SCALES OF VISIBILITY AT A CHACOAN OUTLIER: THE VISUAL WORLD OF PEOPLE AT KIN KLIZHIN

BY

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ABSTRACT

The focus of most archaeological research on visibility is on inter-community communication and warfare. In this thesis, I focus instead on tracking historical changes in visibility within Kin Klizhin community near Chaco Canyon, New Mexico, United States. I use Geographic Information Systems to analyze intervisibility among habitation structures to better understand how visibility may have operated as an identity-formation tool for Ancestral Puebloan residents. My results indicate that on a community (rather than landscape) scale, residents were consistently able to see their neighbors over an 800 year period. Kin Klizhin residents experienced subtle, but archaeologically noticeable, differences in their visual landscape during a period when ideas from a nearby regional center at Chaco Canyon were influential there. The ubiquity and continuity of visibility in the built environment points to this being an important principle for the residents of Kin Klizhin. I conclude it is likely that people were building intervisible habitations and modifying the landscape on a large scale significantly before Chaco became a center of influence. This work is significant in two ways: my research supports that Ancestral Puebloans were preoccupied with visibility; and it suggests that visibility was materialized as both an expression of Ancestral Puebloan ideas and as a technique of community constitution. Intervisibility between people is one possible signifier of the symbolic world, the identities and world views of past peoples. Studying its material representation in archaeological remains is one possible way to access past peoples' conceptualizations of the world.

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Any flaws remaining in this work are my own.

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Chapter 1: Introduction

In quotidian life, the ability to see helps people navigate the physical and social worlds in which they find themselves embedded. Contemporary neighborhoods are a good example of how this plays out materially; homes are oriented facing one another, and a person walking down the street can get a glimpse of the residents and a sense of the neighborhood's makeup from their visual experience. People in prehistory, who created the archaeological record that we analyze, used their visual perception to construct and relate to the world as well. Studying the material remnants of past visual relationships between structures is one way to gain insight into the visual worlds in which these people lived.

In this work, I analyze the ability to see between structures at Kin Klizhin, an Ancestral Puebloan community in New Mexico, United States. People inhabited this group of sites from AD 500 through AD 1300 (Powers and Van Dyke 2012). In the 11th century, the nearby Chaco Canyon became the center of a regional phenomenon. Within the Kin Klizhin community builders erected a monumental structure using iconic Chacoan elements. Kin Klizhin is thus considered an outlying Chacoan community, but the nature of the relationship between inhabitants at Kin Klizhin and Chaco Canyon is unclear. One of my objectives in this work is to use visibility at Kin Klizhin to more fully understand the impact of Chacoan ideas on the inhabitants of this nearby community.

Regional analyses by other archaeologists (Robinson et al. 2007) have shown that monumental structures and shrines associated with Chaco Canyon are often intervisible across vast distances. I use Geographic Information Systems (GIS) to build upon this work to focus on visibility in a residential community, a more spatially limited area than

most previous research has addressed. I test whether builders within the Kin Klizhin community constructed a network of visibility of their own, and whether the Chaco Canyon phenomenon changed previous visibility patterns within that community.

Archaeologists have long recognized the impact of increased activity at Chaco Canyon on nearby communities such as Kin Klizhin. They have also identified long-distance visual connections between monumental structures constructed between AD 900 and 1100. If visibility was a factor in building Chaco Canyon phenomenon, it was likely an important concept shared by Ancestral Pueblo people long before then, one that people in the central canyon as well as in the Kin Klizhin community used to make sense of the world. Understanding the materialization of the visibility concept is an important step if archaeologists are to understand what was shared among these people in the past.

My research questions arose from my reviews of literature on landscape theory and the culture history of Chaco Canyon and Kin Klizhin. In chapter two I discuss how scholars in landscape archaeology study daily practice, use of natural resources, worldview, and identity construction of past peoples. I draw out the concept of visibility in this literature, as well as methods used to study it. In chapter three, I review the literature on the culture historical context of the site I studied, focusing on the population and architectural trends to compare to my observations at Kin Klizhin. In chapter four, I review literature on the Kin Klizhin community, the archaeological remains there, and previous work that has been done at the site. Combined, the three literature reviews provide the background needed to understand the significance of my thesis.

Beginning in the fifth chapter, I describe my own research process. Chapter five includes my research questions and a discussion of possible outcomes. For example, if a

person standing at any habitation can see any other habitation, do those habitations constitute a network of visibility? Following the research questions and hypotheses, in chapter 6, is a description of the methods I used to investigate them: I conducted a GPS study at Kin Klizhin to record the precise three-dimensional locations of selected habitation, shrine, and herradura sites as well as the monumental Great House (this term will be explained in chapter three). I used this data to generate digital models of what a person would see, standing at each site from AD 500 – AD 1300. In chapter 7, I compare the results of digital models, describe trends of continuity and change in visibility over time, and relate these to the culture history of the region. I found that inhabitants of the Kin Klizhin community constructed their homes in places where inhabitants at all other homes would be able to see them. This did not change when monumental structures were constructed in AD 1050; large-scale architectural elements were built into the same visibility network as smaller-scale habitations in this community.

Finally, in chapter 8, I discuss the implications of these results, including the limitations of my methods and possible future directions for analysis. This is organized by site type to correspond with my research questions. The results suggest that habitations were constructed with a different set of principles than other structures, so I separate site types in my discussion to expand on what these results mean.

This work contributes to what is known about how visibility may have operated as an identity-formation tool for Ancestral Puebloan people. It is significant in two ways: my research supports that Ancestral Puebloans were preoccupied with visibility, and suggests that visibility was materialized as both an expression of Ancestral Puebloan ideas and as a technique of community constitution. . Intervisibility between people is

one possible signifier of the symbolic world, the identities and world views of past peoples. Studying its material representation in archaeological remains is one possible way to access past peoples' conceptualizations of the world.

Chapter 2: Archaeologies of Landscape

In the last forty years, as computing technologies have become more widely available, archaeologists have analyzed larger and more specialized volumes of data than ever (Wheatley and Gillings 2002:17-18, 201). Geographic Information Systems (GIS) have become particularly popular tools (Waldron and Abrams 1999:4; Wheatley and Gillings 2002:18-20). Archaeologists have developed varying techniques to use this technology and theories to explain their results, ranging from computer-based spatial analyses to experiments that mimic the bodily experiences of past people (see Anscheutz et al. 2001; Ashmore 1999). In this thesis, I draw from literature which directly connects methods of spatial analysis and computing with a theory of landscape in which space is a medium in which people are embedded, rather than a static backdrop for human action (e.g. Ashmore 2002; Dungan 2009; Fowles 2009; Llobera 1996; Van Dyke 2007;). These build on influential work on the construction and experience of cultural practices by Bourdieu (1977) and Giddens (1984). In the following review, I will focus on the use of landscape as a concept in archaeological research, I discuss the issue of visibility and human perception, and I explore the application of these ideas to creating digital methods for investigating visibility.

Landscape

Over time, the meanings of the term 'landscape' in archaeology have transformed. Until the 1980s, the term was typically used to describe the non-human aspects of a site's surroundings, creating a conceptual divide between natural and human-made elements (Childe 1951; Hawkes 1954; Spaulding 1960). Researchers undertaking settlement pattern studies, for example, were interested in the distances between archaeological sites

but rarely what these spaces might have meant to the people who experienced them (for example, Steponaitis 1978; Willey 1953). Archaeologists described sites as though they were placed on a grid in abstract space rather than in an interactive natural and cultural environment. This concept of landscape is often referred to as “space as container” (Smith 2003:1-30; Tilley 1994:1-34); the material remnants of human activities are said to be left behind on an otherwise empty landscape, with patterns directly reflecting the social structure of the people who created them. In many studies done during the height of processual archaeology, scholars tended to take an positivistic approach to drawing conclusions from landscape-scale studies, seeing correlations between certain settlement patterns and inferred social organizations (e.g., Crumley 1979; Steponaitis 1978; Willey 1953). In this formulation, there are no qualities to space; it is empty and has no impact on the activities themselves. Critics (Hodder 1982; Thomas 1993; Tilley 1994) of this work noted that it was often used to create broad rules for translating settlement patterns to social structures.

Although “space as container” approaches succeeded in incorporating multiple scales of archaeological evidence, they did not address the often recursive nature of interactions between culture and environment. In the early 1980s, following theoretical trends in humanistic geography (Cosgrove 1984; Harvey 1973; Lefebvre 1974; Soja 1980), archaeologists began conducting analyses of socialized space and architecture (Hodder 1982; Lekson 1981; McGuire and Schiffer 1983). Many researchers called for a re-evaluation of the concept of landscape to account for the ways that it ‘informs’ and reciprocates human activities, not just the ways that human activities shape the landscape (Basso 1996; Llobera 1996; Thomas 1993; Tilley 1994). By framing landscape in this

way, space is presented as a medium in which people negotiate social, material, and ideological relations.

These critical studies gave rise to many different approaches to research, and to understanding human life through the lens of landscape. Critical landscape archaeologists agree that past peoples' regular activities leave material traces which are the product of social, ideological, and political processes on a simultaneously natural and built environment. I see the landscape literature as speaking to four aspects of human-landscape relations:

1. Practice: Peoples' daily activities which leave a trace of habitual behaviors and use of space
2. Control of Natural Resources: People modifying their surroundings as a way of controlling subsistence resources and land
3. Landscape and Worldview: People transforming the landscape to enact and reinforce their worldview
4. Signaling Identity through Landscape: People constructing (on) the landscape to signal their relation to a certain group of people, especially relatedness or not

Scholars may be interested in these aspects individually or in any combination. In the following section, I will discuss how landscape archaeologists have sought to access information about the connection between people and their surroundings by asking about each of these types of relationships.

Practice

For many scholars, taking a landscape perspective has been a way of more fully understanding traces left behind by peoples' regular activities. Including a wider spatial area in archaeological study often captures a wider range of peoples' activities, and thus it is easier for scholars to conceptualize space as inhabited by people (Ashmore 2002). Materials deposited through regular activities, and through once-in-a-lifetime ones, often

remain long after the people have gone or changed their ways; left on the landscape are traces of the behaviors and identities of past peoples (Ingold 1993; Snead 2008:115). There are multiple ways to study practice on a landscape scale including investigating how people experience the landscape visually or through other senses, the ways buildings and landscape features shape human activities, and even trying to access aspects of those experiences through phenomenological experiments.

Some of the most identifiable traces of peoples' experiences are the things they constructed in places that are meaningful to them. Trails, monuments, shrines, and other structures are often distinct from the cultural and natural landscapes around them, inspiring archaeologists to ask questions about the significance of these structures and places to the people who constructed them. Such features are evidence of how people made sense of the landscape, and how they shaped their own experiences by adding to and modifying it. Archaeological studies of these public spaces have often focused on monumental architecture (Bradley 1993; Bradley 2002; Kay and Sly 2001; Moore 1996; Swanson 2003; Waldron and Abrams 1999), places established according to ideological principles (Glowacki and Malpass 2003; Van Dyke 2007, 2009), and movement along trails (Hendrickson 2010; Gibson 2007; Roney 1992; Snead 2008).

Practice studies undertaken by archaeologists studying the regional center in Chaco Canyon, New Mexico are particularly pertinent because they demonstrate the ways people mark, and connect, special meaning[1].. Chacoans constructed shrines to mark such places, and as a whole these shrines created a visual network that linked significant Chacoan spaces (Hayes and Windes 1974; Robinson et al. 2007; Van Dyke 2007:142).

[1] Further discussion of shrines, and an in-depth description of the Chaco Canyon phenomenon, can be found in Chapter 3.

The very construction of these shrines would have materialized the mental connection that people had with significant places (Snead 2008:126). They could have been used for communication, as places of community gathering or connection to the spiritual world, or any number of other things. Over more than a hundred years of research in this field, archaeologists have refined their understanding of spatial and temporal patterns in Chacoan archaeological remains. The amount and precision of the data have enabled researchers to explore the social (Gilpin 2003; Irwin-Williams 2008; Lyons et al. 2008; Mahoney and Kantner 2000) and mental (Fritz 1978; Hegmon 2008; Lekson 1999; Stein and Lekson 1992; Van Dyke 2008a, 2008b) constructs which may have contributed to these variations.

