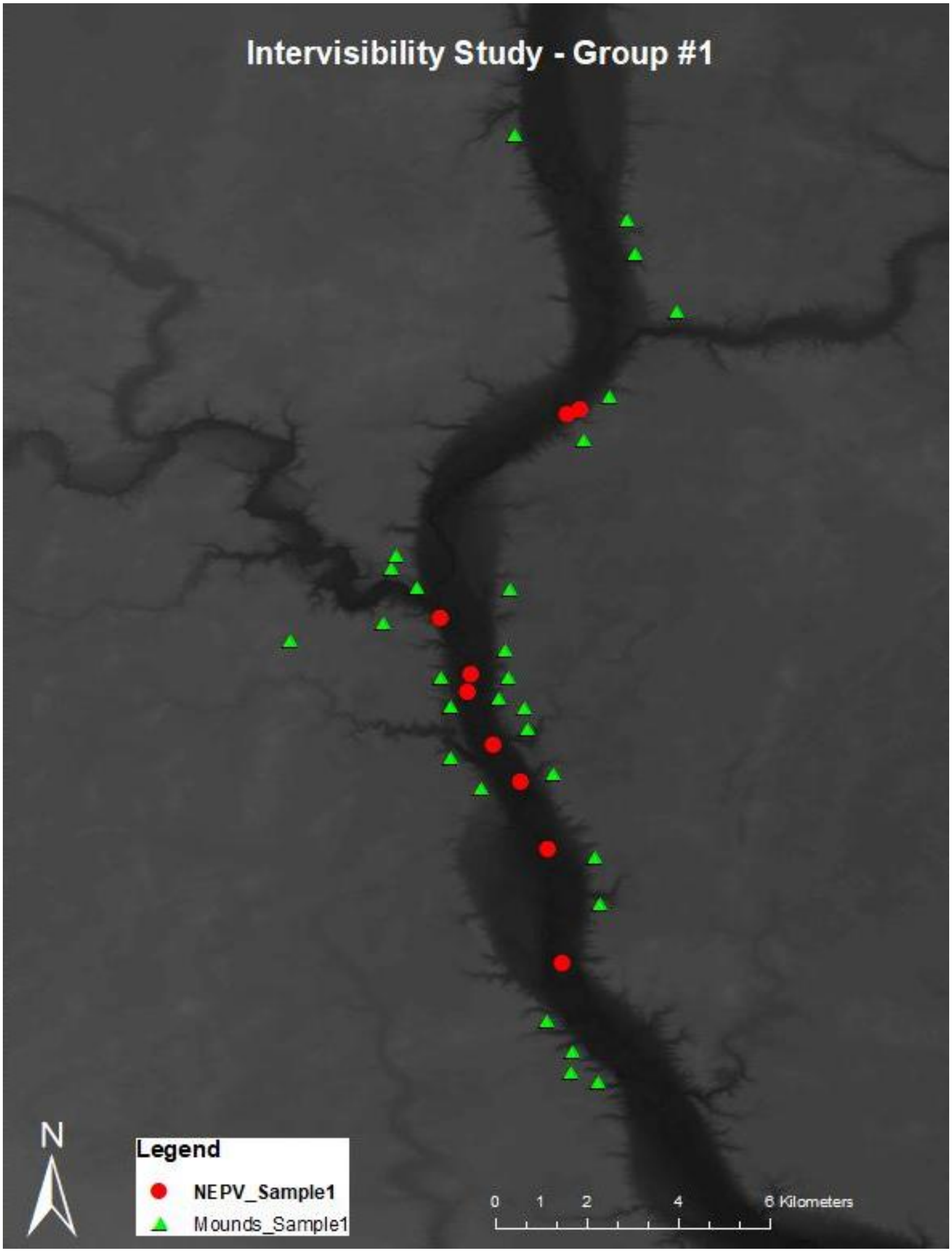

Figure 11: Map of Intervisibility Study Group #1

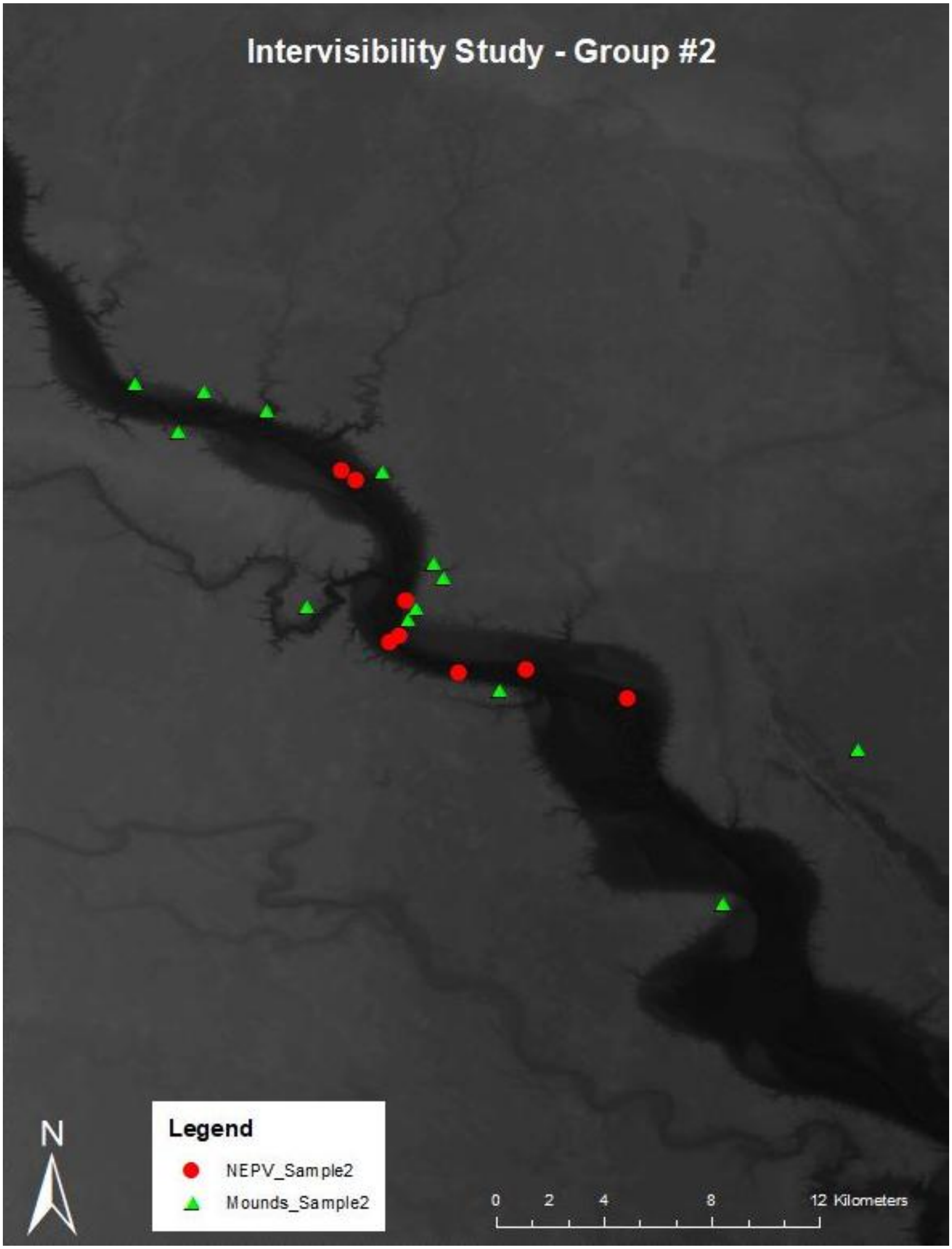

Figure 12: Map of Intervisibility Study Group #2

Using the Raster to TIN tool, a cropped DEM representing just the area of study for this intervisibility research within the James River Valley was converted to a TIN. Two distinct groups of mounds/NEPV sites were identified within this study area and a polygon feature class was created for each feature type within each group, totaling four polygon feature classes in all. Those polygon features were then populated with elevation data from tables created earlier. For every NEPV site, a line of sight analysis using the 3D Analyst extension was used to verify if either a positive or negative line of sight exists between each Mound site located within 3216 meters (2 miles; 3d Distance) of the NEPV site. Further, an Observer Offset Z-value of 1.5 meters was used to represent the view from the perspective of the height of the average human. For each Mound within the specified distance of the NEPV sites, a Profile Graph [Figure 5 below] of the Line of Sight was created to demonstrate which Mounds were directly visible or not visible from the specified NEPV site.

NEPV Site and Summary Attribute Comparisons

Using the TEK information derived from the implementation of the Sci-TEK process outlined in Chapter Three, a master list of summary attributes was created to represent those ecological and spatial traits most similar to those described in ethnography. For example, the mean slope of the site was calculated to determine if the result was universally observed, and therefore preferential, throughout all of the NEPV site locations. The same was conducted for the mean aspect of the site, the site's mean distance to water, and the site's available viewshed based on its mean elevation, plus the average human height of 1.5 meters. Small delineations, such as a site's type, were included to help establish whether or not these outcomes where an artifact of those settlement variations or if they were ubiquitous in their occurrence.

Using the DEM for the study area, a Slope raster was created using the Slope (Spatial Analyst) tool. Also, in preparation for attribute analysis, an Aspect raster was created in a similar way using the Aspect (Spatial Analyst) tool. For each of the three major attributes (Elevation, Slope, and Aspect), the Zonal Statistics as Table tool was used to generate an output table for the specific values associated with each raster at each site location (Polygons: NEPV, Random, & Small Mound Group; Points: Sacred Sites). Those output tables were then joined with their respective attribute tables for the purposes of creating a master site data table for each site type for use in Minitab. Once imported into Minitab, the Descriptive Statistics tool was used to summarize the measurements of each specified attribute, e.g. Mean Slope, Mean Aspect, Distance to Water, and Viewshed Area, and generate an output table of those results. Those attribute summaries were then gathered into a master table [Table #8] for side-by-side comparison of each site type for intersite comparisons.

One-Way ANOVA Attribute Testing

To test the statistical significance of ratio scale variables for each site type, a one-way analysis of variance (ANOVA) test was conducted in Minitab using the statistical tool of the same name. A pair-wise comparison of each site type and by each attribute was used (e.g., NEPV vs Random – Slope, Elevation, etc.) in an attempt to highlight the potential influence of TEK on specific attributes expressed at the NEPV sites versus the rest of the site types. This type of analysis, used to show potential causality in relationships between variables, operates under the following assumptions of the data: 1) it assumes that the dependent variable is normally distributed, 2) it assumes there is homogeneity of variances, and 3) it assumes that there is an independence of observations.

CHAPTER SIX: RESULTS AND DISCUSSION

Geospatial Analysis Results

Ripley's K-Function Results

The aim of this distribution analysis is to determine if the NEPV site point data is clustered, dispersed, or randomly distributed at various scales. The presence of clustering or dispersion of sites, and its variability, would indicate that settlement strategies for the NEPV were influenced by an external factor; most likely ethnoecological choice. Conversely, a completely random distribution of sites would suggest that no external factors were involved in the NEPV's site selection process. If the NEPV sites are truly a series of nested clustered sites (as described in ethnography), then the Observed Spatial Pattern Line will be observed above and outside of the upper boundary of the Confidence Envelop and remain outside the Envelope Boundary for a majority of the graphic result. Otherwise, if the NEPV sites are only considered to be Clustered or Dispersed, the Observed Spatial Pattern Line will diverge from the Confidence Envelop and quickly return. The distance the Observed Spatial Pattern Line travels away from the Confidence Envelop is a measure of dispersion significance. However, the Multi-Distance Spatial Cluster Analysis Tool in ArcMAP does not provide a numerical value to quantify this significance.

As the results clearly illustrate, the waviness (or multiple peaks) of the observed result for the NEPV Complex sites suggests that the clustering of habitation sites occurs over the landscape at various scales. It is then highly likely, as evidenced by the nested clustering of habitation sites that the people of the NEPV were interested in residing in certain spaces. For example, the initial clustering scale for the NEPV Complex sites [Figure 11] occurs at a radius of approximately 9.7 km, then around 32 km, again around 50 km, and then finally at a distance of approximately 97.1

km, before finally reentering the projected Confidence Envelope [e.g. normalizing] around 110 km. By comparison, the smoother profile of the observed result for the mound sites suggests an overall consistency in the clustering of sites over distance [Figure 12], with only a slight initial peak of clustering occurring at approximately 15 km. Unlike the normalization observed for the NEPV Complex sites, the normalization for the distribution of the mound sites does not appear to return to the specified Confidence Envelope within the scope of the analysis before the 999 permutations for the analysis are concluded around the radial distance of 67 km.

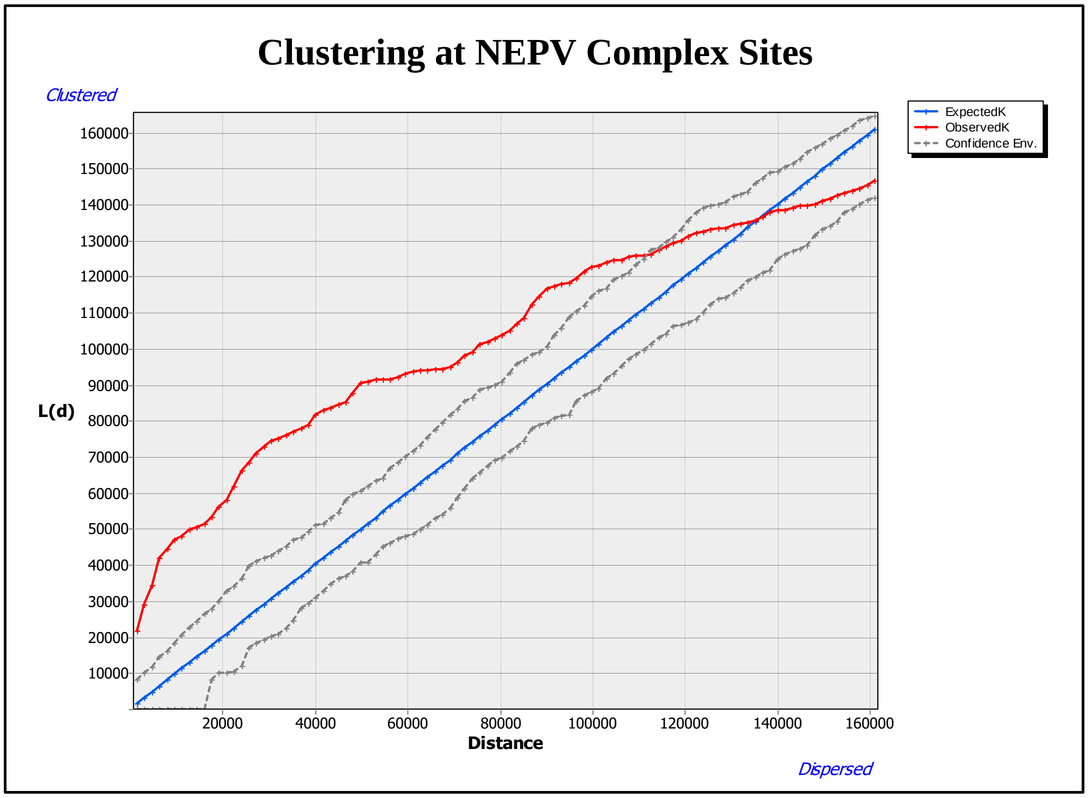

Figure 13: Ripley's K-Function Analysis for NEPV Complex Site Centroids

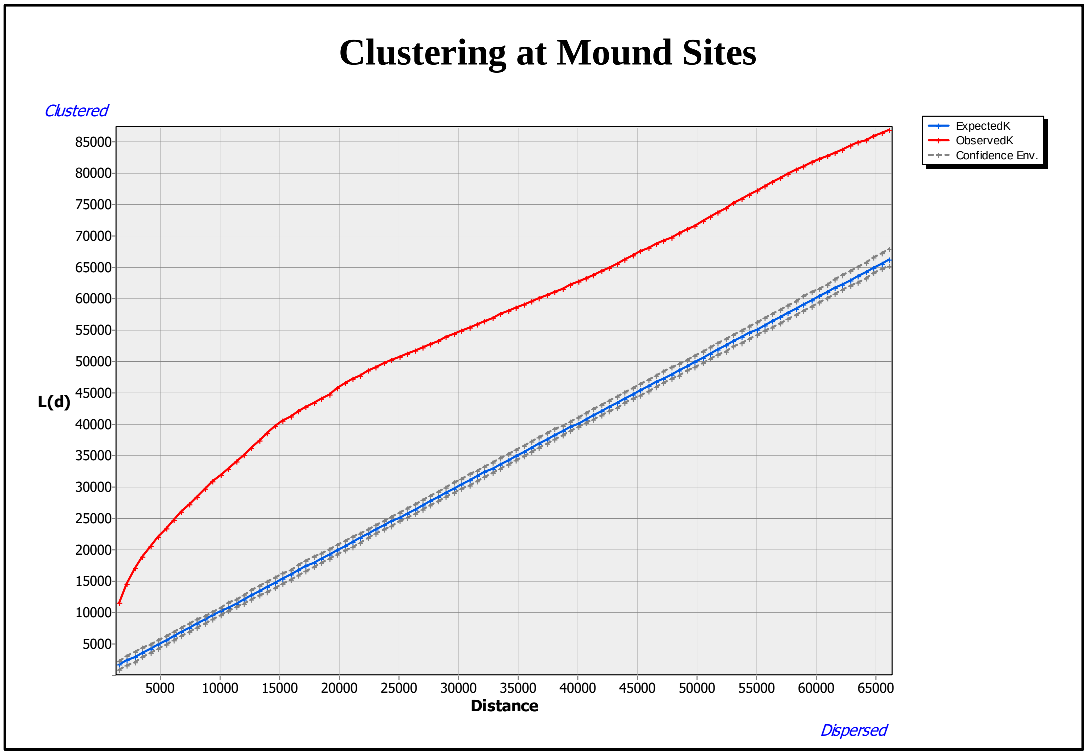

Figure 14: Ripley's K-Function Analysis for Mound Site Centroids

Site-Mound Intervisibility Results

As specified in Chapter Four, the aim of this Intervisibility study is the direct result of providing preference to information provided by Indigenous voices reflecting on their experiences in the environment. If proximity to their dead were of concern to the people of the NEPV, then surely the ability to view the locations of the deceased from the spaces of habitation would reflect that importance. For each of the two groups of the study, the site name, information regarding the last known archaeological period, and type of site is provided, as well as a listing of the specific mound sites viewable from a height of 1.5 meters and within 2 km from the center of the listed NEPV Complex site. For the purposes of comparison, if no mound sites were visible within 2 km of the listed NEPV Complex site, "None" will be annotated in this column. The sites listed in Intervisibility Study Group #1 [Table 6 below] appear to be comprised of sites assigned to the Middle Period of the NEPV Complex, with two earlier sites collocated within. For the second Intervisibility Study Group [Table 7 below], the immediate observation is that fewer Mound sites are visible from the listed NEPV Complex sites. Also of note is that the sites included in this group are trending from the Middle to Late Period for the NEPV Complex versus the Early to Middle Period trend observed in the first group.

The range of visible mounds for the first intervisibility group [Table #6] was one to eleven mounds; with the Gohner-I site having the highest rate of intervisibility and the Martin site having the lowest. On average, the rate of intervisibility per site was 5.4 mounds. The results for the second intervisibility group [Table #7] were vastly different. The range of visible mound for that group was zero to three mounds; with the Chappell site having the highest rate of intervisibility and the McCleary, Schmoker, and Beeber sites tied for the lowest. The average rate of intervisibility for this group was visible one mound per site.

Table 6: List of sites included in Intervisibility Study Group #1.

NEPV Site	**Latest NEPV Period**	**Site Type**	**Mounds Visible**
Tahuka	Early	Campsite	32LM90 32SN147 32SN149 32SN234 32SN241 32SN238
Kirschenmann-III	Early	Campsite	32LM90 32SN147 32SN149 32SN230 32SN234 32SN227 32SN241 32SN238
Hendrickson-II	Middle	Campsite	32SN157 32SN218
Martin	Middle	Campsite	32LM258
Kirschenmann-II	Middle	Campsite	32SN147 32SN227 32SN230 32SN234 32SN238
Gohner-I	Middle	Campsite	32SN147 32SN230 32SN234 32SN255 32SN227 32SN236 32SN237 32SN238 32SN159 32SN160 32SN161
Hendrickson-III	Middle	Ditch Fortified Village	32SN157 32SN218

List of visible mounds from selected NEPV Complex sites

Table 6: List of sites included in Intervisibility Study Group #1 (continued).

NEPV Site	Latest NEPV Period	Site Type	Mounds Visible
Naze	Middle	Campsite	32SN227 32SN222 32SN236 32SN237 32SN238
Ituhu	Middle	Campsite	32SN147 32SN230 32SN234 32SN255 32SN227 32SN222 32SN236 32SN237 32SN161

List of visible mounds from selected NEPV Complex sites

Table 7: List of sites included in Intervisibility Study Group #2.

NEPV Site	Latest NEPV Period	Site Type	Mounds Visible
Quast	Early	Campsite	32LM84
McCleary	Middle	Campsite	None
Chappell	Middle	Campsite	32LM84 32LM245 32LM246
Beeber	Middle	Campsite	None
Seefeldt Village	Middle	Ditch Fortified Village	32LM84
Chappell-II	Late	Campsite	32LM245 32LM246
Dickey	Late	Campsite	32LM86
Schmoker	Unknown	Campsite	None

List of visible mounds from selected NEPV Complex sites.

I have included a sample graph below [Figure 13] for the purposes of explaining the Line of Sight Graph's various components. The small black circle on the far-left side of the graph is representative of the observer point experienced by a 1.5 meter tall human at the center of the specified NEPV Complex site. The triangle located on the far right of the graph represents the location of the mound and the dotted line connecting the circle on the far left and the triangle on the far right represents the literal line of sight between those two points. In the event the terrain obstructs the line of sight anywhere along that dotted line, another circle is placed on that line to demonstrate where on the terrain in front of the person the obstruction occurs. The secondary solid line roughly represents the surface level of the terrain located between those particular locations. That line is color-coded as either green [light gray, if in black and white] or red [dark gray] to reflect which parts of the terrain between the two original points are visible (green being visible and red not visible). During the conduct of the study, if the circle representing the point of obstruction on the landscape was indicated within three meters of the mound site, the mound site was marked as being visible, considering that it is the proximal area to the mound that was most likely counted as sacred and not just the actual mound surface itself.