The Chacoans built roads as well, and they have been a focus of study for archaeologists wanting to understand sociopolitical connections among people in the canyon. Trails and roads present a difficult case for archaeologists because they are by definition connecting elements, and the material correlates to their use are often difficult to detect as well as undocumented. Despite the constraining aspects of roads, the possibility of understanding specific acts of movement and connecting archaeological places leads many scholars to study them (Hendrickson 2010; Nials et al. 1987; Roney 1992; Snead 2008; Vivian 1997a, 1997b; Windes 1987a, 1987b). Some archaeologists have sought to use phenomenological experiments to access embodied movement across landscapes, on roads and otherwise, to understand their potential symbolic value (Hamilton and Whitehouse 2006; Tilley 1994; Van Dyke 2007, 2008b).

Control of Natural Resources

People in the past used, and sought to control access to, natural resources in ways which have motivated archaeologists to expand the spatial boundaries of their research. For example, to understand subsistence and its relationship to past social interactions, the distance from a habitation site to water and food sources must be investigated. People signal their claim to these resources in multiple ways. They may use iconic natural materials in their structures alongside materials strongly associated with their cultural identity (Glowacki and Malpass 2003). Constructing a large, fortified village directly around a water source would have sent a strong message to insiders and outsiders about access to that source (Kuckelman 2007). Other water control features such as berms, pools, and canals enabled the production of a surplus of food (Powers and Van Dyke 2012; Vivian 1992; Vivian et al. 2006:45-56), legitimated claims to social power (Vivian 1974; Vivian 1990:308-318), and facilitated access to spiritually important resources (Van Dyke and King 2009:17-18). While structures and landscape modifications at Chaco Canyon no doubt served to control natural resources, that is not the focus of this study. Instead I will expand on the possibility that ideological principles and meaning were inscribed in the archaeological landscape, both natural and cultural, by people in the past.

Landscape and Worldview

Landscapes are integral to the process of human material and symbolic communication, whether this takes place in peoples' daily lives, or very infrequently, through the construction of particular places, or all of the above. Archaeologists work to access the worldview that framed these human interactions with the landscape in the past.

The seminal work *Wisdom Sits in Places*, by Keith Basso (1993), was the culmination of five years of ethnography concerned with linguistic conceptions of landscape among the Western Apache, conducted in Arizona between 1979 and 1984[2]. Basso's experiences with his interlocutors showed him that landscapes help to shape human experiences. His understanding of how modern Western Apache people experience the landscape suggests possibilities for understanding archaeological remains which were not evident through traditional means of research. Basso's work has served as a source of possible interpretive models for archaeologists because it describes the recursive relationship between meaning-making and material experience as it plays out in the modern world. It is also evidence that ethnographic research is one way to training yourself to identify ideological principles which could match patterns in archaeological data.

Anthropologists studying the Southwest have long used Pueblo oral traditions to make sense of the material patterns they observe. Severin Fowles' (2009) work on the material construction of Pueblo cosmology during the late thirteenth century AD is one example. He identifies a 'villagescape' in the Northern Rio Grande region and uses the ethnographic work of Alfonso Ortiz (1969) to investigate the significance of structure placement in the study area (Fowles 2009:455). Ortiz's work provides unique insight into the meaning of particular features as they are placed throughout the 'villagescape.' Ortiz (1969:18) lays out the mental map of the world that Tewa people understood. Comparing this to his archaeological information originating from a nearby indigenous group, Fowles (2009:449-452) identified archaeological and landscape features that could have

[2] This is one of several ethnographic projects Basso pursued throughout his career studying the Western Apache, all with a particular interest in language.

been part of a layered, cardinally-oriented ‘villagescape’. Fowles used cosmological concepts he gleaned from ethnographic information, including that provided by Ortiz, to identify a “sociospatial logic” (Fowles 2009:463) which seems to have informed the construction of the space that he studied. Ortman (2000) and Van Dyke (2007, 2008) have also used ethnographic information to identify principles underlying the architectural forms in the prehistoric Southwest. Studies like these which focus on worldview and its components allow archaeologists to understand the principles which may have contributed to the patterning of materials left behind.

Signaling Identity through Landscape

Humans share physical senses of sight, hearing, smell, touch, and taste. All humans do not share a sense of identity and how they transform sensory experience into meaning. Part of this transformation takes place in reference to a person’s identification with a group; group identity occupies a mental space for each person, and aspects of the group identity reference material spaces (Connerton 1989:37). The significant places shared by a group, then, form an identity map of sorts which exists in mental and material space (Connerton 1989:38). When people participate in formalized, repetitive rituals, sacred or mundane, the formality references a sense of continuity with past practices, thus connecting the places on the map with an identity that reaches into their shared past (Connerton 1989:44-5). As Ingold (1993) termed it, people *dwell with* the landscape, and this dwelling collapses the mental and material maps in their heads. By studying how people used and interacted with their landscape, archaeologists can often speak to ideological principles that underlie the habitual behaviors which are referenced in the

material world. The material aspect of dwelling, we hope, can tell us about the mental aspect.

While daily practice, resource access, and worldview are components of peoples' identities, they often signal their collective identifications in ways that are explicitly directed at outsiders (Carr and Neitzel 1995; Wobst 1977). The purpose of this is for people to perform and create shared identifications, and their legibility to outsiders only solidifies the unity of those who "belong" (Wobst 1977). For archaeologists, this behavior is useful because we, too, are outsiders to the cultures we study. The focus in this area of study is not discerning the many concepts that make up peoples' identities, but identifying instances of communicating them. Archaeologists often do this by selecting elements and patterns of architecture that were repeated and are easily recognizable from afar, and analyzing their use (Moore 1996:97; Wobst 1977). Scholars taking this direction look across archaeological culture areas for common, usually visual, characteristics in material remains which make sites identifiable.

Moore (1996) sets out some aspects of viewing which make the signals themselves more or less potent as a way of understanding the effectiveness of identity-communicating architecture. He draws from the influential work of Higuchi (1983), who focuses on viewing distance, as well as viewing angle to create the concept of the *isovista*, meaning how much a person's field of view is taken up by a particular structure (Higuchi 1983:12-17). In Higuchi's formula, the isovista of particular structures and landscape features relative to one another informs (and informed) whether people notice them. A distinctive Chacoan structure or part of one, for example, can be said to be positioned to be noticed in a natural and cultural landscape if it is located on a

particularly high place. The weakness with this approach is that archaeologists must work with the modern landscape, so the approximations of past visibility that we experience must incorporate past environmental and archaeological data, and assume that every *body* experiences things in essentially the same way. In other words, this is not a good approach to use alone when conducting phenomenological experiments. Nonetheless, this is one of relatively few studies that systematically deconstruct the legibility of signals that we expect communicated identity in the past.

Higuchi's deconstruction of visibility into components has been especially influential for archaeologists seeking to study visibility, especially those using computer-based methods. In the following section, I will briefly overview the concept of visibility in archaeology, then discuss how researchers have modeled visibility using computer-based techniques.

Visibility in Archaeology

The concept of landscape as a medium for human action has inspired many new research approaches, including the one I use in this project: visibility analysis. Proponents of visibility analysis study the visual characteristics of archaeological sites in a systematic manner, including the extent and distance of features visible to an observer. In applying a critical concept of landscape, they distance themselves from the site-centric spatial analyses that dominated processual archaeology and instead focus on methods that analyzed landscape features and sites together. Viewsheds, or images that represent the visibility of each cell in a grid, have become a popular way of analyzing the spatial patterning of archaeological sites. The ability to superimpose archaeological sites, landscape features, and ranges of visibility within a single representation has improved

scholars' ability to visualize the ways past people constructed landscape. Another popular way to explore visibility is through line-of-sight, modeling the ability of people at two locations to see one another, focusing on the reciprocity of visibility. Lines-of-sight are typically calculated using landscape data, but are visually represented as connections between point locations (sites), so it is more challenging to create a map with them which expresses the embeddedness of sites in the medium of space. I provide a specific discussion of visibility analysis methods later in this chapter.

The phenomenological approach to visibility on the landscape (e.g. Tilley 1994) is a significant departure from traditional archaeological data collection. Phenomenology involves conscious experience of archaeological landscapes and accessing some (partial) sense of the experiences of space that past people may have had. Researchers who take this approach to studying landscape may walk through it in a number of ways to experience it from different places, at different times of day, in different seasons, and perhaps accrue a level of familiarity that would inform them about the impact of the landscape on peoples' sense of their place among the other elements of that landscape (Cummings et al. 2002; Cummings and Whittle 2004; Sims 2009; Van Dyke 2007, 2008b). The theoretical underpinning for this approach is that sensory experiences are critical aspects of life. However, a modern researcher will never replicate the experiences of past people. They will never become an insider to the cultures in which past peoples were embedded, so the influence of their expectations and interpretations cannot be gleaned from phenomenological research. While phenomenology inspires people to ask novel research questions and think differently about them, it has not been translated into a systematic research method (Barrett and Ko 2009; Bruck 2005). One group of scholars

has attempted to develop a method for this approach by describing three phenomenological experiments that they undertook (Hamilton et al. 2006), but this 'subjective' approach is not easily (or perhaps appropriately) transformed into a common method. A more fully developed method for studying human experience is creating a digital model of perception, specifically visibility.

Perception and Visibility

The digital viewshed model became one of the applications that made learning GIS worthwhile to researchers (Wheatley and Gillings 2000:11). A viewshed model is a useful tool because it represents the total view of an individual in any given place (Gillings and Wheatley 2001:28). Archaeologists have tried to identify and incorporate the complexities of visual perception into their digital visibility models (Frieman and Gillings 2007:4-5; Llobera 2007; Waldron and Abrams 1999). According to these scholars, things like the "fuzziness" of peoples' vision and random loss of visibility (caused by weather or other factors) should be incorporated into models of visibility if they are to imitate the human experience. We are cautioned, though, that visual perception cannot be favored over auditory and sensory perception (Connolly and Lake 2006:33; Llobera 2007:52). Visual perception is a good place to start, as long as we acknowledge that our understanding of peoples' experience using visibility is only one-sixth of the sensory input they received. The benefit of studying visibility is that it includes information about objects spatially near and far, unlike any of the other senses, which are most effective in close proximity (Llobera 2007:52). Visual perception has impacted peoples' construction of the landscape as well; many prehistoric monuments and earthworks prescribe ways to experience particular spaces by either drastically

improving or limiting visibility (Dungan 2009; Kay and Sly 2001; Sims 2009; Tilley 1994; Waldron and Abrams 1999).

Critical discussions in archaeology about the qualities of perception are relatively recent and often do not address the larger issue of perception directly, but describe how a particular digital model is closer to the 'reality' of human perception (Frieman and Gillings 2007; Llobera 2003, 1996). Researchers developing digital models of perception often expect that it is possible to create a model that nearly replicates 'the human experience', whereas more theoretically-oriented scholars tend to model visibility to *understand* 'the human experience'. Theoretically-oriented studies of visibility are much fewer in number, but the work of Marcos Llobera provides a good example of how perception can be investigated using digital visibility models (Llobera 1996, 2003, 2007). Llobera has found that, for example, the presence of structures within close, visible range may impact peoples' likelihood to notice distant structures, which might give them a different sense of their place on the landscape than if they did not see other structures (Llobera 2003:62).

GIS-based visibility approaches do not model the diversity of human experience. This is a familiar problem to phenomenologists (as described above), but in a GIS research programme, it arises from trying to account for human variation in a digital model. Scholars have tried to address the visual perception of people with imperfect vision, but have largely chosen to carry out analyses assuming that the human body will sense the landscape in similar ways. We often expect that people living in the same community will experience the world in a similar way. It bears repeating that within communities there is a diversity of experiences, because of biological and cultural

differences. Addressing human experience in spatial analysis contributes immensely to the strength of our conclusions about the experience of past peoples.

The Meaning of Visibility

Despite critiques (Frieman and Gillings 2007) of GIS-based visibility studies, they have provided valuable information about the construction of cultural landscapes (Fitzjohn 2007; Kay and Sly 2001; Waldron and Abrams 1999; Wheatley and Gillings 2002:201, 209). Most studies in this intellectual thread have sought to explain why visual connections exist across communities and landscapes. I note three common explanations within this literature: marking distinction, surveillance, and interpersonal signaling (Wilcox 1999:133-136).

Many of the studies on long-distance visibility reference the strategic importance of highly visible features for marking distinction, surveillance, and signaling to people on the surrounding landscape. Highly visible structures are intended to be seen, and a higher profile on the landscape is meant to attract attention (Carr and Neitzel 1995; Higuchi 1983:12-17). The inverse of this, and often folded into the same research, is the idea that highly visible places are constructed to enable surveillance. The motivation for monitoring could have been to control people and resources (Foucault 1977) or to defend settlements in times of conflict (Wilcox 1994). An example of this is Johnson's (2003) work on towers constructed in the Mesa Verde Region of southwest Colorado in the twelfth and thirteenth century. Using GIS-based viewshed analyses, Johnson tested, and confirmed, the hypothesis that towers enabled monitoring of surrounding agricultural land.

Highly visible structures are also explained as facilitating interpersonal signaling (Hayes and Windes 1974; Kay and Sly 2001; Waldron and Abrams 1999) motivated by control and defensibility. I propose that a more productive approach would be to focus on how the towers were *used* and the social context in which they *operated*. Perhaps surrounding structures were only built in areas that could easily see the tower, for example, ensuring that they would receive a signal. If two frequented structures are positioned so that the people in them can see one another, this is likely to impact their understanding of their place on the landscape (Llobera 2003).

All three explanations for constructing visible places can (and do) have salience simultaneously. The structure of the arguments made by Johnson (2003) and Kay and Sly (2001) limited the authors to the three potential explanations I listed, taking out of focus the complex social context surrounding the construction of visibility. I have chosen to focus on the consequences of visibility rather than its intentionality. I propose that considering the social consequences of visibility will allow me to evaluate whether it might have been part of a set of principles people used in constructing the landscape. In other words, I approach visibility as a residue of the decision-making process and a potential window into understanding why people chose to construct their homes in highly visible areas or not. As Llobera (2007) points out, other residues of the decision-making process, such as the architectural style of the structures or the relative times of construction, must also be studied if we expect to determine whether intervisibility was intentional or not.

Studies I have used as examples in this chapter are a small portion of a large body of research connecting themes in landscape archaeology to the people who inhabited

Chaco Canyon, New Mexico. Scholars have researched how visibility and other qualities of landscape impacted the daily practice, use of natural resources, worldview, and identity of the people who lived there. In the next chapter, I discuss the culture history of Chaco Canyon as a significant place for Ancestral Pueblo people.

Chapter 3: The Chacoan World

Between AD 900 and AD 1150, Chaco Canyon was a place of significant activity that seems to have had influence on communities reaching from modern-day Bluff, Utah, to the West, to within 25 miles of Albuquerque, New Mexico to the East. People throughout the Four Corners region would have been involved with people at the center in Chaco Canyon, but they also shared a longer history of living on the Colorado Plateau. In order to frame my analysis of Kin Klizhin, I discuss here the archaeology of Chaco Canyon, the architectural characteristics we use to recognize connections to the canyon's core concentration of structures.

As early as AD 750, a growing population and shifting social organization in the San Juan River basin (contemporary Southwest Colorado and Northwest New Mexico; see Figure 1) was the climate for the construction of many large, but short-lived, villages (Van Dyke 1999; Lekson 2004; see also Wilshusen and Van Dyke 2006:211-237). Between that time and the beginning of large-scale construction at Chaco Canyon, by about AD 500, the concentration of villages north of the San Juan river decreased and the number of structures built to the south implies a migration to the area near Chaco Canyon (Wilshusen and Van Dyke 2006:221- 226). There had been relatively large communities near Chaco long before this (e.g. Shabik'eschee and 29SJ423; See Figure 1 for location of 29SJ423), but none of the magnitude of those constructed between AD 800 and 875; Windes has estimated that the South Fork community alone represents fifty to seventy households (Wilshusen and Van Dyke 2006:224).

It is at this time that architectural elements that become formalized during the population boom at Chaco Canyon begin to appear in the archaeological record. Starting

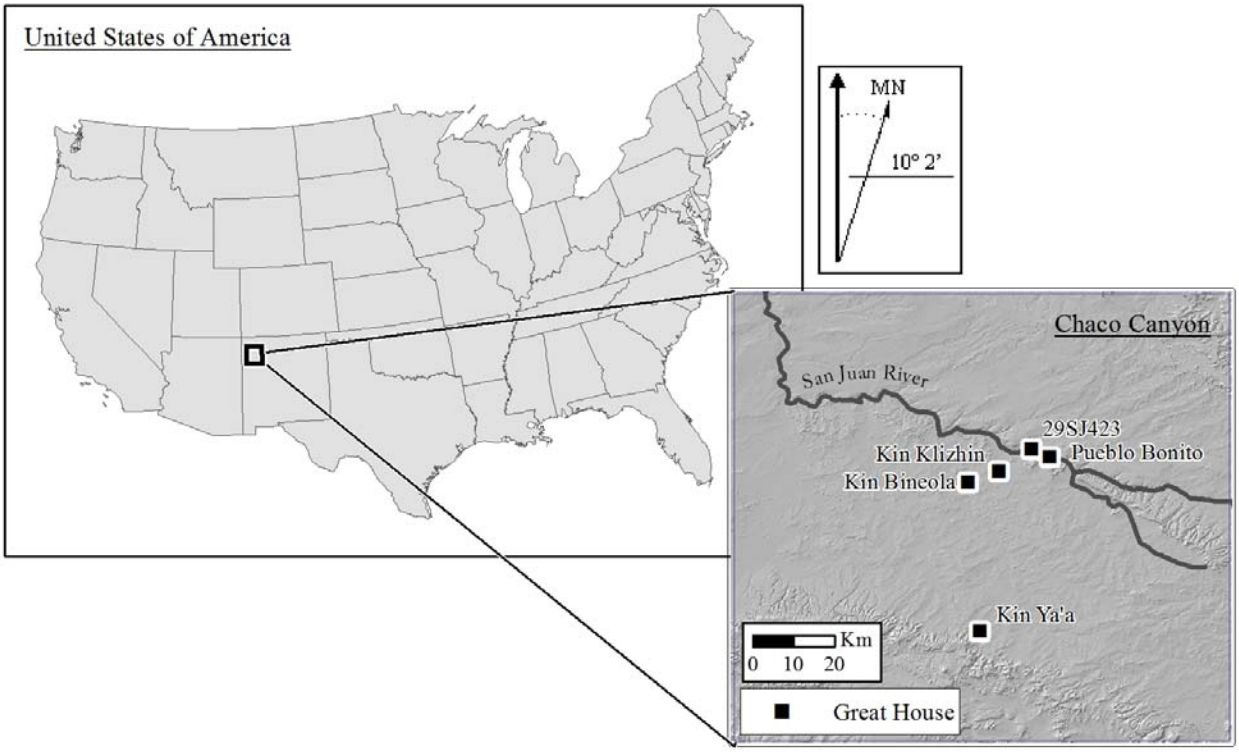


Figure 1. Geographic Location of Study Area and Sites Described in Chapter

with Richard Wetherill and Neil Judd in the early twentieth century, researchers identified key features shared by sites in and around Chaco Canyon. These are evidence of the florescence of ideas that motivated their construction. The great house has been regarded as the hallmark of Chaco Canyon architectural style: a large-scale, more formalized (great) house and associated ceremonial structures (a great kiva and additional kivas) surrounded by smaller habitation clusters (Lekson 1984, 2007; Lekson, Windes, and McKenna 2006:78-93; Mahoney and Kantner 2000:4; Van Dyke 1999, 2003). Each habitation cluster is comprised of a residential room block, kiva, and midden or middens, otherwise known as a unit pueblo or Prudden unit (after Prudden 1903). The great house complex itself mimics the unit pueblo in that it contains the three key elements, but their arrangement, scale, and formality differs significantly. Where individual unit pueblos typically have four to ten rooms, enough for a single family, the number and scale of

great house rooms are such that “an entire unit pueblo would fit in a single large room at a Chaco great house (Lekson 2006:11).

As Mills (2002) summarizes, great houses are identified “on the basis of one or more of the following attributes: larger building size and labor investment than contemporary structures within its community, multistoried construction, symmetry of layout, evidence of planning in the form of large-scale foundation units, core-and-veneer wall construction, and banded masonry” (Mills 2002:81). Kivas blocked-in by walls and high ceilings also figure into the identifications of many scholars (Van Dyke 1999; Wilshusen and Van Dyke 2006:248). Early great houses did not always possess all or most of these characteristics (see Windes 2007), but they are common in buildings constructed during the height of Chaco Canyon’s population. This allows us to look back on early great houses and see a material connection to the phenomenon that led to Chaco’s boom (Wilshusen and Van Dyke 2006).

The culture history of Chaco Canyon itself has been classified by multiple scholars (see Judge 1989, Figure 21; Mills 2002:72-4, Figure 3) but the dating system I will reference here is Sebastian’s (1992). I use this along with the regional classificatory system, the Pecos Classification, allowing me to simultaneously discuss small-scale temporal trends at Chaco and broad regional trends.

Formal architectural elements seem to have been built more consistently into great houses constructed in the Classic Bonito (AD 1020-1100) than they were in the Early Bonito phase (AD 900-1020). The concentration which began to form in Chaco Canyon after AD 850 grew exponentially by the beginning of the Classic Bonito, such that the concentration of sites within the canyon was higher than anywhere else in the

surrounding region by about AD 1020 (Lekson 1986). In their influential work, Doyel et al. (1984) proposed that within a short distance from the central canyon, the “Chaco Halo”, inside which people would have been tightly integrated.

Assuming that the great houses inside the canyon were lived in at least part-time, they could each have housed from tens to hundreds of people at a time, yet archaeological evidence on the floors of these great houses shows sparse occupation (Bernardini 1999; Bustard 2003; Neitzel 2003; Windes 1984, 1987). What, then, was the purpose of expending this much labor on structures? And why were they positioned at the center of Chacoan settlements? A significant amount of labor was undoubtedly required to build the monumental structures, or great houses. Surrounding each great house there was usually a cluster of relatively smaller unit pueblos, but the sociopolitical relationship between the two is not clear (Kintigh 2003:107-111; Mahoney and Kantner 2000:4). Great houses typically had a greater number and variety of artifacts than inhabited sites in the area, and this has raised questions about the use of these structures (Durand 2003:152-154; Kantner and Hobgood 2003:217; Vivian 1990, 1996): were they used as centers for redistribution (Durand 2003:145-146), communal or ritual places for the surrounding community (Durand 2003:147-152, 161; Toll 2001:70-71), or houses for an elite minority (Bernardini 1999; Durand 2003: 143-145; Mills 2008; authors in Neitzel 2003; Windes 1984)? It is likely that they were used for some combination of these three things. Because none of these are mutually exclusive, recent research on great house use has focused more on how these uses speak to what we call “Chacoan culture” (Durand 2003; Gilpin 2003; Kantner and Hobgood 2003; Kantner and Kintigh 2006:161-172)

Although the great house is an iconic Chacoan structure, it is not exclusively found within the boundaries of Chaco Canyon (Marshall et al. 1979; Powers et al. 1983). Outlying great house sites now contained within Chaco Culture National Historic Park, such as Kin Klizhin and Kin Bineola, are the nearest of these, about half a day's walk from the central canyon. One of the furthest outlying great houses, Lowry Pueblo, is located about 180 miles away in southwest Colorado, more than four hours by car today. These structures and the communities that surrounded them are numerous and their presence is one of the main criteria for archaeologists defining the boundaries of the Chacoan World (Lekson 1996; see Mills 2002:68-70). The relationship between these communities and the similarly-structured ones in the canyon itself has been a topic of great interest to archaeologists for the past twenty years. What is understood as Chacoan culture is an archaeological construction based on architectural and artifact similarity, so scholars have looked to patterns in artifacts as evidence of what it meant to be part the group that created them.

As discussed in the previous chapter, roads connected Chacoan sites (and people) together by referencing important natural and cultural places (Kantner and Kintigh 2006: 162; Roney 1992; Van Dyke 2007:144-168; Vivian 1997a, 1997b). Given that there is little evidence of their use for travel, it seems that Chacoan people constructed roads primarily as symbolic, rather than functional, connections between places (Marshall 1997; Roney 1992; Van Dyke 2007:148-151; Snead 2008:115). Chaco archaeologists have found that the Great North Road at Chaco Canyon does not physically connect specific places (Roney 1992:130), but instead extend in North-South cardinal directions, framing Chaco Canyon as the central place from which all else extends in the minds of its

inhabitants (Van Dyke 2007:137-168). Trails are “material signals emphasizing connections between the local community and the larger world” (Snead 2008:126) and between present and past. Roads and road markers (called herraduras) could have reaffirmed Chacoan identity by pointing to common reference points on the landscape that framed peoples’ sense of where they were in their world. Van Dyke (2004:415, 423-424; 2003) points out that some of these roads visually connect sites built during the Late Bonito phase with much older sites, so they may have also served as a symbolic connection between new practices and a common set of values rooted in the past.