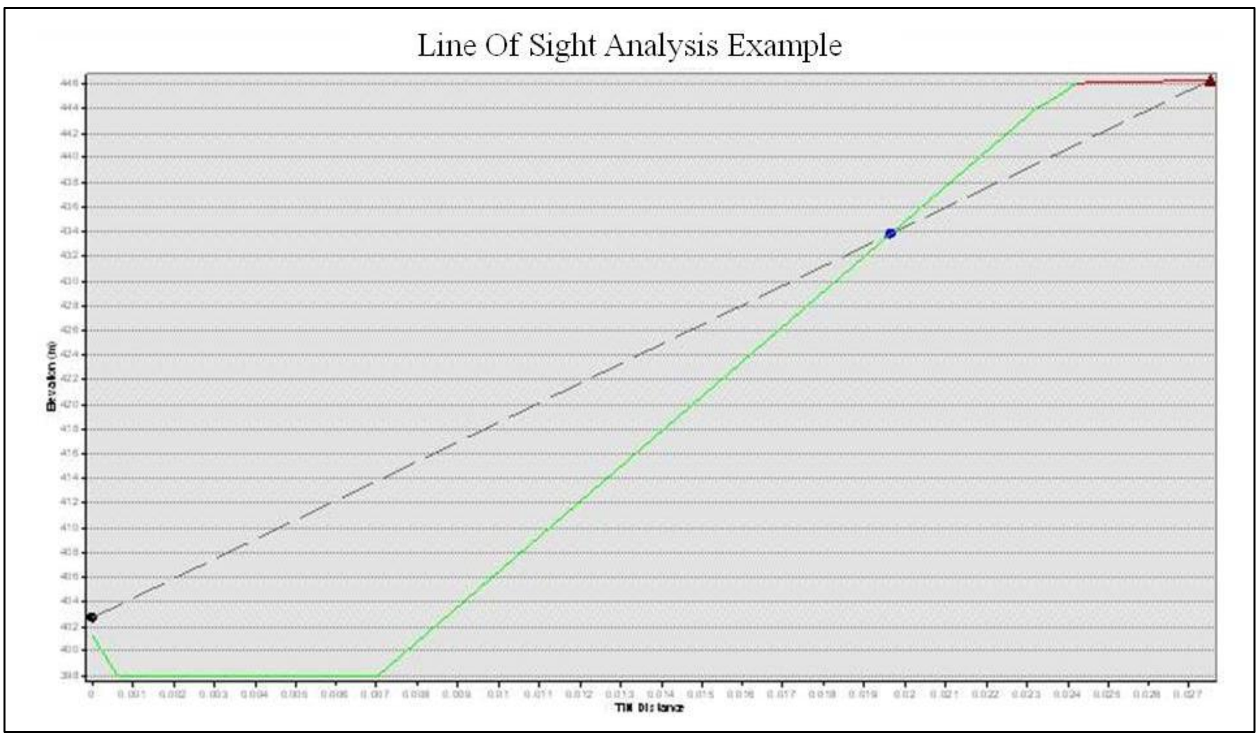

Figure 15: A graphic example of a Line of Sight analysis conducted in ArcGIS

NEPV Site Attribute Comparisons

In the following table [Table 8] is a listing of the site specific attributes for each of the 32 NEPV Complex sites. A cursory review of those attributes illustrates that the sites' mean elevation is most likely an artifact of the sites' distance from water, being that the more distant from a water source one goes, the more likely an increase in elevation is experienced. Another immediate observation is that higher mean slope totals are mostly observed in the Ditch Fortified Villages [DFV] versus the Unfortified Village [UV] and Campsite locations. Lastly, while not exclusive to the DFV sites, the viewshed areas trend towards being larger at those sites versus the others.

Table 8: NEPV Complex attribute data by site.

Site Name	Latest Period	Site Type	Elev. (m)	Slope (deg.)	Aspect (deg)	Distance Dist. To H2O (m)	Viewshed Area (km^2)
Sprunk	Early	DFV	322.1	6.9	113	22.7	15538.2
Quast	Early	Campsite	401.8	1.5	202	13.2	4966.8
"Lucas-II" Site	Early	UV	346.5	0.7	144	227.8	21238.1
Lucas	Early	DFV	346.1	5.3	210	121.1	28293.3
Makacega	Early	Campsite	421.8	1.3	237	12.5	3320.9
Tahuka	Early	Campsite	407.4	2.1	256	2.0	3195.2
Kirschenmann-III	Early	Campsite	409.3	0.7	199	7.1	3077.8
Irwin Nelson	Middle	Campsite	444.1	2.9	331	53.4	2614.6
Shea	Middle	DFV	323.7	3.1	185	93.5	13008.1
Seefeldt Village	Middle	DFV	403.2	0.5	127	10.2	11612.4
Beeber	Middle	DFV	402.2	2.3	147	12.7	5336.2
McCleary	Middle	Campsite	405.2	1.1	184	6.9	7000.7
Schultz	Middle	Campsite	303.8	2.7	190	0.0	1182.0
Greenwood Village	Middle	UV	420.6	1.8	180	46.5	2588.3
Ituhu	Middle	Campsite	408.0	1.6	157	0.0	1473.7
Gohner-I	Middle	Campsite	409.9	1.0	143	6.5	1913.6
Naze	Middle	Campsite	413.0	3.4	84	11.1	5298.3
Hendrickson-II	Middle	Campsite	414.2	2.1	217	9.9	4172.0
Hendrickson-III	Middle	DFV	417.5	2.4	300	12.7	4703.9
Sharbono	Late	Campsite	447.2	3.4	109	54.3	38835.5
Lake Coe	Late	Campsite	459.8	1.7	203	3.1	4585.4
"Dickey" Site	Late	Campsite	406.3	2.0	170	12.0	7894.3
Chappell-II	Late	Campsite	402.6	1.9	149	144.3	4742.8
Horner-Kane	Late	Campsite	447.8	2.3	124	4.7	59391.5
Hintz	Late	UV	436.2	0.0	2	0.0	3773.3
Martin	Unknown	Campsite	408.3	0.8	212	38.3	3361.5
Chappell	Unknown	Campsite	404.8	1.5	239	21.5	4075.8
Schmoker	Unknown	Campsite	408.8	2.9	287	15.6	6034.1
Peterson	Unknown	DFV	433.4	5.6	168	107.1	16940.9
Nelson	Unknown	DFV	426.4	8.6	141	533.3	14454.1
Lake Tewaukon	Unknown	UV	353.2	2.9	181	1.1	11896.1
Kirschenmann-II	Unknown	Campsite	409.6	1.0	190	8.0	2009.8

Site-related attribute data for the NEPV Complex.

Site Summary Attribute Comparisons

The table below [Table 9], where applicable, contains the population of each site type (n), the mean elevation, the mean slope, the modal aspect, the mean area of viewshed, the mean number of visible mounds sites from the listed habitation site, the mean distance to water, the mean distance to the nearest mound site centroid, and lastly, the mean distance to the nearest known sacred site. The modal aspect was used here to provide mean summary data regarding analysis on circular data (e.g., the reporting of 358° & 2° as separated by merely four degrees versus a total of 356° apart). Also of note: the group of Mound sites used during the attribute comparisons portion of this research is the population of smaller mound sites [i.e. ≤ 20 km] referenced in Chapter Five.

Table 9: A Comparison of Summary Attributes for sites in research area.

	(n)	**Elev. (m)**	**Slope (deg)**	**Modal Aspect**	**Viewshed Area (km²)**	**Visible Mounds**	**Dist. to H_2O (m)**	**Dist. to Nearest Mound (m)**	**Dist. to Nearest Sacred Site (m)**
Random	32	390.9	1.3	SE	1.07	0.0	2,358	27,291	48.8
NEPV	32	402.0	2.4	SSW	9.95	1.8	50.4	699	13.5
Mounds	166	431.2	3.4	SSE	#	#	380.8	#	#
Sacred Sites	14	440.6	4.3	#	#	#	#	#	#

The columns indicated by a hash mark (#) were not used for statistical comparison.

One-Way ANOVA Test Results

The results for the P-Values indicated below in Table 10 represent the level of significance between the two values for the site types represented in the test. The R^2-adjusted values (%) represent how much of the variability observed in the attribute [e.g., slope, elevation, etc.] of the first site type [i.e., NEPV] is explained by the variability of the same attribute of the second site type [i.e., Mounds]. For example, the One-way ANOVA test conducted, which compares the difference in mean between the elevation values of the NEPV Complex and

Random sites, shows that there is not a significant difference in values (0.493) between the two groups without a large difference in those values (0.00%).

Table 10: Pairwise, One-way ANOVA test results.

	Slope		**Elevation**		**Distance to H2O**	
	P-Value	**R^2(adj)**	**P-Value**	**R^2(adj)**	**P-Value**	**R^2(adj)**
NEPV/Random	*0.011	8.48%	0.493	0.00%	*0.000	35.63%
NEPV/Mounds	0.068	1.19%	*0.001	4.63%	*0.000	13.60%
NEPV/Sacred Sites	0.061	5.63%	*0.003	15.93%	#	#
Random/Mounds	*0.000	7.52%	*0.000	6.35%	*0.000	38.62%
	Viewshed		**Mounds Visible**		**Distance to Nearest Mound**	
	P-Value	**R^2(adj)**	**P-Value**	**R^2(adj)**	**P-Value**	**R^2(adj)**
NEPV/Random	0.808	0.00%	*0.001	14.20%	*0.000	36.46%

The P-Values and R^2-adjusted results of the One-Way ANOVA Tests (* = significant value, # = no data).

Discussion

Geographical Observations

The first group of sites in the intervisibility study is situated along a portion of the James River which is located east of and adjacent to a low, gradually sloping section of the Missouri Escarpment to the west. This would have been the most likely corridor of overland travel by bison moving between the high upland summer ranges on top of the escarpment region to the low-lying, riparian, and riverine over-wintering locations in the James River Valley.

The position of this northernmost grouping of sites would be advantageously positioned geographically [Figure 14] in another way as well. Due to its centralized location proximal to that previously mentioned low and sloping section of the escarpment, not only would these sites be well positioned to take advantage of the herds over-wintering near the river bottoms; the habitation sites within this group are also located approximately 17km away from the Bone Hill sacred site, a known bison kill site located to the south-southwest. Furthermore, the second group of NEPV Complex and Mound sites, which is located further south along the James River Valley corridor from the first group, is situated closer to the Bone Hill sacred site at an average distance of one to seven kilometers between the habitation sites and the sacred kill site.

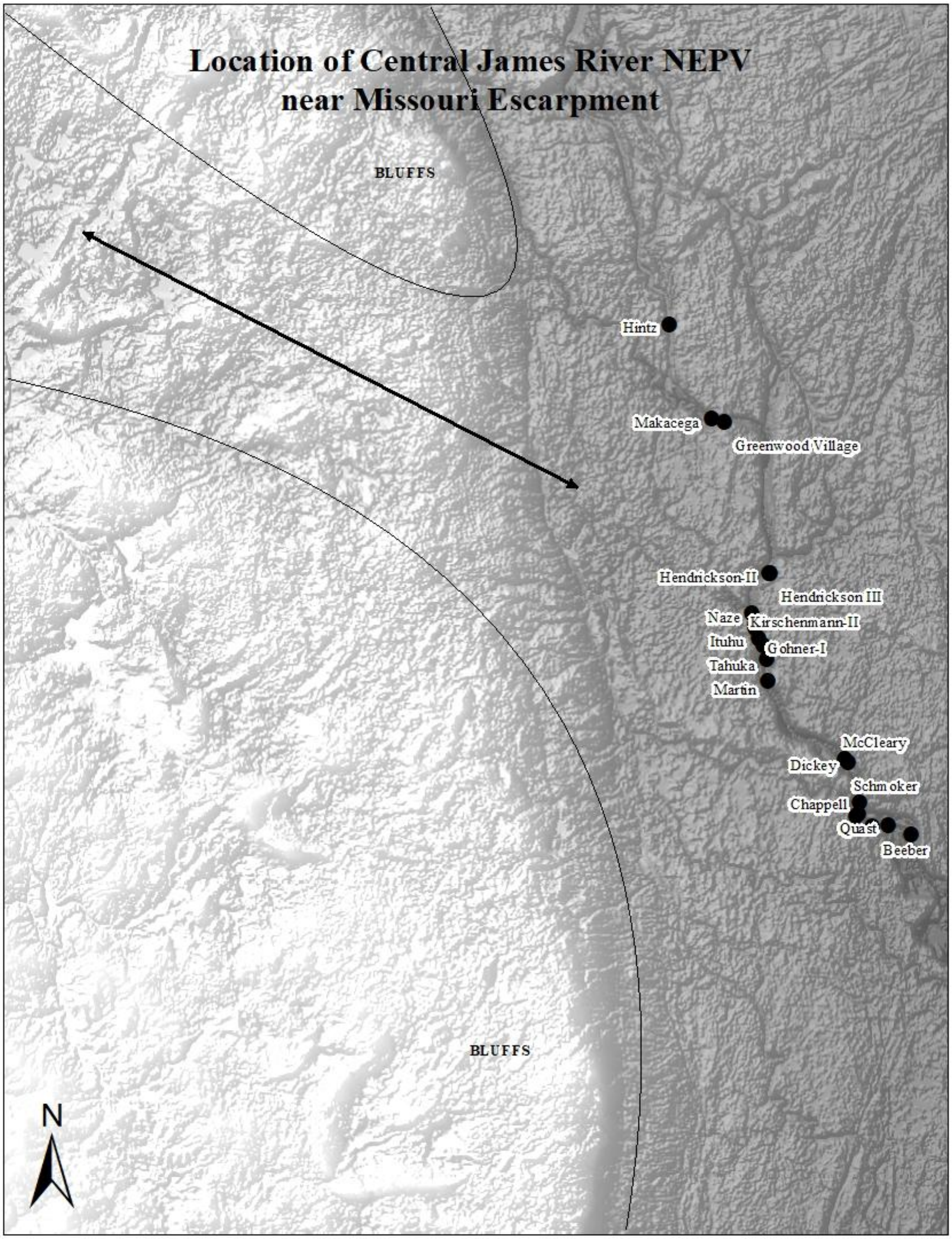

Figure 16: This map illustrates the location of the Central James River NEPV sites to a low area along the bluffs of the Missouri Escarpment.

An examination of the spatial arrangement of NEPV Complex sites in relation to the Digital Elevation Model used in this study seeks to confirm what previous researchers had concluded; that the people of the NEPV Complex are indeed a political admixture of groups who are ancestral Hidatsa in origin and also have either social or political ties with Siouan groups from the Big Stone Lake and Lake Traverse regions. This assertion is evidenced by the comparison of the distribution of Early Period NEPV Complex sites verses the distribution of the sites associated with the Late Period NEPV. In the Early NEPV, habitation sites were widely distributed throughout southeastern North Dakota from the Devil's Lake Basin, south through the Lake Coe region to the central James River Valley, and east along the Big Bend of the Sheyenne River to the Pembina Escarpment. For the Middle NEPV, this original distribution of habitation sites was expanded to include Lake Tewaukon near the Coteau de Prairies and two sites along the Maple River [Shea and Sprunk]. Finally, the Late NEPV Period witnessed a contraction of sites from the wide range observed in the Middle NEPV to most of the active sites solely occurring in the central James and Sheyenne River Valley Corridors, north through Lake Coe to Devil's Lake.

Significance of Correlation in NEPV & Mound Intervisibility

The difference in the mound site numbers expressed between Intervisibility Study Groups #1 and #2 on the James River is notable, as it could serve as a result which speaks directly to the preference of occupation – by either frequency or duration – of one space over the other. It is also possible that as time passed, the importance of mound-style burials waned, which would explain the difference in ratio between the first and second groups of the study. In any case, there seems to be no correlation between the number of observable mounds and the associated NEPV Complex site's type, e.g. campsite, unfortified, or fortified. If it were true that a positive correlation did exist between the mounds and habitation sites, then the Gohner-I site could likely be interpreted as a spiritual center or focal point of the Upper James River NEPV Complex by having visibility of 11 of the mound sites in the surrounding area. While two of the 17 other sites included in this study exhibit larger than average instances of intervisibility between sites – Ituhu with nine mounds visible and Kirschenmann-III with eight – these comparatively elevated numbers of visible mounds can be simply explained by an increased frequency or duration of habitation at these locations; due to the increased amount of mortuary space. Conversely, if one were to attempt to assign spiritual importance to an NEPV Complex site based on the cultural materials found, then the Seefeldt Village site would be the site of greatest importance to date, due to the copper jewelry recovered there. However, since Seefeldt Village is only intervisible with a singular mound site, there is validity in my original assertion of no correlation between the number of visible mounds and the significance of the habitation site.

NEPV Complex Site Attributes

With the exception of the values for slope and viewshed area, there is no strict uniformity expressed in any of the individual attribute categories for the sites of the NEPV Complex. The mean elevation for each site appears to be derivative of the distance from the edge of the site boundary to water - given the associated river valley terrain in which these sites are found, the value for the site elevation will increase as the distance to water increases. The aspect values are similar to the elevation values in that they are more an artifact of settlement location choice versus an independent social or cultural need to be tilted in a specified direction. While it is true that the modal aspect for all NEPV Complex Sites is generally SSW in its expression, this can be explained as a symptom of the fact that most sites for the NEPV Complex exist in a north-to-south oriented river valley and will therefore naturally be oriented in a southerly direction. As mentioned earlier in this chapter, the slope values increase for Ditch Fortified Village [DFV] sites versus the relatively flat nature of the NEPV Campsites. It is difficult to know if these site locations were specifically selected for this reason, however, as similar locations adjacent to these DFV sites were not examined for their slope value. Lastly, the viewshed area values for the various NEPV Complex sites tend to increase as the level of architecture or fortification increases within the sites. For example, of the largest ten viewsheds examined in this research, six of those belong to Ditch Fortified Village sites, two to Unfortified Villages, and the last two to Campsites.

Summary Attribute Comparisons

When comparing the summary attributes for each of the four major site types (i.e., Random, NEPV, Mounds, and Sacred Sites), a few of the categories naturally organize themselves according to their values. For example, the mean elevation value for the randomly generated sites is less than the mean elevation for NEPV Complex sites. The NEPV Complex sites' elevation is less than the mean elevation for the Mounds, which are lower in elevation than the Sacred Sites. After the conduct of a spatial analysis of the region, this is explained by the specific geographic situatedness of the NEPV Complex, Mounds, and Sacred Sites. Comparatively, the Random sites are more heavily distributed throughout the entirety of the research area, and therefore are more likely to represent those regions of the landscape not found within the bounds of a particular river valley. The same is true for the mean slope values observed throughout each site type; the NEPV Complex, Mounds, and Sacred Sites all adhere to a hierarchy based on suppositions regarding their geographical locations. By and large, the NEPV Complex sites are situated within the lightly meandering twists and turns of the water systems. Elevation changes are slight, so there are not many places where abrupt water level changes will naturally occur and the mean slope values expressed by this site type are reflective of that. The Mound sites, which were intentionally built on the upper terraces and bluffs of the region's river valleys, exhibit a greater mean slope value than the NEPV Complex sites. Lastly, the mean slope value for the Sacred sites was expected to be the highest mean slope value due to the ethnographical significance of locations with the highest elevations, e.g., sacred hills or mountains, buttes, etc. For the rest of the summary attribute values (i.e., viewshed area, number of visible mounds, the nearest distance to water, the distance to the nearest Mound site, and the distance to the nearest Sacred site), only the NEPV Complex and Random sites were used for comparison purposes.

In terms of the mean viewshed areas, that of the NEPV Complex sites were nine times larger than that of the Random sites, suggesting that visibility for defensive purposes was of some importance. For the average number of mounds visible for each site type, only the NEPV Complex sites had a measurable value for this category, with a mean value of 1.8 mounds visible per site. Also of note is the stark difference in the expressed mean distances to fresh water. The mean distance for the Random sites was approximately 2.4 km to the nearest water source, versus the mean value of 50.4 meters for the NEPV Complex sites. Similarly, the mean distance to the nearest Mound site observed for the Random sites was 27.3 km, versus the mean value of 699 meters for the NEPV Complex sites. Lastly, the mean distance to the nearest Sacred site was 48.8 km for the Random sites and 13.5 km for the NEPV Complex Sites. This comparison to a randomly generated population of habitation sites helps to illustrate the relative importance of some of these features to the people of the NEPV Complex.

Analysis of Attribute Variance

By conducting the One-Way ANOVA tests, this research is attempting to determine whether or not there is any significant difference between the two tested groups. The statistical comparison between the NEPV Complex and Random sites indicated a significant difference in the values for mean slope, mean distance to water, number of visible mounds, and the mean distance to the nearest mound. In the comparison between NEPV Complex and Mounds Sites, there was a significant difference in the values for mean elevation and mean distance to water. In the comparison between the NEPV Complex and Sacred sites, there was a significant difference in only the mean elevation values. Lastly, for the statistical comparison between the Random and Mound sites, there was a significant difference in values for every comparable category, including mean slope, mean elevation, and mean distance to water.

CHAPTER SEVEN: CONCLUSIONS

The Northeastern Plains Village Complex, an archaeological entity which was once principally distinguished by the types of lithic and ceramic wares, has now been subjected to a spatial analysis conducted on its population of associated mound and habitation sites. What is now clear is that the settlement pattern associated with the NEPV Complex is defined by an association with geographic locations in relative proximity to sources of fresh water, which are typically river systems. Furthermore, there is a connection to associated Mound sites, although intervisibility is not necessarily requisite. It is also apparent that the people of the NEPV Complex had an affinity for specific locations throughout the region, especially those of equal proximity to resource rich areas, such as sacred sites or hunting areas.

The settlement pattern varied greatly from the Early to Middle and Middle to Late NEPV periods. While the range of site locations were moderately distributed and centralized on the central James River in the Early NEPV, this range grew significantly and spread eastward throughout the Middle NEPV to the Maple River. Conversely, the Late NEPV exhibited evidence of an increased coalescence of both overall site size and site dispersion which was occurring contemporaneously with other archaeological traditions in the region. Throughout the periods of expansion and contraction, the specific attributes associated with NEPV Complex sites, i.e. distance to fresh water and the proximity to burial mounds remained the same. The only significant differences observed in the settlement pattern over time would be the reduction in the footprint of the habitation area and a relocation of sites to areas which provided an increased viewshed area, most likely used for defensive means.

To answer the original research questions stated in this paper: *Is Traditional Ecological Knowledge spatially observable in prehistoric archaeology and is Traditional Ecological*

Knowledge evidenced in specific site attributes? The answer for both questions is yes and can be evidenced by multiple examples from the ethnographic literature. For example, Waheenee (1921: 10) tells the story of an uncle who was believed to be deceased and laid to rest under a log at some distance from the village. Her description of how her uncle was able to readily call for help when he recovered fully (within shouting distance) illustrates a specific spatial relationship between her village [habitation] site its' associated burial mound's location. Further, Waheenee (1921:28) describes an instance of difficulty in retrieving water from the nearby river due to a particular Spring thaw (ice break up), so they melted snow they had collected from opening of the winter shelter instead.