The consensus in the literature is that some sort of social organization must have existed at a level higher than the extended family to support such a large population through agriculture. How this hierarchical social structure developed and was maintained is a central debate among archaeologists studying this area (Judge 1989; Kantner and Hobgood 2003:218-221; Kantner and Kintigh 2006; Sebastian 1991; Vivian 1990). Van Dyke offers the analytic framework of shared ideology to understand how “the appearance of a seamless social whole, naturalizing or legitimating authority” was achieved by Chacoans (2004:414). Referencing a common past could serve as a powerful tool to give people a sense of common identity while at the same time allowing some individuals to claim more social power than others. The quality of that social power is disputed but seems to be related to the control of specialized knowledge and not just the control of goods (Sebastian 1991:113-114). In brief, it is unlikely that the authority of community leaders was exclusively economic.

Another way Chacoan people could have constructed a sense of connectedness is through visibility. Common reference points on the landscape can give people a sense of

where they are in relation to other important places and people. Expanding on this, Chacoan people constructed shrines and monumental great houses in places that could see and be seen. So far, the work on visibility that has been done in the Chacoan world has identified many highly visible places across the landscape (Hayes and Windes 1974; Kantner and Hobgood 2003; see Kantner and Kintigh 2006:169-170; Robinson et al. 2007; Van Dyke 2007:137-168). This is the first step to understanding the complex network constructed by the Chacoans that framed the perception of those who knew about it. Outlying great houses and other significant structures (such as shrines) were connected with Chaco Canyon by a series of lines-of-sight that indicate the influence of Chacoan ideology across large distances (Dungan 2009; Kantner and Hobgood 2003; Robinson et al. 2007). Although the purpose and meaning of these visual connections is not known, the fact that they exist in such abundance has compelled Kantner and Kintigh (2006:169-172) to study the nature of the network as a way of understanding what connects Chaco-style sites across the San Juan basin. Smaller-scale analyses are few in number, but seem to have a lot to contribute to understanding the network's significance.

Particularly pertinent to my work here are discussions of the visual characteristics of monumental towers and tower kivas in the surrounding San Juan Basin region. These two types of structures share a similar architectural form, but tower kivas were internally organized like an underground kiva. Given that I am interested in how people saw to and from the outside of the structure here, I draw from literature on the visibility of both towers and tower kivas, the former being much larger.

Explanations for towers' high visibility range the three common reasons outlined in the previous chapter: marking distinction (Lipe and Ortman 2000:110; Fewkes

1926:278-279; Schulman 1950:289; Wilcox and Haas 1994:218); defense and surveillance (Wilcox and Haas 1994; Schulman 1950; Kenzle 1997; Kuckelman 2004; Mackey and Green 1979; Winter 1981); and signaling (Schulman 1950:289; Wilcox and Haas 1994:217). Researchers have also suggested that storage (Fewkes 1926; Winter 1981), ideological fulfillment (Van Dyke and King 2009), and defense (Johnson 2003) could have motivated Ancestral Puebloans to build towers.

Many of the towers studied by the above authors were constructed after the population boom at Chaco Canyon had subsided, and thus in a different social context than the tower kiva I focus on in this study. However, many scholars have pointed out that towers constructed in the region in the eleventh and twelfth centuries were often physically connected to kivas (Bredthauer 2010:Table 5.15, Table 5.25; Malville 2004:89; Van Dyke and King 2009:11-12), sometimes through subterranean tunnels that to some researchers evoke sipapu, a sacred opening in the ground in Pueblo cosmology (Fewkes 1917; Marshall et al. 1979; Parsons 1929).

Tower kivas are so rare, with only three identified at Chacoan sites, that it is difficult to draw out patterns in their characteristics with any certainty. In his study on the tower kivas at Haystack and Kin Ya'a, John Kantner (2003:121) determined that even standing on the roofs of these structures would not increase inhabitants' capability to relay messages to other sites. They did, however, facilitate increased ability to see sites in the *local* area. This could have served to integrate the local community through shared visibility, transmitting a sense of belonging to a common lived space.

Recently, Katherine Dungan (2009) addressed the visibility of the monumental structures at Kin Bineola, an outlier 18 km southwest of Chaco Canyon. She suggested

that comparing the visual characteristics of community structures and habitation sites may help us understand the decisions Chacoans made in constructing buildings in particular locations (Dungan 2009:98). I believe this is a fruitful direction for research as it can inform the interpretation of the visual connections that have already been identified across the Chacoan world. It is also likely to inform us about the role of outliers in the Chaco system, something which has long been asked and has yet to be resolved (Kantner and Mahoney 2000). The investigation of the Chacoan visibility network and outliers all boil down to one question: what unifies Chacoans as a cultural group? This is the over-arching question that the present study contributes to by conducting an intra-community analysis of visibility at the outlier community of Kin Klizhin.

Chapter 4: Kin Klizhin

The Kin Klizhin community is a cluster of archaeological sites located in a discontinuous unit of Chaco Culture National Historic Park, approximately 17 km southwest of Pueblo Bonito. The focal point of the community is the tower kiva in the great house, one of three in the San Juan River Basin (Kantner and Hobgood 2003; Marshall et al. 1979; Powers et al. 1983; Van Dyke 2007). Much of the data I use in this study comes from a survey of Kin Klizhin that took place in 1980 as part of the National Park Service's Chaco Expansion Project (Powers and Van Dyke 2012). The Park Service undertook this project to identify nearby communities of interest and acquire the land that they were on; the 2-by-1 mile Kin Klizhin parcel was acquired from the U.S. Bureau of Land Management in April 1981.

The topography of the Kin Klizhin community is variously flat and steep – mesas are dispersed throughout, separated by large spans of floodplain (Figure 2). The vegetation is short and includes cacti, woody shrubs, and grasses. Taller shrubs grow on the banks of Kin Klizhin Wash, which drains northward into the Chaco River and kilometers beyond. This valley was well-watered, arable land when the Kin Klizhin community was inhabited. Water control features indicate intensive farming during the Chacoan occupation of this area between approximately AD 550-1200 (Powers and Van Dyke 2012).

In this study, I am primarily interested in the time period from AD 500 to 1300 because it is the interval during which most of the sites in the community were constructed and inhabited, according to ceramic dating. During this time, there were 47 separate habitation sites, one herradura and two shrines, as well as a great house within

the boundaries of the community as identified by Robert Powers (Figure 3; see Appendix A for site inventory)[3]. The number of habitations, and by extension the population, of the community fluctuated significantly over time. Sites dated to the Basketmaker III period (AD 500-750) are limited to one possible roomblock of unknown size, up to twelve pit houses and a variety of refuse scatter features, representing an approximate population of 60 people. By the Pueblo I period (AD 750-900), there were at least eleven habitation sites (either pit structures or above-ground room blocks) supporting some 55 people.

Figure 2. Photo: Landscape of the Kin Klizhin Community

In the Pueblo II period (AD 900-1150), a Chacoan great house and tower kiva were constructed inside the community and the population increased dramatically. Powers estimated that the architectural and natural resources would have supported

[3] Chaco Culture National Historic Park bought two 640-acre sections to protect as much of the documented archaeological remains as possible. My research here was limited to the land owned by CCNHP.

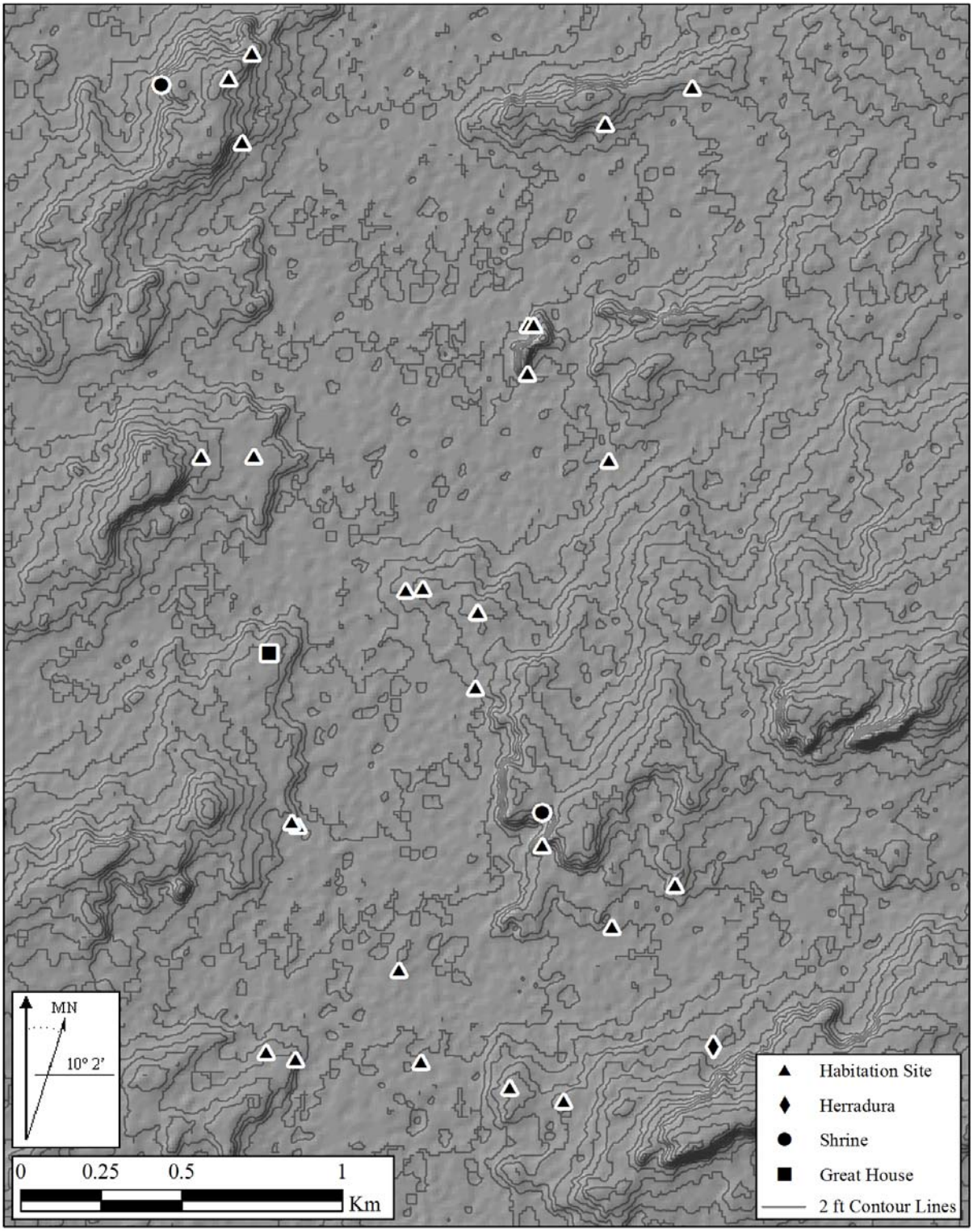


Figure 3. Archaeological Sites in the Kin Klizhin Community used in this Study

between 137 and 166 people living at Kin Klizhin between AD 1030 and 1130 (Powers and Van Dyke 2012) at 29 habitation sites. According to tree-ring dates of "unprovenienced samples collected by Hawley in 1932," the great house itself was likely constructed in the mid-AD 1000s (Bannister et al. 1970:24 as cited in Powers and Van Dyke 2012). Following this population boom, during the Pueblo III period (AD 1150-1300), seven roomblock structures were used. There is only one visible kiva structure that dates to this time period, and the numbers of rooms in each roomblock is not known, so I cannot confidently estimate the population of the community during this time. It is clear that there are many fewer sites constructed and used during the Pueblo III than during the Pueblo II period, and this likely corresponded to a decreased population.

Of all the structures in the community, the great house has attracted the most attention historically. It covers an area of about 40 by 50 meters, with about 20 rooms and three kivas, including a tower kiva (Marshall et al. 1979; Powers et al. 1983; Powers and Van Dyke 2012). Originally an estimated three stories above the ground, the tower kiva is the tallest structure still standing in the community, and was likely one of the tallest structures when Puebloan people still lived there.