Zitkala-Sa (2019:41-42) also spoke to site proximity during her recollection of returning from a trip to gather water at a nearby river when her mother stopped her and pointed over Zitkala-Sa's shoulder to highlight the rising sun coming over the "barren hills [mounds] which held the bones of buried warriors." Like Waheenee's description of her settlements' spatial arrangement, Zitkala-Sa firmly associates the proximity of the habitation areas to the burial mounds, in addition to specifying the proximity of the habitation area to a fresh water source (Zitkala-Sa 2019:3). These accounts are also confirmed in personal narratives cataloged by Bowers (1963:73&170) in his fieldwork from the early 1920s.

From the collaboration of these three sources, we are able to make two determinations regarding the archaeological observability of TEK-derived information and the possibility of identifying that information in a specific, measurable attribute. The first is that habitation sites were typically placed proximal to fresh water sources according to the season; winter camps were usually built within the flood plain and the summer camps were constructed on the uppermost terraces of a river system. The second is that mortuary spaces were created in the same upper terrace locations as the summer habitation sites and were directly visible by the living descendants of those interred; however, it is important to note that not all burials occurred on the eastern side of the river as Zitkala-Sa's testimony infers.

Also of note are the references to the distances travelled to gather resources or act in intertribal relations. It is inferred in Bowers (1963:251) that the post-Coalescence period distance between the amiable Hidatsa and Mandan is also relative to the overall size of the resource area needed to sustain the referenced populations. Meaning, that the referenced 150 miles between the two, when halved, speaks directly to the radius of the greater resource catchment area necessary to sustain the inhabitants of those two individual site locations. These distances are also supported in Bower's record (1963:50) where the distance travelled during the pre-Coalescence period was approximately 150-200 miles for the end of summer Bison hunting trip. During this annual event, remote encampments were created to collect, process, and package the large quantities of meat.

Therefore, layers of occupation zones are revealed by the data when the ethnographic, geographic, and ecological information is cross-examined. At its core, the triumvirate of habitation space, mortuary space, and fresh water resource serve as the minimum requirements for regular occupation of an area for the NEPV. Other habitation spaces, e.g. hunting or travelling camps, can be categorized from this baseline as dwell time (as evidence via debitage and architectural remnants) is the major variable discriminating between the two. To support this assertion, Bowers (1963:170) highlights a circumstance of person's death at a hunting encampment away from the main habitation location where strict social protocols were in place to retrieve the individual's skull (at a minimum) for later burial near that person's former home and family.

Further, living within close proximity to their primary food resource was not a delimiting factor for the establishment of long-term habitation areas as more minor sustenance items, such as June berries, were seasonally available in nearby resource catchments (Waheenee 1921:99-108). Conversely, it is more likely that long-term habitation considerations for any location were made on the basis of available firewood and other fuels used in cooking and heating; which is evidenced by a linear concentration of sites distributed along the same section of waterway. Those concentrations of sites were most likely exploiting the very same hunting locations [up to 200 miles away (Bowers 1963:50)] from year to year, maintaining specific political relationships within the region via trade or other exchange (Bowers 1963:251), or both but necessarily needed to relocate their habitation site [up to two miles (Waheenee 1921:86)] based on the depletion of local fuel resources. The Ripley's K distribution study of NEPV sites supports this assertion as well.

In conclusion, I suggest – based on the outcome of this research – that the archaeological definition of the NEPV Complex be updated to: The Northeastern Plains Village Complex is characterized by uniquely diagnostic ceramics and catlinite artifacts with high frequencies of chipped KRF assemblages, the conduct of a semi-sedentary village settlement system with earthen mound mortuary features [which include Devil's Lake-Sourisford mortuary goods (SHPO 2016:B.47)], and use a hierarchically clustered, river-bound settlement strategy, which is constructed around a centralized habitation area, and utilizes nested resource catchments at varying distances until those resources are depleted." A correlation between habitation site locations and known sacred sites or traditional hunting grounds has yet to be determined, but is suspected.

Moving Forward

Continued research in the spatial analysis of the NEPV Complex could improve upon this thesis work through the addition of more ethnographic information for the purposes of deepening and strengthening the catalog of TEK-derived data for the region. Further, while sacred spaces were discussed in this research, the addition of a spatial analysis focused on the relationship between those sacred spaces or traditional hunting ranges and the habitation zones would be essential in the determination of any correlation between the two exists, i.e. if the habitation locations are mapped onto the sacred sites/hunting locations or vice versa.

REFERENCES

Advisory Board for Historic Preservation, State Historical Society of North Dakota (SHPO). 2016. *North Dakota Comprehensive Plan for Historic Preservation: Archeological Component.* North Dakota Heritage Center: Bismarck.

Anfinson, S.F. 1982. "The Prehistoric Archaeology of the Prairie Lake Region: A Summary from a Minnesota Perspective." *Journal of the North Dakota Archaeological Association* 1:65-90.

Auch, Roger F. 2010. "Northern Glaciated Plains Ecoregion Summary." U.S. Geological Survey. Sioux Falls: Earth Resources Observation and Science Center. https://landcovertrends.usgs.gov/gp/eco46Report.html

Arzigian, Constance. 2008. The Psinomani Complex: Late [Terminal] Woodland, Protohistoric, and Early Historic in Northern and Central Minnesota, A.D. 1100–1750, In *Minnesota Statewide Multiple Property Documentation Form for the Woodland Tradition*, 126-158. Mississippi Valley Archaeology Center at the University of Wisconsin-LaCrosse.

Balram, S., S. Dragicevic, and T. Meredith. 2004. "A collaborative GIS method for integrating local and technical knowledge in establishing biodiversity conservation priorities." *Biodiversity and Conservation* 13:1195–1208.

Bamonte, Gerardo. 1983. "On Reductionism in Cultural Ecology." *Current Anthropology* 24(1):115-116.

Bethel, Matthew B., Lynn F. Brien, Emily J. Danielson, Shirley B. Laska, John P. Troutman, William M. Boshart, Marco J. Giardino, and Maurice A. Phillips. 2011. "Blending Geospatial Technology and Traditional Ecological Knowledge to Enhance Restoration

Decision-Support Processes in Coastal Louisiana." *Journal of Coastal Research* 27(3):555–571.

Bethel, Matthew, Lynn F. Brien, Michelle M. Esposito, Corey T. Miller, Honora Buras, Shirley Laska, Rosina Philippe, Kristina Peterson, and Carol Parsons Richards. 2014. "Sci-TEK: A GIS-Based Multidisciplinary Method for Incorporating Traditional Ecological Knowledge into Louisiana's Coastal Restoration Decision-Making Processes." *Journal of Coastal Research* 30(5):1081-1099.

Berkes, Fikret. *Sacred Ecology*. Hoboken: Taylor & Francis, 1998.

Berkes, F., J. Colding, and C. Folke. 2000. "Rediscovery of Traditional Ecological Knowledge as Adaptive Management." *Ecological Applications* 10(5):1251–1262.

Berkes, Fikret and Iain J. Davidson-Hunt. 2006. "Biodiversity, Traditional Management Systems, and Cultural Landscapes: Examples from the Boreal Forest of Canada." *International Social Science Journal* 58(187):35-47.

Berkes, Fikret, Mina Kislalioglu, Carl Folke, and Madhav Gadgil. 1998. "Exploring the Basic Ecological Unit: Ecosystem-Like Concepts in Traditional Societies." *Ecosystems* 1(5):409-415.

Bowers, Alfred W. 1963. *Hidatsa Social and Ceremonial Organization*. Lincoln: University of Nebraska Press.

Chambers, K.J., J. Corbett, C.P. Keller, and C.J. Wood. 2004. "Indigenous Knowledge, Mapping, and GIS: A Diffusion of Innovation Perspective*." Cartographica: The International Journal for Geographic Information and Geovisualization* 39(3):19–31.

Chapin, M., Z. Lamb, and B. Threlkeld. 2005. "Mapping Indigenous Lands." *Annual Review of* Anthropology 34:619–638.

Conolly, James, and Mark Lake. 2006. “Spatial Analysis.” In *Geographical Information Systems in Archaeology*, 149–186. Cambridge Manuals in Archaeology. Cambridge: Cambridge University Press.

Federal Writers' Project of the Works Progress Administration for the State of North Dakota. 1938. *North Dakota: A Guide to the Northern Prairie State*. Fargo, ND: Knight Printing Company

Gadgil, M., F. Berkes, and C. Folke. 1993. “Indigenous Knowledge for Biodiversity Conservation.” *Ambio* 22:151– 156.

Gilmore, Melvin R. 1987. *Prairie Smoke*. St. Paul: Minnesota Historical Society Press.

Good, Kent, James Dahlberg, Thomas Larson, Bruce Benz, and Fred Schneider. 1977. Archaeological Investigations of the Hendrickson III Site, 32SN403, LaMoure-Oakes Project, Garrison Diversion, North Dakota. Department of Anthropology, University of North Dakota, Grand Forks. Submitted to the Bureau of Reclamation, Billings.

Gregg, Michael L. 1987. “Stone Tools and Manuports from the Naze Site.” In *Archeological Excavation at the Naze Site (32SN246)*, edited by Michael L. Gregg, pp. 231-302. Department of Anthropology, University of North Dakota, Grand Forks. Submitted to the Bureau of Reclamation, Billings.

Gregg, Michael L. 1994. “Chapter 4: Archaeological Complexes of the Northeastern Plains and Prairie-Woodland Border, A.D. 500-1500.” In *Plains Indians, A.D. 500-1500: The Archaeological Past of Historic Groups*, edited by Karl H. Schlesier, 71-95. Norman: University of Oklahoma Press.

Gregg, Michael L., Paul R. Picha, Cynthia Kordecki, Fern E. Swenson, Cherie E. Haury, and Christopher Quinn. 1986. Test Excavations at Eight Archeological Sites on the James

River in Stutsman and LaMoure Counties, North Dakota. Department of Anthropology, University of North Dakota, Grand Forks. Submitted to the Bureau of Reclamation, Billings.

Hasenstab, Robert J. 1996. "Aboriginal Settlement Patterns in Late Woodland Upper New York State. *Journal of Middle Atlantic Archaeology* 12(1):17-26.

Haury, Cherie E. 1990. *In the Footsteps of T.H. Lewis: Retracing of the Northwestern Archaeological Survey in North Dakota.* Grand Forks, ND: University of North Dakota.

Henning, Dale R., and Dennis L. Toom. 2003. "Cambria and the Initial Middle Missouri Variant Revisited." *Wisconsin Archeologist* 84(1&2):197–217.

Hill, Mark. 2009. "Distribution of Late Archaic Populations in the Upper Great Lakes" Paper presented at the Annual Meeting of the Indiana Academy of Sciences, Kokomo, IN, October 2009.

Holley, George R., and Michael Michlovic. 2013. The Prehistoric Village Cultures of Southern Minnesota. Department of Anthropology and Earth Science, Minnesota State University Moorhead. Submitted to the State Historical Society of Minnesota, St. Paul, MN.

Ingold, T. 2000. "Building, dwelling, living: How animals and people make themselves at home in the world." In *The Perception of the Environment: Essays on Livelihood, Dwelling, and Skill*, edited by Tim Ingold, 172-188. London: Routledge.

Johnson, Allen and Clifford Behrens. 1982. "Nutritional Criteria in Machiguenga Food Production Decisions: A Linear-Programming Analysis." Human Ecology 10(2):167-189.

Johnson, Craig M. 1998. "Chapter 10: The Coalescent Tradition." In *Archaeology of the Great Plains*, edited by W. Raymond Wood, 308-344. Kansas: University Press of Kansas.

Jones, Eric E. 2010. “An Analysis of Factors Influencing Sixteenth and Seventeenth Century Haudenosaunee (Iroquois) Settlement Locations.” *Journal of Anthropological Archaeology* 29(1):1-14.

Kohler, Timothy A. 1988. “Predictive Locational Modeling: History and Current Practice.” *In* Quantifying the Present and Predicting the Past: Theory Method, and Application of Archaeological Predictive Modeling. Edited by J.W. Judge and L. Sebastian, 19-59. Denver: US Department of the Interior, Bureau of Land Management Service Center.

Laird, Kathleen R., Sherilyn C. Fritz, Eric C. Grimm, and Pietra G. Mueller. 1996. “Century-scale Paleoclimatic Reconstruction from Moon Lake, a Closed-Basin Lake in the Northern Great Plains.” *Limnology and Oceanography* 41 (5): 890-902.

Lescure, J.P. 1983. “On Reductionism in Cultural Ecology.” *Current Anthropology* 24(1):116-118.

Meehan, Miranda A., Kevin K. Sedivec, Garret A. Hecker, and Jeffrey L. Prinz. 2014. “Riparian Complex Ecological Sites of North Dakota: A Pictorial Guide of Riparian Complex Ecological Sites Common in North Dakota.” Fargo: University of North Dakota – Agriculture Department.

Meyer, David, and Henry T. Epp. 1990. “North-South Interaction in the Late Prehistory of Central Saskatchewan.” *Plains Anthropologist* 35 (132): 321–342.

Michlovic, Michael G 2008. “The Shea Phase of the Northeastern Plains Village Culture.” *North Dakota Archaeology*, 8 (1): 35-52.

Michlovic, Michael G, and Fred E. Schneider. 1988. The Archaeology of the Shea Site (32CS101). Report submitted to the State Historical Society of North Dakota, Bismarck.

Michlovic, Michael G, and Fred E. Schneider. 1993. “The Shea Site: A Prehistoric Fortified Village on the Northeastern Plains.” *Plains Anthropologist* 38 (143):117–137.

Michlovic, Michael G. and Fern E. Swenson. 1998. “Northeastern Plains Village Pottery.” *North Dakota History* 65 (2-3):11-25.

Mitchell, Mark D. 2013. *Crafting History on the Northern Plains: Political Economy of the Heart River Region, 1400-1750.* Tucson: University of Arizona Press.

Morgan, Grace Ruth. 1979. *An Ecological Study of the Northern Plains As Seen Through the Carratt Site.* Occasional Papers in Anthropology 1. University of Regina, Saskatchewan.

Gerald Anthony Oetelaar (2014) Better Homes and Pastures: Human Agency and the Construction of Place in Communal Bison Hunting on the Northern Plains, *Plains Anthropologist* 59 (229):9-37.

Oneroad, Amos E, Alanson Skinner, and Laura L Anderson. 2003. *Being Dakota: Tales and Traditions of the Sisseton and Wahpeton*. St. Paul: Minnesota Historical Society Press.

Picha, Paul R. and Michael Gregg. 1993. Chronostratigraphy of Upper James River Floodplain Sediments: Implications for Southeastern North Dakota Archaeology. *Geoarchaeology* 8(3):203-215.

Pierotti, R., and D. Wildcat. 2000. “Traditional Ecological Knowledge: The Third Alternative (Commentary)”. *Ecological Applications* 10(5):1333–1340.

Schneider, Fred. 1982. A Model of Prehistoric Cultural Developments in the James River Valley of North Dakota. Journal of the North Dakota Archaeological Association 1:113-133.

Schneider, Fred. 1986. The Devils Lake Basin Archeological Sites and Interpretation. Manuscript on file, Department of Anthropology, University of North Dakota, Grand Forks. Submitted to the North Dakota Attorney General's Office.

Schneider, Fred. 1988. Sharbono Site Test Excavations: 1986. Manuscript on file, Department of Anthropology, University of North Dakota, Grand Forks.

Schneider, Fred. 2002. Prehistoric Horticulture in the Northeastern Plains. *Plains Anthropologist* 47:33-50.

Sponsel, Leslie. 2001 "Is Indigenous Spiritual Ecology a New Fad?: Reflections from the Historical and Spiritual Ecology of Hawai`i" in *Indigenous Traditions and Ecology*, John Grim, ed., 159-174. Cambridge, MA: Harvard University Center for the Study of World Religions.

Swenson, Fern. 1987. "Prehistoric Ceramics from the Naze Site." In *Archaeological Excavation at the Naze Site (32SN246),* edited by Micheal Gregg, 123-183. University of North Dakota, Grand Forks. Submitted to the USDI Bureau of Reclamation.

Swenson, Fern E. and Michael L. Gregg. 1988. "Devils Lake-Sourisford Mortuary Vessel From Southeastern North Dakota." *Journal of the North Dakota Archaeological Association* 3:1-15.

Sundstrom, Linea. 1996. "Mirror of Heaven: Cross-Cultural Transference of the Sacred Geography of the Black Hills." World Archaeology 28 (2):177-189.

Syms, E. Leigh. 1977. "Memoir 12: Cultural Ecology and Ecological Dynamics of the Ceramic Period in Southwestern Manitoba." *Plains Anthropologist* 22 (76):1-160.

Syms, E. Leigh. 1978. *Aboriginal Mounds in Southern Manitoba: An Evaluation Overview*. Manuscript Report, No. 323. Ottawa: Parks Canada.

Syms, E. Leigh. 1979. "The Devils Lake—Sourisford Burial Complex on the Northeastern Plains." *The Plains Anthropologist* 86: 283-308.

Toom, Dennis L. 2004a. “Northeastern Plains Village Complex Timelines and Relations.” *Plains Anthropologist* 49 (191):281–297.

Toom, Dennis L. 2004b. Tahuka Site (32SN113) 1998 Archaeological Excavations, Stutsman County, North Dakota. Anthropology Research, Department of Anthropology, University of North Dakota, Grand Forks. Submitted to the Dakotas Area Office, U.S. Bureau of Reclamation, Bismarck, North Dakota.

Toom, Dennis L. 2004c. Naze Site (32SN246) 1998 Archaeological Excavations, Stutsman County, North Dakota. Anthropology Research, Department of Anthropology, University of North Dakota, Grand Forks. Submitted to the Dakotas Area Office, U.S. Bureau of Reclamation, Bismarck, North Dakota.

Toom, Dennis L. 2004d. Ituhu Site (32SN110) 1998 Archaeological Excavations, Stutsman County, North Dakota. Anthropology Research, Department of Anthropology, University of North Dakota, Grand Forks. Submitted to the Dakotas Area Office, U.S. Bureau of Reclamation, Bismarck, North Dakota.

Toom, Dennis L. 2004e. Retro-Interpretation of the Irvin Nelson Archeological Site (32BE208) on Devils Lake, Sullys Hill National Game Preserve, Benson County, North Dakota. Department of Anthropology, University of North Dakota, Grand Forks. Submitted to the US Fish and Wildlife Service.

Toom, Dennis L., Michael A. Jackson, Zachary W. Wilson, and Cynthia Kordecki. 2007. Camp Grafton South Lowland Sites: 2002-2004 Archeological Test Excavations, Eddy County,North Dakota. Department of Anthropology, University of North Dakota, Grand Forks. Submitted to the Environmental Office, Office of the Adjutant General, North Dakota Army National Guard, Bismarck.

Waheenee, and Gilbert L. Wilson. 1921. *Waheenee, an Indian Girl's Story*. Lincoln: University of Nebraska Press.

Waheenee, and Gilbert L.Wilson. 1987. *Buffalo Bird Woman's Garden : Agriculture of the Hidatsa Indians*. Borealis. St. Paul: Minnesota Historical Society Press.

Walde, Dale, David Meyer, and Wendy Unfreed. 1995. The Late Period on the Canadian and Adjacent Plains. *Revista De Arqueología Americana,* 9 (1):7-66.

Watrall, Charles R. 1976. *Ecotones and Environmental Adaptation Strategies in the Prehistory of Northwestern Minnesota*. Doctoral dissertation, University of Minnesota.

Watson, Alan, Lilian Alessa and Brian Glaspell. 2003. "The Relationship between Traditional Ecological Knowledge, Evolving Cultures, and Wilderness Protection in the Circumpolar North." *Conservation Ecology* 8(1):1-13.

Wheeler, Richard P. 1963. The Stutsman Focus: An Aboriginal Culture Complex in the Jamestown Reservoir Area, North Dakota. Bulletin 185:167-233, plates 27-36. Smithsonian Institution, Bureau of American Ethnology.

Winham, R. Peter and F. A. Calabrese. 1998. "Chapter 9: The Middle Missouri Tradition." In *Archaeology of the Great Plains*, edited by W. Raymond Wood, 269-307. Kansas: University Press of Kansas.

Wood, Raymond W. 1963. Appendix: Lisbon Flared Rim and Owego Flared Rim Wares. In The Stutsman Focus: An Aboriginal Culture Complex in the Jamestown Reservoir Area, North Dakota, by Richard P. Wheeler, Smithsonian Institution, *Bureau of American Ethnology Bulletin* 185:167-233.

Zitkala-Sa. 2019. American Indian Stories. New York: Modern Library

APPENDIX: POPULATION/SITE LOCATION VALIDATION DATA

Township	Total Population	NEPV Site Count	Mounds Site Count
Sullivan Township	173	0	0
Tabor Township	113	0	0
Tynsid Township	64	0	0
Vineland Township	87	0	0
Bygland Township	272	0	0
Climax City	267	0	0
East Grand Forks City	8601	0	0
Esther Township	165	0	0
Farley Township	45	0	0
Fisher Township	200	0	0
Grand Forks Township	179	0	0
Higdem Township	84	0	0
Hubbard Township	75	0	0
Huntsville Township	464	0	0
Keystone Township	91	0	0
Nesbit Township	99	0	0
Nielsville City	90	0	0
Northland Township	160	0	0
Rhinehart Township	139	0	0
Roome Township	177	0	0
Sandsville Township	67	0	0
Middle River Township	78	0	0
Oak Park Township	131	0	0
Oslo City	330	0	0
Vega Township	125	0	0
Warrenton Township	103	0	0
Georgetown Township	156	0	0
Halstad City	597	0	0
Halstad Township	108	0	0
Hendrum City	307	0	0
Hendrum Township	95	0	0
Lee Township	128	0	0
Kragnes Township	293	0	0
Oakport Township	1797	0	0
Shelly City	191	0	0
Shelly Township	115	0	0
Alvarado City	363	0	0
Big Woods Township	53	0	0

Township	Total Population	NEPV Site Count	Mounds Site Count
Bloomer Township	89	0	0
Boxville Township	39	0	0
Norway Township	169	0	0
Portland City	606	0	0
Reynolds City	208	0	0
Roseville Township	109	0	0
Stavanger Township	110	0	0
Viking Township	169	0	0
Wold Township	100	0	0
Addie Township	64	0	3
Ball Hill Township	55	0	0
Bartley Township	25	0	0
Binford City	183	0	0
Broadview Township	38	0	2
Bryan Township	39	0	0
Clearfield Township	44	0	0
Cooperstown City	984	0	0
Cooperstown Township	56	0	0
Dover Township	46	0	0
Greenfield Township	102	0	0
Hannaford City	131	0	0
Helena Township	50	0	0
Kingsley Township	50	0	0
Lenora Township	60	0	0
Mabel Township	52	0	0
Pilot Mound Township	41	0	6
Romness Township	36	0	1
Rosendal Township	35	0	0
Sverdrup Township	92	0	6
Belmont Township	76	0	0
Bingham Township	70	0	0
Tyrol Township	116	0	1
Washburn Township	68	0	1
Willow Township	53	0	0
Blanchard Township	87	0	0
Bloomfield Township	130	0	0
Bohnsack Township	55	0	0
Buxton City	323	0	0
Buxton Township	107	0	0
Caledonia Township	111	0	0