Because the community contains a great house but is outside Chaco Canyon, archaeologists have conceptualized Kin Klizhin as both connected by and separated from the center of the Chacoan world. The structures that are still visible on the surface bear resemblance to the Chaco-era communities elsewhere, where roomblocks, kivas, and middens are clustered together in what were likely multi-family habitations. The builders of the Kin Klizhin great house used the same core-and-veneer masonry used at the height of the Chacoan flourescence.

Following Doyel et al.'s Chaco Halo model (1984), the archaeologists who assessed Kin Klizhin in 1980 proposed that the close vicinity to Chaco Canyon likely translated to, at the very least, resource-sharing with inhabitants of the center (Powers and Van Dyke 2012). Since then, scholars have considered that the Chaco phenomenon was a set of influential ideas and practices rather than a distinct group of people; sites where Chaco-like characteristics are found are thus places of ideological infiltration, not necessarily physical colonization. My research questions focus on how Chacoan ideas may have impacted the people at Kin Klizhin.

5: Research Questions and Hypotheses

I am interested in whether, and how, the people living in the Kin Klizhin community used intervisibility to choose where to build structures. The broader network of visibility shared by Great Houses and shrines associated with Chaco Canyon, hereafter described as the "external network", indicates that visibility was a significant concept to people living in Chacoan communities (Dungan 2009; Hayes and Windes 1974; Kantner and Hobgood 2003; Robinson et al. 2007; Van Dyke 2007:137-268). Given its geographic and architectural association with Chaco Canyon, I expect that visibility was a site planning principle for the construction of the Kin Klizhin community, at least during the time that Chaco was a regional center. In the case that there exists a network of visibility within the community, an "internal network", I would expect that habitation structures would play a significant part in this. Not only did people live in these structures, but they also would have spent time near them doing daily activities. Average-size habitations (rather than Great Houses) have not typically been discussed as connecting to an external network of visibility, so I focus on them here to see if they instead play a role in an internal network. I am also interested to assess how the construction of the Great House impacted the relationships of visibility within the community, especially whether the incursion of this iconic Chacoan structure disrupted the patterns of visibility existing before its construction. Below, I will divide the discussion of my hypotheses into two parts corresponding to these two research questions.

Structural Forms and Visibility at Kin Klizhin

I expect to see specific ubiquitous and consistent visibility relationships among habitations if they are the primary component of an internal visibility network (Table 1). Relationships of visibility should be maintained throughout the construction of new habitations. If habitations are consistently intervisible, I would conclude that habitations are nodes in an internal visibility network that served as a means for identity formation, surveillance, symbolism, or some combination of these (see pages 17-19 for a more in-depth description). If habitations are not consistently intervisible, people at Kin Klizhin either did not value intervisibility or other qualities, such as privacy, were more important to them in a home.

Table 1. Possible Visibility Characteristics of Habitations and Implications

Possible Pattern	**Implication**
Habitations are consistently intervisible with one another	People at Kin Klizhin valued intervisibility (for identity, surveillance, symbolism)
Habitations are *not* consistently intervisible with each other	People at Kin Klizhin did not value intervisibility (perhaps valued privacy more)
Visibility pattern for habitations changes over time	The concept of visibility was affected by the influx of Chacoan people and ideas
Visibility pattern for habitations stays the same over time	The concept of visibility was not affected during the height of Chaco Canyon
Herraduras, shrines, or monumental architecture have same pattern of visibility as habitations	People at Kin Klizhin valued intervisibility at these sites in the same way that they valued it at their habitations

The construction of the monumental great house and tower kiva could have significantly impacted the intervisibility of habitation structures at Kin Klizhin; if it did, this is evidence that Chacoan ideas impacted the concept of visibility among people at Kin Klizhin. If not, I would conclude that the concept of visibility stayed consistent throughout the ‘lifetime’ of the community.

According to previous work (Hayes and Windes 1975; Kantner and Hobgood 2003; Robinson et al. 2007 Stein 2008), herraduras, shrines, and monumental architecture are most likely to reference the regional network of visibility associated with Chaco Canyon, but scholars have not published on their intervisibility with spatially nearer sites. If these structures are also part of an internal network, their visibility characteristics would be similar to habitations. If they only belong to an external network, they would be less consistently intervisible with other sites inside the community than habitations are to one another.

If the tower kiva's construction played an integrative role within the community, I would expect a significant increase in intervisibility among contemporaneous structures after AD 1050. If habitations were consistently intervisible before and after the construction of the great house, the great house is unlikely to have been built to be an integrative feature of the visibility network. However, if sites constructed during or after the construction of the great house can consistently see it, I will interpret this as evidence that it did play some role in the community identity; visibility would be interpreted as significant principle in this case, and the tower kiva is highly visible.

The Impact of the Great House and Tower Kiva on Existing Visibility

The tower kiva's construction was no doubt visually noticeable to other inhabitants within the Kin Klizhin community and they may have even built the structure itself. I am primarily interested in whether the addition of the great house significantly increased or decreased the frequency of intervisibility relationships present in the community already. If "internal" visibility became more ubiquitous at the time of the great house's construction, I would conclude that the great house played an *integrative*

role in the community; the tower kiva and great house construction corresponded to a social shift that is consistent with increased unity, visually speaking.

Table 2. Possible Impact of the Great House and Tower Kiva on Visibility Patterns at Kin Klizhin

Pattern changes?	**Implication**
Yes, it changes	The ideas exchanged between Chaco Canyon and Kin Klizhin inhabitants significantly impacted the concept of visibility at Kin Klizhin.
No, it does not change	The pattern of visibility does not change, either because the practices concerning visibility at Kin Klizhin and Chaco Canyon were similar and were similarly expressed all along, or the ideas exchanged between Kin Klizhin and Chaco Canyon, while they may have differed, did not impact how visibility was materialized.
The pattern is ambiguous	Either visibility was not considered constructing salient factor in the placement of buildings, or there are problems with my methods for identifying patterns

In the case that the pattern of visibility changed at AD 1050, when the great house and tower kiva were constructed, this would imply that the incursion of Chacoan architectural elements and ideas changed how people at Kin Klizhin used visibility in constructing buildings. If not, either the practices materializing visibility at Chaco Canyon and at Kin Klizhin were similar all along, or the incorporation of Chacoan ideas did not impact the way people at Kin Klizhin located their structures (Table 2).

I have designed my research methods to assess the possibility that an internal network of visibility exists, and that it could have been impacted by the increased activity at Chaco Canyon in the 11th century. If the pattern of visibility is ambiguous, I would conclude that either visibility was not a factor Kin Klizhin inhabitants employed making construction decisions, or that my methods were not effective for identifying patterns. In

the next chapter, I discuss these methods and how I used them to study visibility at Kin Klizhin.

Chapter 6: Data Collection and Analysis Methods

The processes of data collection, processing, and analysis for this project are designed to examine ways that Chacoan builders experienced visibility across the landscape. As described above, many archaeologists agree that Chacoan structures were intentionally positioned to establish (or to ensure) visual connections with one another on a regional scale. I designed my methods to allow me to assess whether this is also the case within the Kin Klizhin community. I have done this using the viewshed approach, which will be discussed in this chapter. This required two sets of data: GPS data collected in the field, and elevation data for the area in and around the community. I used this data to generate digital representations of what is visible to a person standing at particular structures within the community.

Data Collection

The field crew (myself, Ruth Van Dyke, and Erina Gruner) collected data for 5 days in July 2010. The fieldwork was funded by Ruth Van Dyke using funds provided by the Binghamton University Dean's Office, and carried out under a research permit issued by the National Park Service.

We collected data for this project by revisiting site locations with a Trimble Geoexplorer 2008 GPS receiver and mobile GIS (ArcPad 8) software. Using site records and a community map drawn by Robert Powers obtained from the Chaco Archives, the crew relocated sites from the time period of interest (AD 500 – AD 1300). We then recorded the three-dimensional point locations of the great house and all habitation sites, shrines, and herraduras from that list (see Appendix A for site inventory and dates derived from earlier ceramic analysis). The project was limited to the boundaries of

Chaco Culture National Historic Park; the portion of the park that Kin Klizhin is on was treated as the boundary of the community because the archaeologists who surveyed the area added this parcel to the park based on their assessment of the boundaries of Kin Klizhin (Powers et al. 1983). To ensure accuracy, the research team collected data points with horizontal or vertical accuracy above 90%, according to the estimation of the GPS receiver (see Wheatley and Gillings 2002:72-73 for a discussion of GPS precision and accuracy). For all points, I held the GPS receiver at chest height (approximately 1.6 meters) to ensure a consistent distance from the ground.

For each structure, we collected at least one point where we detected the structure's physical traces on the surface, most often a linear alignment of stones. If possible, the crew collected multiple points along such alignments or at multiple structures within one site. The crew used the survey report and other previous archaeological studies of the site to locate, identify, and double-check the site numbers. At many of the sites, we relocated the site tag.

I acquired satellite remote sensing data of the elevation in the area surrounding Kin Klizhin from Rich Friedman, supervisor of the Farmington, New Mexico GIS office. This data was necessary to calculate visibility across the landscape rather than just between two abstract locations (such as two archaeological sites). The type of elevation data used for this analysis is a Digital Elevation Model (DEM), a model of ground surface topography created by processing field data or images of the ground surface from sensors mounted in airplanes or satellites. For the study area, the highest spatial resolution data available has 20 by 20 meter pixels and was collected by the US government (Rich Friedman, personal communication 2010). Using data with such a

large pixel size limits the utility of the analysis for understanding the human experience (people are much smaller than a single pixel) but this does not prevent my analysis from being useful for understanding the relative visibility on a community-wide scale. Even the smaller sites often spanned 20 by 20 meters, so this analysis is perhaps better suited for understanding the relationships between people located at particular sites rather than individuals moving throughout the landscape.

The field crew took photographs of many sites for use in this project. We captured panoramic (360 degree) images showing what was visible for a person standing on top of the location where a structure once stood. I intended for these to be an entry point for consumers of the final products of this project to connect the spatial data with the visual experience the crew had at the sites. (See folder marked Appendix D in digital version of this document for these images.)

Viewsheds: A Digital Method for Investigating Archaeological Questions

Although researchers studied towers and other highly visible structures before the 1980s, the widespread adoption of visibility as a measure of community relations did not come until GIS became widely available (and usable) to archaeologists (Wheatley and Gillings 2002:202). In this section I will describe one method that archaeologists have used to investigate visibility, the viewshed.

A viewshed is an image which codes the visibility of each grid cell from a defined point. The simplest form of viewshed is a binary viewshed, coding each cell either “0” (not visible) or “1” (visible). Although the binary viewshed can be a useful analytical tool, people experience visibility as a spectrum, so this simplistic model does not do much to help us understand how their experiences vary. If our goal as archaeologists is to

understand the lives of past peoples, we need to look at the distribution of visibility across the landscape, over time, for different people. The variables that impact the landscape include natural ones such as vegetation and human aging, as well as social ones like the construction of new structures or interpersonal relationships.

Although many scholars have attempted to address the shortcomings of digital visibility analyses, none have provided an adequate alternative to the easily understood and generated binary viewshed (Gillings and Wheatley 2001:29). A complex incarnation of the binary viewshed is the cumulative viewshed, which is made by adding binary viewsheds together (Gillings and Wheatley 2001:31; Llobera 2003:33-34). I chose to use cumulative viewsheds alongside binary viewsheds in this project. When I combined the binary viewsheds, the result was an image which represents the overall level of visibility of each cell. If the original binary viewsheds modeled the visibility of the landscape from different observation points, the value of each cell in the cumulative viewshed would equal the number of those observer points that could see the area represented by the cell. This only enables the researcher to look at one axis of difference between peoples' visual experiences at a time, but it does result in a model where the range of visibility is more flexible than 'visible' and 'not visible'. Because it can be used to combine viewsheds from different times, the cumulative viewshed improves upon the binary viewshed by being temporally sensitive. The cumulative viewshed is also useful for comparing to binary viewsheds and identify, for example, observer locations which can see significantly more or less of the landscape than others (Llobera 2007:56). Archaeological sites may have vastly different or strikingly similar views of the landscape despite being built at different times, and this could prompt scholars to ask new questions.