Township	Total Population	NEPV Site Count	Mounds Site Count
Clifford City	44	0	0
Eldorado Township	107	0	0
Elm River Township	32	0	0
Ervin Township	160	0	0
Galesburg City	108	0	0
Galesburg Township	83	0	0
Garfield Township	169	0	0
Grandin City	0	0	0
Greenfield Township	72	0	0
Hatton City	777	0	0
Herberg Township	65	0	0
Hillsboro City	1603	0	0
Hillsboro Township	132	0	0
Kelso Township	69	0	0
Lindaas Township	114	0	0
Mayville City	1858	0	0
Mayville Township	133	0	0
Morgan Township	91	0	0
Norman Township	74	0	0
Avon Township	78	0	0
Bentru Township	77	0	0
Blooming Township	295	0	0
Brenna Township	725	0	0
Bilodeau Township	41	0	0
Bremen Township	47	0	0
Colvin Township	60	0	1
Eddy Township	39	0	0
Gates Township	43	0	0
Grandfield Township	22	0	0
Chester Township	122	0	0
Elkmount Township	50	0	0
Cathay Township	56	0	0
Hillsdale Township	41	0	1
Lake Washington Township	27	1	2
Munster Township	56	0	0
New Rockford City	1391	0	0
New Rockford Township	81	0	0
Elm Grove Township	120	0	0
Emerado City	414	0	0
Fairfield Township	117	0	0

Township	Total Population	NEPV Site Count	Mounds Site Count
Falconer Township	304	0	0
Ferry Township	359	0	0
Gilby City	237	0	0
Gilby Township	79	0	0
Fairville Township	35	0	0
Germantown Township	29	0	0
Paradise Township	39	0	0
Pleasant Prairie Township	32	0	0
Rosefield Township	33	0	0
Sheldon Township	22	0	0
Sheyenne City	204	0	0
Grace Township	81	0	0
Grand Forks City	52838	0	0
Grand Forks Township	505	0	0
Hegton Township	204	0	0
Inkster City	50	0	0
Inkster Township	139	0	0
Johnstown Township	79	0	0
Lakeville Township	69	0	0
Hawksnest Township	21	0	0
Superior Township	55	0	0
Tiffany Township	31	0	1
Johnson Township	36	0	0
Sykeston City	117	0	0
Sykeston Township	43	0	0
Valhalla Township	20	0	0
Woodward Township	22	0	0
Bartlett Township	71	0	0
Brocket City	57	0	0
Cato Township	17	0	0
Chain Lakes Township	12	0	0
Churchs Ferry City	12	0	0
Coulee Township	65	0	0
Crary City	142	0	0
Creel Township	1305	0	4
De Groat Township	22	0	0
Devils Lake City	7141	0	0
Aliceton Township	121	0	11
Alleghany Township	55	0	0
Bale Township	83	0	0

Township	Total Population	NEPV Site Count	Mounds Site Count
Big Bend Township	153	0	9
Dry Lake Township	44	0	0
Freshwater Township	75	0	0
Grand Harbor Township	163	0	0
Casey Township	90	0	6
Coburn Township	61	0	1
Elliott City	25	0	0
Elliott Township	79	0	1
Enderlin City	882	0	0
Fort Ransom City	77	0	0
Fort Ransom Township	96	0	8
Harding Township	33	0	0
Hope Township	7	0	0
Lawton City	30	0	0
Lawton Township	28	0	0
Greene Township	109	0	1
Hanson Township	69	0	0
Island Park Township	262	0	22
Isley Township	44	0	0
Liberty Township	118	0	0
Lisbon City	2154	0	0
Lillehoff Township	25	0	0
Minnewaukan Township	199	0	0
Morris Township	53	0	1
Newbre Township	36	0	0
Noonan Township	31	0	0
Moore Township	93	0	0
Northland Township	52	2	6
Owego Township	21	1	1
Preston Township	79	0	2
Rosemeade Township	39	0	0
Sandoun Township	66	0	0
Scoville Township	35	1	6
North Creel Township	426	0	0
Odessa Township	49	0	2
Ontario Township	72	0	0
Sheldon City	116	0	0
Shenford Township	118	0	7
Springer Township	59	0	7
Sydna Township	194	1	4

Township	Total Population	NEPV Site Count	Mounds Site Count
Tuller Township	107	0	10
Pelican Township	39	0	0
Poplar Grove Township	218	1	7
South Minnewaukan Township	225	0	0
Stevens Township	67	0	0
Triumph Township	38	0	0
Webster Township	67	0	0
Agnes Township	72	0	0
Allendale Township	470	0	0
Americus Township	159	0	0
Arvilla Township	338	0	0
Freeborn Township	102	0	1
Bush Township	40	0	4
Cherry Lake Township	33	0	0
Columbia Township	34	0	0
Grandin City	173	0	0
Gunkel Township	43	0	0
Harmony Township	81	0	0
Harwood City	718	0	0
Harwood Township	352	0	0
Highland Township	94	2	5
Hill Township	53	0	0
Prairie Centre Township	107	0	0
Pulaski Township	88	0	0
Rushford Township	85	0	0
Sauter Township	37	0	0
Shepherd Township	37	0	0
Kathryn City	52	0	0
Lake Town Township	39	0	0
Leal City	20	0	0
Litchville City	172	0	0
Mansfield Township	38	0	0
Marsh Township	283	0	0
Meadow Lake Township	81	0	0
Horace City	2430	0	0
Howes Township	78	0	0
Hunter City	261	0	0
Hunter Township	64	0	0
Kindred City	692	0	0
Kinyon Township	91	0	0

Township	Total Population	NEPV Site Count	Mounds Site Count
Lake Township	34	0	0
Vernon Township	88	0	0
Minnie Lake Township	50	0	0
Nelson Township	57	0	1
Noltimier Township	65	0	1
Nome City	62	0	1
Norma Township	36	0	0
Oakhill Township	51	0	4
Oriska City	118	0	0
Leonard City	223	0	0
Leonard Township	108	0	0
Maple River Township	128	0	0
Mapleton City	762	0	0
Mapleton Township	188	0	0
Noble Township	74	0	0
Normanna Township	333	0	0
Walsh Centre Township	154	0	0
Walshville Township	112	0	0
Oriska Township	65	0	0
Pierce Township	74	0	0
Pillsbury City	12	0	0
Potter Township	34	0	0
Raritan Township	95	0	0
Rogers City	46	0	0
Page City	232	0	0
Page Township	52	0	0
Pleasant Township	468	0	0
Pontiac Township	100	0	0
Prairie Rose City	73	0	0
Raymond Township	254	0	0
Reed Township	1175	0	0
Reile's Acres City	513	0	0
Rich Township	64	0	0
Rogers Township	42	0	0
Rosebud Township	55	0	0
Sanborn City	192	0	0
Sibley City	30	0	0
Sibley Trail Township	92	0	3
Skandia Township	40	0	0
Ashley City	749	0	0

Township	Total Population	NEPV Site Count	Mounds Site Count
Rochester Township	53	0	0
Rush River Township	82	0	0
Stanley Township	1218	0	0
Tower Township	54	0	0
Tower City City	253	0	0
Walburg Township	152	0	1
Warren Township	139	0	0
Watson Township	93	0	0
Spring Creek Township	74	0	0
Springvale Township	53	0	0
Stewart Township	89	0	0
Svea Township	41	0	0
Thordenskjold Township	67	0	2
Tower City City	0	0	0
East McIntosh UT	278	0	0
Lehr City	66	0	0
Northwest McIntosh UT	349	0	0
Roloff Township	12	0	0
Southwest McIntosh UT	257	0	0
West Fargo City	25830	0	0
Wheatland Township	158	0	0
Wiser Township	88	0	0
Uxbridge Township	89	0	0
Valley Township	536	0	8
Valley City City	6585	0	3
Weimer Township	47	0	0
Wimbledon City	216	0	0
Aurora Township	32	0	0
Brinsmade City	35	0	0
Eldon Township	35	0	0
Fort Totten UT	1638	1	5
Beaver Creek Township	77	0	0
Broadlawn Township	41	0	0
Carpenter Township	51	0	0
Colgate Township	93	0	0
Easton Township	54	0	0
Edendale Township	60	0	0
Irvine Township	16	0	0
Enger Township	76	0	0
Finley City	445	0	0

Township	Total Population	NEPV Site Count	Mounds Site Count
Finley Township	52	0	0
Franklin Township	41	0	0
Golden Lake Township	59	0	0
Greenview Township	44	0	0
Hope City	258	0	0
Lake Ibsen Township	23	0	0
Lallie Township	453	0	3
Lallie North UT	40	1	0
Leeds Township	91	0	0
Lohnes Township	36	0	0
McClellan Township	46	0	0
Hugo Township	43	0	0
Luverne City	31	0	0
Melrose Township	38	0	0
Newburgh Township	90	0	0
Primrose Township	73	0	0
Riverside Township	41	0	0
Sharon City	96	0	0
Minco Township	19	0	2
Minnewaukan City	224	0	0
Mission Township	1087	0	3
Normania Township	44	0	0
Oberon City	105	0	0
Oberon Township	67	0	0
Sharon Township	48	0	0
Sherbrooke Township	49	0	0
Westfield Township	59	0	0
Willow Lake Township	56	0	0
Ardoch City	67	0	0
Addison Township	91	0	0
Alice City	40	0	0
Amenia City	94	0	0
Riggin Township	47	0	1
Rock Township	29	0	0
Ardoch Township	69	0	0
Cleveland Township	76	0	0
Conway City	23	0	0
Alta Township	108	0	0
Anderson Township	52	0	0
Ashtabula Township	112	0	4

Township	Total Population	NEPV Site Count	Mounds Site Count
Amenia Township	105	0	0
Argusville City	475	0	0
Arthur City	337	0	0
Arthur Township	78	0	0
Ayr City	17	0	0
Ayr Township	72	0	0
Barnes Township	25	0	0
Twin Tree Township	143	0	3
Warwick City	65	0	0
Warwick Township	64	0	0
West Antelope Township	21	0	0
Eden Township	42	0	0
Fordville City	212	0	0
Forest River City	125	0	0
Baldwin Township	33	0	1
Binghampton Township	76	0	0
Brimer Township	59	0	0
Cuba Township	76	0	0
Dazey City	104	0	0
Bell Township	36	0	0
Berlin Township	124	0	0
Buffalo City	188	0	0
Buffalo Township	82	0	0
Casselton City	2329	0	0
Casselton Township	78	0	0
West Bay Township	57	0	0
Wood Lake Township	522	0	3
Forest River Township	63	0	0
Dazey Township	51	0	0
Eckelson Township	111	0	0
Edna Township	76	0	0
Ellsbury Township	28	0	0
Fingal City	97	0	0
Getchell Township	73	0	1
Clifton Township	75	0	1
Cornell Township	59	0	0
Davenport City	252	0	0
Davenport Township	144	0	0
Dows Township	43	0	0
Durbin Township	83	0	0

Township	Total Population	NEPV Site Count	Mounds Site Count
Eldred Township	106	0	0
Harriston Township	131	0	0
Lankin City	98	0	0
Latona Township	56	0	0
Medford Township	62	0	0
Grand Prairie Township	48	0	0
Green Township	84	0	1
Greenland Township	42	0	0
Hemen Township	27	0	0
Hobart Township	111	0	0
Empire Township	114	0	0
Enderlin City	4	0	0
Erie Township	109	0	0
Everest Township	88	0	0
Fargo City	105549	0	0
Frontier City	214	0	0
Gardner City	74	0	0
Gardner Township	107	0	0
Gill Township	117	0	0
Minto City	604	0	0
Norton Township	69	0	0
Ops Township	63	0	0
Perth Township	52	0	0
Pisek City	106	0	0
Freeman Township	40	0	0
Garborg Township	96	0	0
Grant Township	102	0	0
Greendale Township	104	0	0
Hankinson City	919	0	0
Helendale Township	104	0	0
Ellendale Township	115	0	0
Elm Township	76	0	0
Forbes City	53	0	0
Fullerton City	54	0	0
German Township	17	0	0
Wright Township	50	0	1
Yorktown Township	50	0	0
Young Township	35	0	0
Buchanan Township	99	0	28
Chase Lake UT	3	0	0

Township	Total Population	NEPV Site Count	Mounds Site Count
Chicago Township	47	0	0
Cleveland City	83	0	0
Conklin Township	12	0	0
Corinne Township	42	0	0
Homestead Township	90	0	0
Ibsen Township	105	0	0
Liberty Grove Township	114	0	0
Lidgerwood City	652	0	0
Mantador City	64	0	0
Mooreton City	197	0	0
Grand Valley Township	25	0	0
Hamburg Township	34	0	0
Hudson Township	88	0	0
James River Valley Township	40	0	0
Kent Township	29	0	0
Kentner Township	183	0	0
Corwin Township	100	2	5
Courtenay City	45	0	0
Courtenay Township	36	0	0
Cusator Township	26	0	0
Mooreton Township	117	0	0
Moran Township	70	0	1
Nansen Township	86	0	0
Sheyenne Township	51	0	0
Viking Township	67	0	0
Walcott City	235	0	0
Walcott Township	326	0	0
Keystone Township	44	0	0
Lorraine Township	35	0	0
Lovell Township	42	0	0
Ludden City	23	0	0
Maple Township	49	0	0
Monango City	36	0	0
Northwest Township	19	0	0
Oakes City	1856	0	0
Port Emma Township	35	0	0
Deer Lake Township	29	0	0
Durham Township	50	0	0
Edmunds Township	35	0	1
Eldridge Township	123	0	0

Township	Total Population	NEPV Site Count	Mounds Site Count
Flint Township	40	0	0
Waldo Township	103	0	0
West End Township	39	0	0
Wyndmere City	429	0	0
Wyndmere Township	82	0	0
Fried Township	155	0	4
Gerber Township	9	0	0
Germania Township	19	0	0
Glacier Township	22	0	0
Bowen Township	67	0	0
Larimore City	1346	0	0
Larimore Township	117	0	0
Levant Township	58	0	0
Lind Township	62	0	0
Logan Center Township	44	0	0
Gray Township	41	0	0
Griffin Township	51	0	0
Adler Township	30	0	0
Aneta City	222	0	0
Bergen Township	39	0	0
Central Township	29	0	0
Clara Township	21	0	0
Dahlen Township	68	0	0
Dayton Township	70	0	0
Brampton Township	59	0	0
Cayuga City	27	0	0
Cogswell City	99	0	0
Denver Township	57	0	0
Dunbar Township	103	0	0
Forman City	504	0	0
Forman Township	48	0	0
Gwinner City	753	0	0
Loretta Township	50	0	0
Manvel City	360	0	0
Mekinock Township	2535	0	0
Michigan Township	139	0	0
Moraine Township	66	0	0
Niagara City	53	0	0
Hidden Township	50	0	0
Homer Township	289	2	6

Township	Total Population	NEPV Site Count	Mounds Site Count
Iosco Township	17	0	0
Jamestown City	15427	0	7
Dodds Township	44	0	0
Enterprise Township	27	0	0
Field Township	44	0	0
Forde Township	34	0	0
Hall Township	130	0	0
Harlem Township	41	0	0
Havana City	71	0	0
Herman Township	56	0	1
Jackson Township	33	0	0
Kingston Township	85	0	0
Niagara Township	72	0	0
Northwood City	945	0	0
Northwood Township	138	0	0
Oakville Township	200	0	0
Pleasant View Township	138	0	0
Jim River Valley Township	38	0	0
Kensal City	163	0	0
Kensal Township	44	0	0
Lenton Township	64	0	0
Lippert Township	96	0	0
Hamlin Township	69	0	0
Illinois Township	70	0	0
Lakota City	672	0	0
Lakota Township	50	0	0
Lee Township	42	0	0
Marboe Township	29	0	0
Milnor City	653	0	0
Milnor Township	97	0	0
Ransom Township	56	0	0
Rutland City	163	0	0
Rutland Township	55	0	0
Plymouth Township	68	0	0
Reynolds City	93	0	0
Rye Township	297	0	0
Strabane Township	98	0	0
Thompson City	986	0	0
Turtle River Township	174	0	0
Union Township	194	0	0

Township	Total Population	NEPV Site Count	Mounds Site Count
Walle Township	457	0	0
Lowery Township	33	0	0
Lyon Township	19	0	0
Manns Township	78	0	1
Marstonmoor Township	23	0	0
Medina City	308	0	0
Midway Township	579	1	23
Leval Township	29	0	5
McVille City	349	0	0
Melvin Township	27	0	0
Michigan Township	58	0	0
Michigan City City	294	0	0
Nash Township	53	0	0
Nesheim Township	43	0	0
Ora Township	69	0	0
Osago Township	31	0	10
Pekin City	70	0	0
Petersburg City	192	0	0
Sargent Township	32	0	0
Shuman Township	60	0	0
Southwest Township	18	0	0
Taylor Township	39	0	0
Tewaukon Township	54	1	2
Verner Township	42	0	0
Washington Township	116	0	0
Wheatfield Township	74	0	0
Montpelier City	87	0	0
Montpelier Township	70	6	23
Moon Lake Township	65	0	0
Newbury Township	51	0	0
Petersburg Township	29	0	0
Rubin Township	38	0	0
Rugh Township	26	0	0
Sarnia Township	39	0	0
Tolna City	166	0	0
Wamduska Township	34	0	9
Vivian Township	140	0	0
Weber Township	73	0	0
Whitestone Hill Township	85	0	0
Willey Township	100	0	0

Township	Total Population	NEPV Site Count	Mounds Site Count
Nogosek Township	20	0	0
Northwest Stutsman UT	15	0	0
Paris Township	23	0	0
Peterson Township	34	0	0
Pingree City	60	0	0
Pingree Township	49	0	0
Pipestem Valley Township	35	0	0
Williams Township	48	0	0
Plainview Township	40	0	0
Rose Township	73	0	4
Birtsell Township	97	0	0
Bordulac Township	75	0	0
Round Top Township	9	0	1
St. Paul Township	71	0	0
Severn Township	51	0	0
Sharlow Township	55	0	0
Sinclair Township	30	0	0
Spiritwood Township	73	0	0
Spiritwood Lake City	90	0	9
Bucephalia Township	43	0	0
Carrington City	2065	0	0
Carrington Township	205	0	0
Eastman Township	17	0	0
Estabrook Township	74	0	0
Florance Township	32	0	0
Glenfield City	91	0	0
Glenfield Township	51	0	0
Grace City City	63	0	0
Stirton Township	70	0	0
Streeter City	170	0	0
Streeter Township	55	0	0
Abercrombie Township	268	0	0
Antelope Township	110	0	0
Barney City	52	0	0
Barney Township	134	0	0
Haven Township	35	0	0
Larrabee Township	56	0	3
Longview Township	47	0	0
McHenry City	56	0	0
McHenry Township	51	0	0

Township	Total Population	NEPV Site Count	Mounds Site Count
McKinnon Township	24	0	0
Strong Township	19	0	0
Sydney Township	78	0	0
Valley Spring Township	19	0	0
Wadsworth Township	22	0	0
Walters Township	44	0	0
Barrie Township	191	0	0
Belford Township	122	0	0
Brandenburg Township	102	0	0
Brightwood Township	203	0	0
Colfax City	121	0	0
Colfax Township	241	0	0
East Logan UT	263	0	0
Finn Township	16	0	0
Fredonia City	46	0	0
Gackle City	310	0	0
Melville Township	35	0	0
Nordmore Township	65	0	0
Rolling Prairie Township	32	0	0
Rose Hill Township	66	0	0
Wyard Township	63	0	0
Porter Township	50	0	0
Potsdam Township	38	0	0
Weld Township	31	0	0
Windsor Township	59	0	0
Winfield Township	83	0	1
Woodbury Township	208	0	0
Danton Township	135	0	0
Dexter Township	67	0	0
Duerr Township	118	0	0
Eagle Township	252	0	0
Elma Township	78	0	1
Gutschmidt Township	28	0	0
Haag Township	25	0	0
Janke Township	28	0	0
Lehr City	14	0	0
Ada Township	51	0	0
Albertha Township	23	0	0
Albion Township	42	0	0
Bear Creek Township	183	0	0

Township	Total Population	NEPV Site Count	Mounds Site Count
Clement Township	109	0	0
Divide Township	79	0	0
Elden Township	73	0	0
Ellendale City	1394	0	0
Riverdale Township	95	0	0
Spring Valley Township	28	0	0
Valley Township	30	0	0
Van Meter Township	77	0	0
Whitestone Township	29	0	0
Alexander Township	26	0	0
Ashland Township	64	0	2
Bloom Township	554	0	1
Bloomenfield Township	34	0	0
Buchanan City	90	0	0
Woodworth City	50	0	0
Ypsilanti Township	128	0	8
Adrian Township	99	1	23
Badger Township	52	0	0
Berlin City	34	0	0
Black Loam Township	44	0	0
Bluebird Township	35	0	0
Dean Township	224	0	0
Dickey City	42	0	0
Edgeley City	563	0	0
Gladstone Township	51	0	0
Glen Township	38	0	0
Glenmore Township	53	0	0
Golden Glen Township	108	0	0
Grand Rapids Township	90	0	7
Grandview Township	45	2	4
Greenville Township	47	0	0
Henrietta Township	84	0	0
Jud City	72	0	0
Kennison Township	108	0	0
Kulm City	354	0	0
LaMoure City	889	0	0
Litchville Township	49	0	0
Marion City	133	0	0
Mikkelson Township	37	0	0
Nora Township	71	0	0

Township	Total Population	NEPV Site Count	Mounds Site Count
Norden Township	51	0	0
Ovid Township	46	0	1
Pearl Lake Township	54	0	1
Pomona View Township	22	0	0
Prairie Township	43	0	0
Raney Township	24	0	0
Ray Township	42	0	0
Roscoe Township	59	6	22
Russell Township	35	0	0
Ryan Township	70	0	0
Saratoga Township	52	0	11
Sheridan Township	28	0	0
Swede Township	36	0	0
Verona City	85	0	0
Wano Township	35	0	0
Willowbank Township	135	0	1
Lien Township	122	0	0
Minnesota Township	120	0	0
Norway Township	112	0	0
Victor Township	180	0	0
Dayton Township	19	0	0
La Belle Township	70	0	0
Newark Township	109	0	0
Veblen Township	196	0	0
Victor Township	37	0	0
White Township	122	0	0
Osceola Township	47	0	0
Palmyra Township	34	0	0
Portage Township	58	0	0
Savo Township	71	0	0
Central McPherson UT	561	0	0
Wachter Township	30	0	0
Wacker Township	15	0	0
Weber Township	156	0	0
Hecla Township	45	0	0
Liberty Township	68	0	0