Archaeologists are developing methods which address the other substantive critiques about viewsheds, as well. One of these is the "fuzzy" viewshed, which was developed by geographer Peter Fisher to evaluate the meaningfulness of his results (Fisher 1991). A "fuzzy" viewshed is produced when random error is incorporated into a binary or cumulative viewshed, so that the final data reflects a probability of visibility rather than supposing to model actual visibility. This is presented as one way to evaluate the likelihood that visibility results are not due to chance. While this is a useful tool for evaluating results, its goal is not to improve the ability of the data to give us insight into the circumstances of past peoples, it is to strengthen studies done on weak data. Other scholars are more focused on incorporating more information about human experiences into their computer models. Critics of visibility analysis charge that all the senses are equally important, and we should strive to create multi-sensory models that include at least sight and sound (Connolly and Lake 2006:33; Llobera 2007:52). While visual perception can be a good place to start, our models of peoples' experiences will always be incomplete. This thesis is a first effort to build a community-scale model of visibility at Kin Klizhin.

Data Processing

When I returned from the field, I downloaded the data from the GPS unit and corrected it according to the notes recorded in the Geoexplorer associated with each point location collected. Next I subtracted my chest height from the elevation values collected, which resulted in data that represented the height of the ground (see Appendix B for procedure). I then added the height at my eye-level; my height (66 inches) is consistent with a tall Chacoan, according to biarchaeological estimates of individuals buried at

Chaco Canyon (Akins 1986 as cited in Akins 2003:100). I also added two sites which were not relocated during fieldwork, using location information from the site forms in the Chaco Achives. In preparation for analysis, I read through site forms in more detail and compiled a table with more detailed information about each site, which I appended to the field data table to create one comprehensive dataset (Appendix A).

I analyzed the data using ESRI ArcGIS 10 software, a GIS package that is widely used by geographers and archaeologists. I divided the analysis into 50-year intervals to standardize the variety of dating intervals used in the site forms. I calculated a viewshed for each site that was in use for every 50 year interval starting in AD 500 and ending at AD 1300. Each viewshed is a polygon showing where the landscape is visible or not visible from the vantage point of someone at a specific point location. In this case, each individual viewshed represented the view of someone standing at an archaeological site.

After producing a viewshed for each point location in the data table, I separated habitation and non-habitation sites for analysis. For each group I combined all viewsheds from each interval to create a cumulative viewshed. Every cell of the cumulative viewshed represents the number of the collected points from which that cell can be viewed by a person of average height. The cumulative viewshed for habitation structures, then, shows the variability in visibility among habitations, and the non-habitation version likewise. Displaying the point locations of archaeological sites together with the cumulative viewshed, I was able to determine the relative visibility of each structure from every other contemporaneous structure in that group. I represented the presence and absence of intervisibility between structures using matrix tables, which make it easy to identify a pattern of complete intervisibility among sites, or a lack thereof.

For sites which did not fit the pattern of visibility that other sites tended to share (e.g. a relatively less visible site at a time where all others were intervisible), I did side-by-side comparison of the cumulative viewshed and the binary viewshed for that site. I looked more carefully at these sites to see if there was change in their visibility to and from other sites over time, and if the area surrounding the site became more or less visible at the same time. This aspect of the analysis was more qualitative and I will represent it in the discussion section rather than in tabular or graphical form. In the next chapter, I discuss the general trends in visibility among sites at Kin Klizhin over time.

Chapter 7: Results

My expectations for this study were that there would be consistent intervisibility among residential structures within the Kin Klizhin community through time, and that the ubiquity of intervisibility might increase when a Chacoan great house was constructed there. The results of my analysis suggest that while intervisibility between habitations is pervasive, it does not change over time. In this chapter, I will describe the patterns I identified in this analysis by time period. A discussion of how we might interpret these results can be found in Chapter 8.

In order to clearly relate my results to regional trends, I will divide my discussion of this study's results according to the Pecos Classification with additional references to Sebastian's (1992) sub-classification of the Chaco era. Following that is a discussion of the challenges I encountered while conducting this analysis.

Basketmaker III (AD 500-750)

At the beginning of this time period (AD 500), all the habitations within the community boundaries are intervisible (See Figures C1-C11). People lived in three to four large habitations within the community, and these dwellings were not clustered near to each other. Each site was situated on the edge of a highly visible patch of land and facing a larger patch of land which is mostly visible to people at the other habitations. The largest habitation site (29SJ2490) was built on the top of a mesa with multiple cists, at least one room block, and an extensive refuse scatter. New sites built during this time were positioned in these highly visible areas without blocking visibility between any existing sites. A large habitation south of existing sites (29SJ2521), for example, was

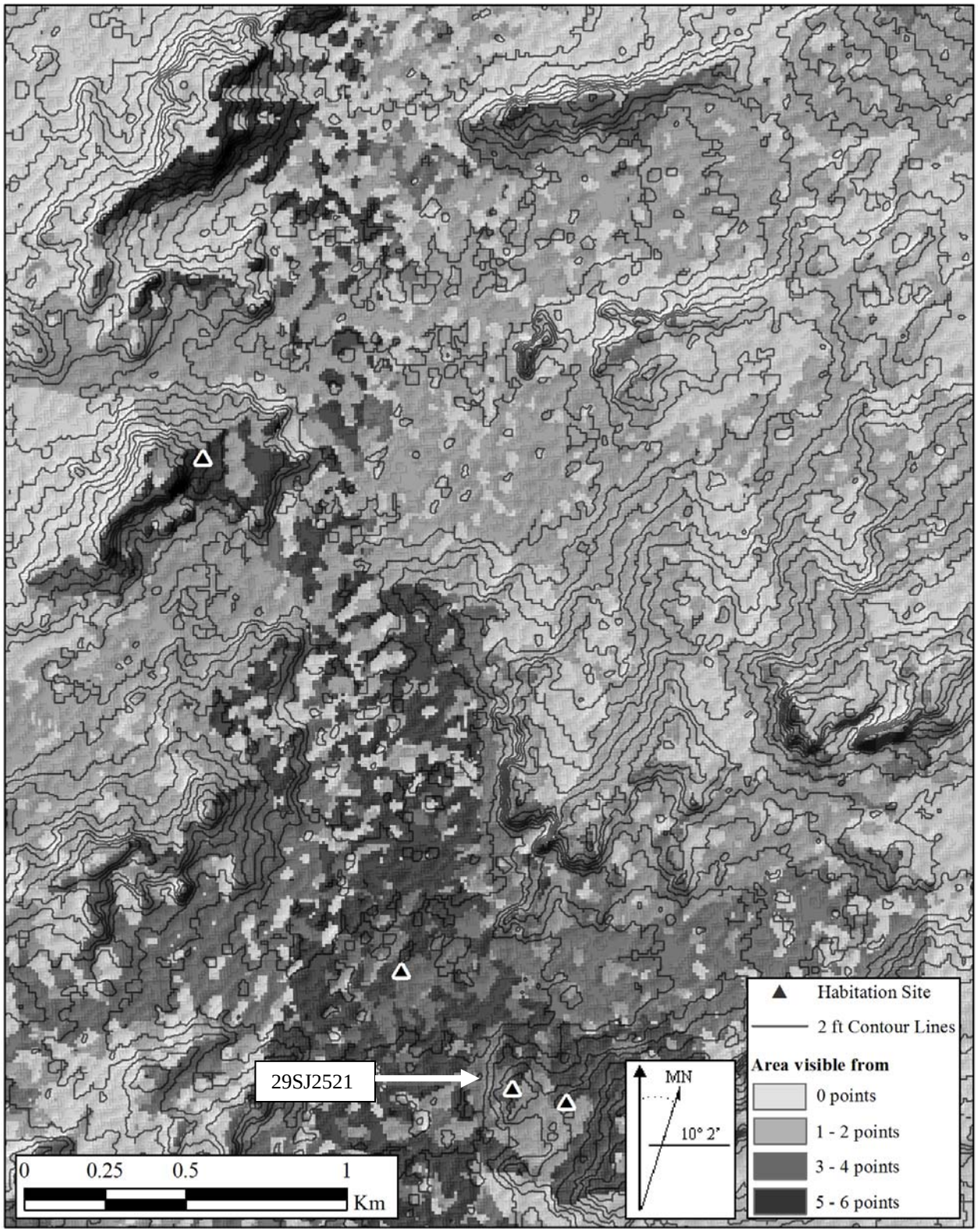


Figure 4. Sites in AD 750 with relation to cumulative visibility from habitation sites used in this study.

built on a ridge that was more visible from other habitations than the land surrounding it (Figure 4). People lived at this site (29SJ2521) for at least 100 years after its construction, leaving behind a significant midden, so it must have been considered an appropriate place to live during this time.

The only non-habitation which has been dated within this time period is a shrine in the Northeast portion of the community (29SJ2476), just west of a large habitation (29SJ2490). People were able to see this shrine if they were standing at the adjacent habitation (2490), but not from any other contemporaneous habitation. Not only was the shrine not placed in a highly visible spot for the entire Kin Klizhin community, it was placed along a ridge that is surrounded by land that was not visible from any other habitation. This shrine seems to have been positioned to be visible from only one site and totally cut off from the rest of the Kin Klizhin community. This could mean that the purpose of this shrine is the opposite of what I predicted; the shrines here are places of very limited visibility.

Pueblo I (AD 750-900)

Beginning in 800 AD, the spacing between habitations decreases and new habitations were clustered in the middle of the study area. My analysis indicates an overall increase in habitations (and likely population) around this time: a total of three from AD 500-750, four from AD 750-800, and five after AD 800 (See Figures C11-C14). One of the new sites included a roomblock (29SJ342), while the other was a refuse scatter, depressions, and a cist (29SJ2439). Residents appear to have abandoned the habitation from the Basketmaker III period (29SJ2490) during this time, and built new habitations on the floodplain near where habitations (29SJ2521 and 29SJ2522) were

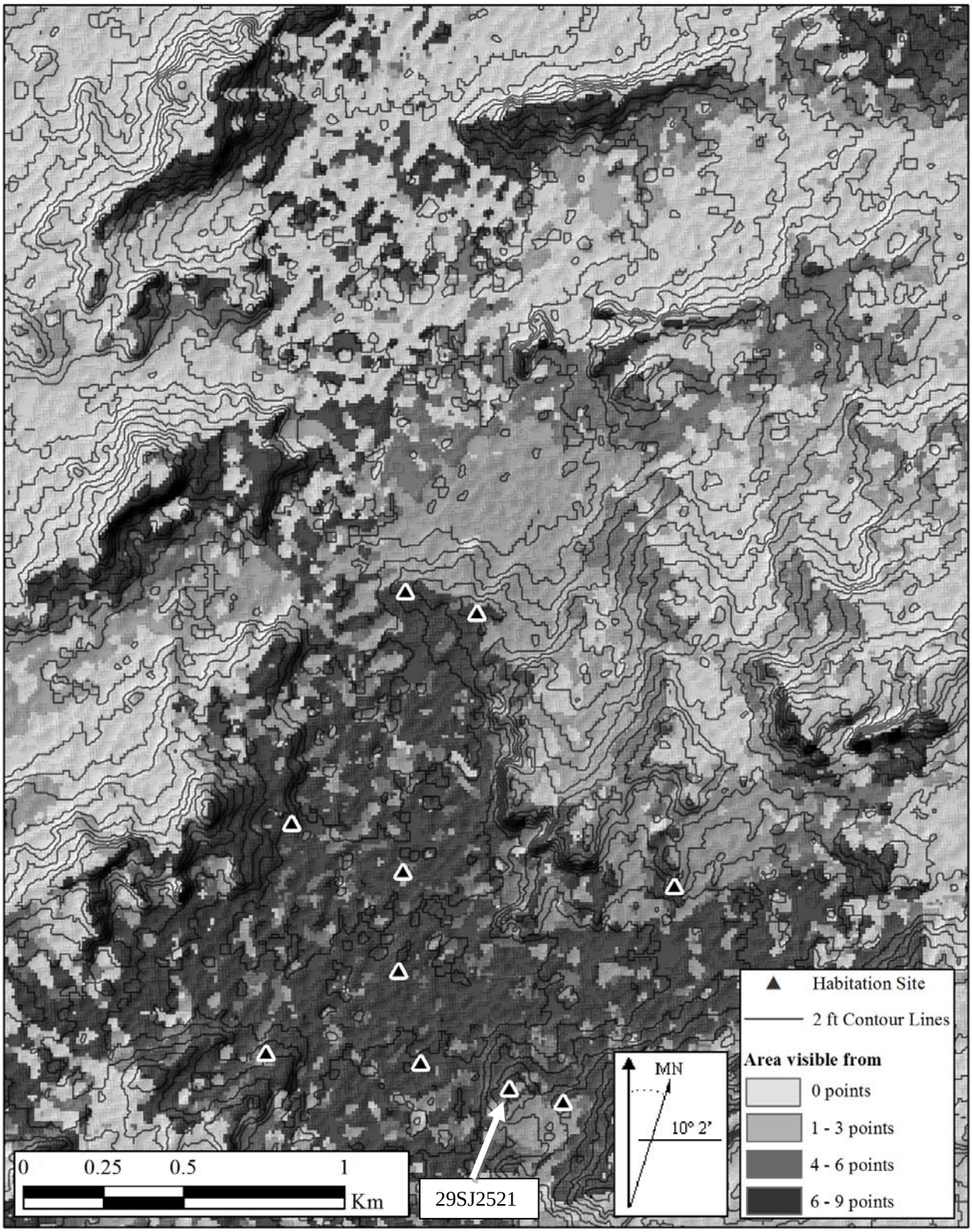
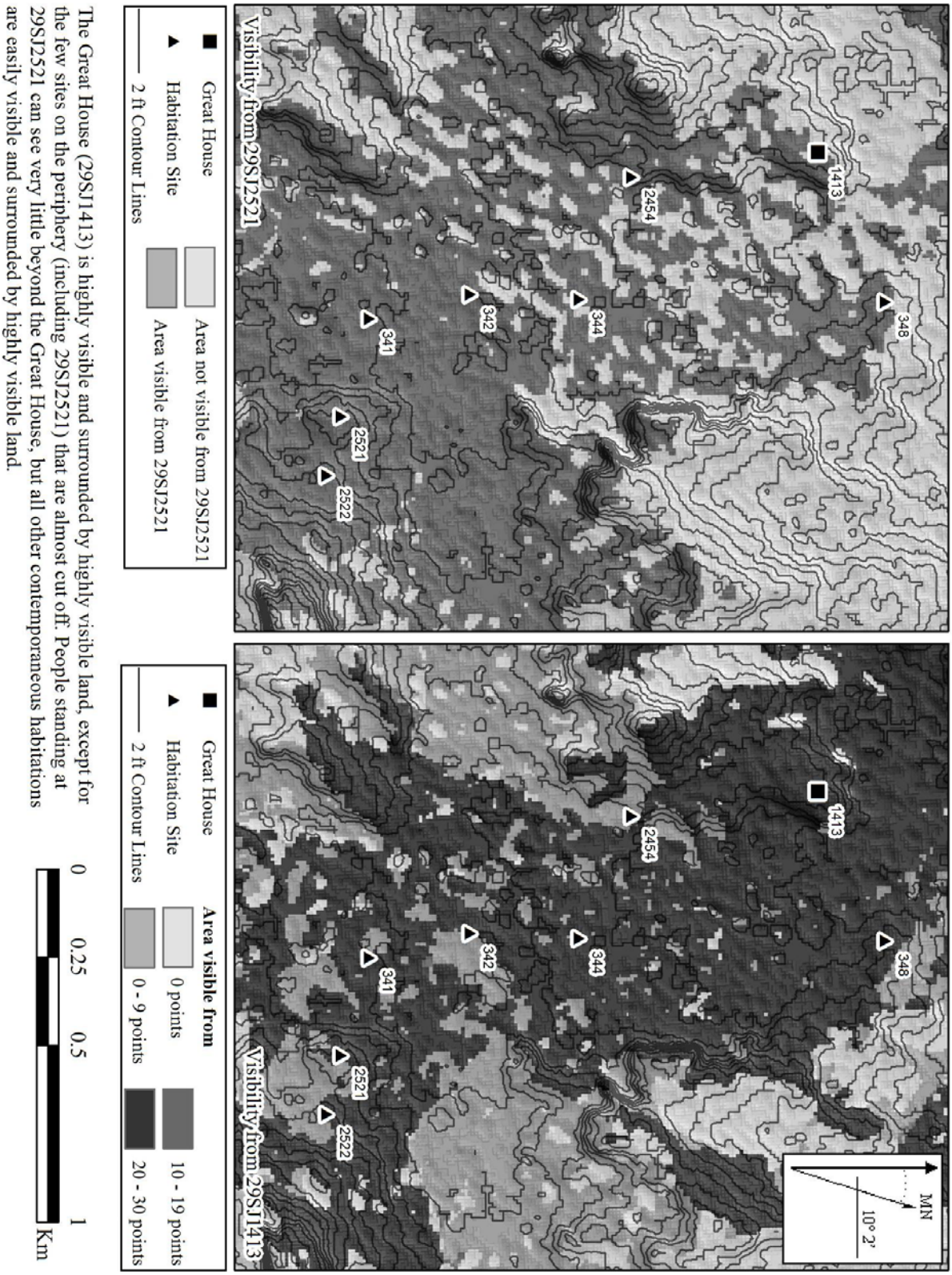


Figure 5. Sites in AD 900 with relation to cumulative visibility from habitation sites used in this study.



The Great House (29SJ1413) is highly visible and surrounded by highly visible land, except for the few sites on the periphery (including 29SJ2521) that are almost cut off. People standing at 29SJ2521 can see very little beyond the Great House, but all other contemporaneous habitations are easily visible and surrounded by highly visible land.

Figure 6. Comparison of visibility from a habitation (L) and from the great house (R).

constructed during the previous time period. These new sites seem to have been intentionally located in such a way that they were surrounded by land that was visible to all other surrounding inhabitants, rather than on the periphery of visible areas (Figure 5).

Pueblo II (AD 900-1150)

At the beginning of this interval, the community grew – three new habitation sites were built in AD 900 and the outer margin of the group was greatly expanded (Figure 7). In AD 950, 29SJ348 was built far from any other site but remained visible from all other habitations. The great house was built in approximately AD 1050 in a highly visible location, consistent with the visual characteristics of previous habitations. However, the landscape surrounding habitations was significantly less consistently visible than in the prior period. The proportion of intervisibility connections shared between habitations did not significantly increase or decrease at this time; a person standing at any given habitation could likely see about 80% of the other contemporaneous habitations. After incorporating the great house into the network of visibility, less of the overall land was highly visible than before, and two habitations (29SJ2521 and 29SJ2522) changed from being surrounded by highly visible areas to being on the periphery of visible land (Figure 7).

During this time, in addition to the great house, the only other non-habitation site in use was the herradura. From the herradura (29SJ2420), a person could see the great house and about half of the habitations, especially those relatively near (see table D13). This is significantly less visibility than that afforded by the average contemporaneous habitation.

A shrine built just before the tower kiva (29SJ2476) was not relocated while we were collecting this field data. While it has subsequently been identified, I did not include it in this analysis because its location was not subject to the same level of spatial precision as the rest of my data. This said, it appears that from the tower kiva, the shrine may not be visible because it is surrounded by significant buffers of topographically obscured land. Whether they were constructed before or after the tower kiva, these non-habitations were not constructed with the same concern with intervisibility that seems to have been the case with habitations

Pueblo III (AD 1150-1300)

In AD 1200, the great house fell into disuse and what had become a more restricted network of visibility once again expands. Vast areas of the landscape became visible as the great house disintegrated, and sites that were on the margin or cut off from visibility with other sites were all highly visible again (Figure 8). This set of visual relationships appears to be very similar to the pattern I observed at the end of the Pueblo I period (Figure 4): habitations could all see each other, and were scattered around a large area of land which relatively visible to all.

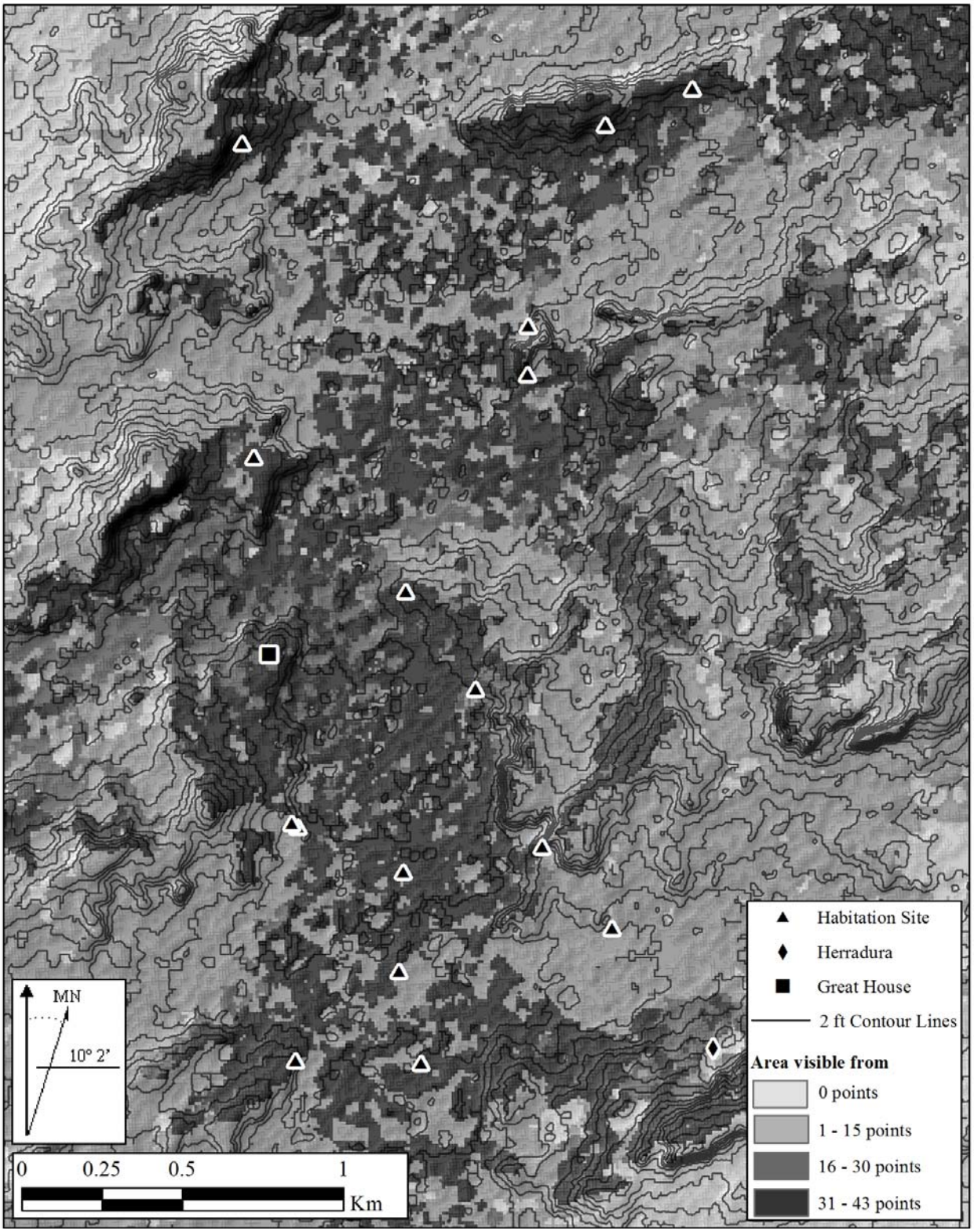


Figure 7. Sites in AD 1100 with relation to cumulative visibility from habitation sites used in this study.

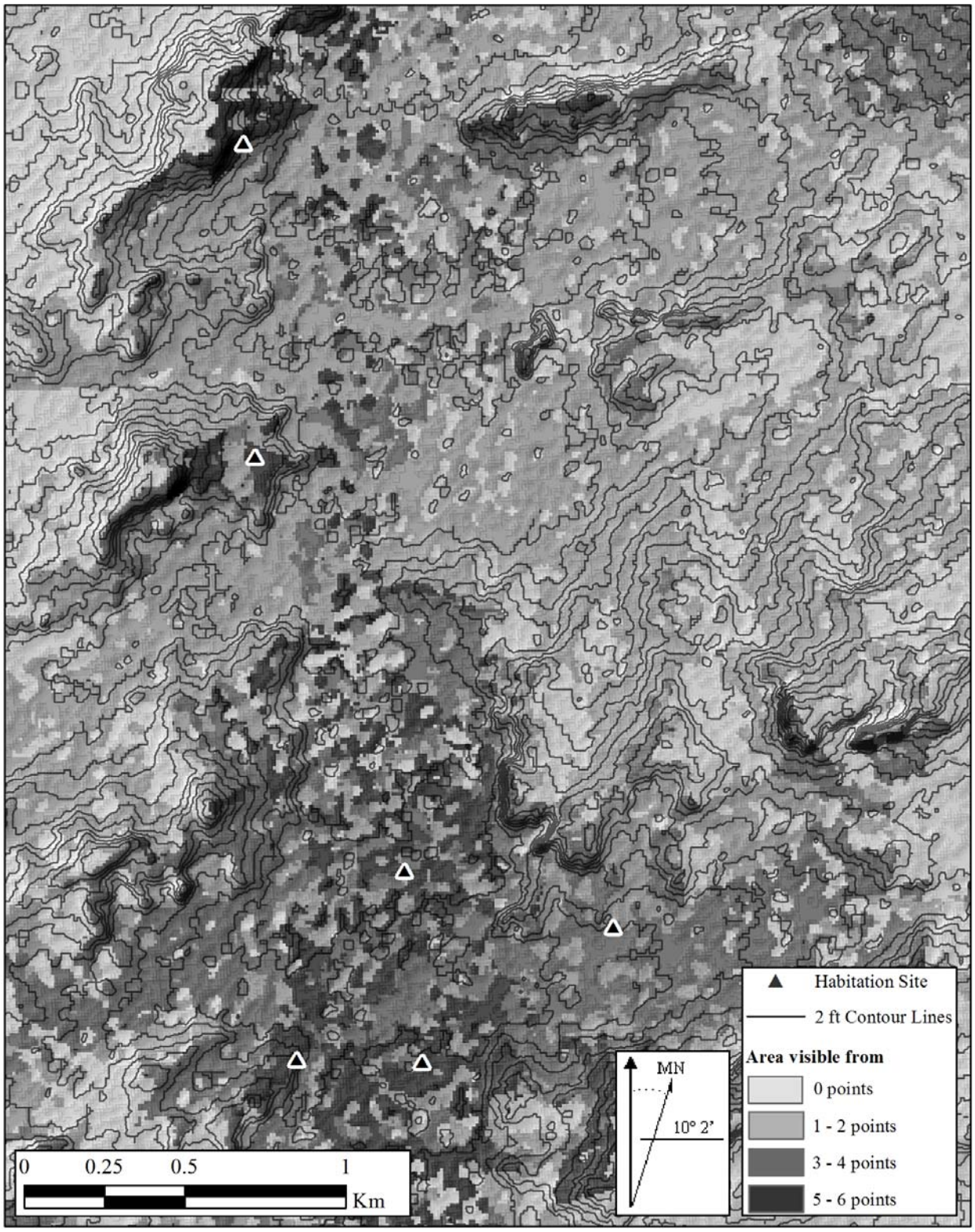


Figure 8. Sites in AD 1200 with relation to cumulative visibility from habitation sites used in this study.

Chapter 8: Discussion

This study of visibility has brought to light a story of change over time. Clearly at various stages in the history of this community, visibility played a role in choices about where to construct new buildings: new structures were consistently built where inhabitants could see them, and this practice continued over approximately 400 years. The continuity of this pattern indicates the presence of some shared awareness of, and use of, visibility long before any "Chacoan" architectural elements were built there. It is likely that Chacoan material markers existed in the community long before the construction of the great house. However, this research shows that little change in intervisibility took place once Chacoan monumental architecture was built. More habitation sites were constructed around the time of the great house, but these were constructed such that they fit into the visibility patterns that already existed in the community. Even though visibility as a concept was used long before the Chaco regional center was established, the combination of internal community-level, and external regional networks of visibility is consistent with the layered repetition of concepts in Pueblo ideology (Ortiz 1969).

The great house and tower kiva specifically were a focus of my research, and I was surprised to find that a person standing adjacent to these structures would be just as likely to see another habitation as someone at any other habitation site. In short, if Chacoan ideas radically changed things for people at Kin Klizhin, it is not reflected in the architecture or visibility observed here. I do think that this work can speak to the degree that Chacoan ideas probably influenced Kin Klizhin residents. The lack of significant shift in visibility means that:

1. The people at Kin Klizhin shared a concern with visibility with Chaco Canyon dwellers, and
2. The people at Kin Klizhin used visibility in a way that constituted a sense of community before, through, and after a period of Chacoan influence

This could be an indication of the ways residents of Kin Klizhin used the great house and tower kiva.

In this chapter I will discuss the relationships suggested by visibility at this community, both among its inhabitants and with the greater Chaco culture. For the sake of clarity, I will discuss habitations, the tower kiva, shrines and herraduras, and landscape separately.

Habitations

Throughout the 800-year lifetime of the Kin Klizhin community, there are only a few habitation sites which are not intervisible with every other contemporaneous habitation site. At the sites for which I collected multiple data points, a person standing at any of the recorded positions could see every other contemporaneous site where people lived in the entire Kin Klizhin community.

Table 3. Observed Visibility Characteristics of Habitations and Implications

Pattern	**Implication**
Habitations are consistently intervisible with one another	**People at Kin Klizhin valued intervisibility (for identity, surveillance, symbolism)**
Habitations are *not* consistently intervisible with each other	People at Kin Klizhin did not value intervisibility (perhaps valued privacy more)
Visibility pattern for habitations changes over time	The concept of visibility was affected by the influx of Chacoan people and ideas
Visibility pattern for habitations stays the same over time	**The concept of visibility was not affected during the height of Chaco Canyon**
Herraduras, shrines, or monumental architecture have same pattern of visibility as habitations	People at Kin Klizhin valued intervisibility at these sites in the same way that they valued it at their habitations

the hypotheses which are supported by the results of this study (Table 3).

Based on my hypotheses, I expected that the construction of the great house would coincide with a shift in visual relationships between sites at Kin Klizhin, but it appears this is not the case. Habitations remain highly visible from one other similar structures, but are on the periphery of the area visible from the great house. While the amount of land and visible to the whole community contracts during this time, there is still intervisibility among habitations, and between habitations and the great house (Figure 7).

While visibility remained more or less consistent over the duration of habitation, there is evidence of some reduction of visibility, insofar as people during part of the time the tower kiva was occupied (specifically AD 1100-1150) would have experienced a patchy visual field from their habitations. During this same time, people built habitation sites on the margins, whereas before and after, people located habitations so that they were *surrounded* by highly visible land. Visibility clearly informed where people put their homes, whether they conceived of it this way or it was a nondiscursive part of a spiritual or cultural concept. The reduction in visibility across the landscape is significant because people would have spent a significant amount of time in the areas between sites, which were likely agricultural fields and other activity areas. After the construction of the great house, for example, 29SJ348 is no longer surrounded by a landscape also readily visible to other community members; the structure itself is the only highly visible feature in that portion of the study area. This could have changed the ‘picture’ of that household for other Kin Klizhin inhabitants.

The patterns I observed here indicate that Chacoans did not introduce visibility to the people at Kin Klizhin with the construction of the tower kiva. Therefore, the patterns I observed in this study may not be a good measure of the overall impact of Chaco culture on the Kin Klizhin community. Instead, ideas about visibility could have been part of an Ancestral Pueblo complex of ideas shared by Chacoans and residents of Kin Klizhin, and the physical manifestation of these ideas seems to have helped construct a sense of community at Kin Klizhin. The abundance of intervisibility relationships across the region do indicate that visibility was an important principle to people in Chacoan times, as it is understood to be among Puebloan peoples studied ethnographically (e.g. Ortiz 1969). At Kin Klizhin, it is clear that it was (Table 3). Builders could have constructed highly visible structures to enable surveillance or signaling, to marking distinction, or as a reflection of their worldview. Since they used visibility on multiple scales in what seems like a consistent manner, the concept of visibility was likely a principle shared among those who became "Chacoan", but who had shared history before AD 900. This would be consistent with Ortman's (2000) work on how Puebloan concepts translate into archaeological patterns. Since building practices factored in visibility long before Chacoan times, it seems from this study that visibility functioned here as both a reflection of inhabitants' worldview *and* a way to constitute, and recursively mark, community distinction.

The Great House and Tower Kiva

The single most prominent piece of architecture on the site is the tower kiva, and its construction and use is the key signal to archaeologists that this community was connected to the Chaco cultural complex by something other than geographic proximity.

I expected this unusually tall structure to be highly visible throughout the community, and that its unique form would correspond with unique visibility characteristics (Table 4). (Again, I have recreated the table showing my hypotheses relating to the great house, Table 2, here and highlighted the hypothesis that was supported by this analysis.) What I found was that it was equally as likely to be intervisible with another structure as any habitation; the tower kiva was positioned inside the existing community such that it fit into the existing network of visibility. Furthermore, its construction did not significantly obstruct or improve visibility between other structures. The scale of the building itself probably achieves a higher level of visibility, or at least recognizability to those who can see it, but I was not able to assess that systematically here (see

Table 4. Possible Impact of the Great House and Tower Kiva on Visibility Patterns at Kin Klizhin

Pattern changes?	**Implication**
Yes, it changes	The ideas exchanged between Chaco Canyon and Kin Klizhin inhabitants significantly impacted the concept of visibility at Kin Klizhin.
No, it does not change	**The pattern of visibility does not change, either because the practices concerning visibility at Kin Klizhin and Chaco Canyon were similar and were similarly expressed all along, or the ideas exchanged between Kin Klizhin and Chaco Canyon, while they may have differed, did not impact how visibility was materialized.**
The pattern is ambiguous	Either visibility was not considered constructing salient factor in the placement of buildings, or there are problems with my methods for identifying patterns

the following section in this chapter on methodological challenges for a more in-depth discussion of this).

The construction of the tower kiva did not introduce or secure visibility in the community, rather it fit into already existing relationships: it was constructed in a location that was highly visible to established habitations and remained highly intervisible with habitations until it fell into disuse. In terms of the three common explanations for visibility, it seems that the position of the tower kiva did not significantly improve the capability of its users to monitor the landscape or send signals[4]. Whether it was intended to or not, this monumental structure would have been distinct from other sites surrounding it, so it may have marked the distinction of a community, a person, or a set of ideas such as those that were influential in Chaco Canyon.

Builders constructed new habitations exclusively in places that were intervisible with the great house, a characteristic of many, but not all, of the habitation structures (see columns to the right of the great house – 29SJ1413 – in Tables D12-D14). While visibility itself was clearly not introduced at the time of the great house's construction, the full integration of Chacoan architectural elements into this community is compelling evidence that Chacoan ideas were integrated at Kin Klizhin at this time, to a degree that they had not been before. The short distance from Kin Klizhin to the central canyon means that almost certainly inhabitants of both would have been aware of one another, but the appearance of monumental architecture at Kin Klizhin implies a greater commitment to shared identity with people from the central canyon. It is possible that there was a shift in how visibility was understood by inhabitants of Kin Klizhin that is not visible archaeologically, or which my methods did not detect (Table 4).

[4] Someone standing on top of the tower kiva would likely see more of the surrounding landscape than at ground level, but I did not assess that in this study. See the methodological challenges section of this chapter for further discussion of building height.

Because it is part of a great house, the tower kiva could also reference spatially larger networks of visibility associated with Chaco Canyon. During this time, the only other non-habitation in use is the herradura, and it has intervisibility with the tower kiva. The undated shrine (29SJ2429) could have been constructed while the tower kiva was in use, however it did not share any visibility with the tower kiva. Robinson et al. (2007) presented evidence that the tower kiva does connect to the Chacoan network (see also Hayes and Windes 1978); further research is needed to determine if the herradura does, as well.

Kantner and Hobgood's (2003) study of the Kin Ya'a and Haystack tower kivas indicates that tower kivas may have been constructed to surveil the local community rather than exclusively to connect that community to the central canyon. If this was the case at Kin Klizhin, it would imply that people who utilized the tower kiva sought sociopolitical control over inhabitants at Kin Klizhin. But the fact that the building was tall does not necessarily mean it was intended to be used for surveillance. Drawing from the literature on towers (see chapter 2), structures that are intended to be seen could also function as a symbol of community identity or a visual cue for outsiders, or both. The tower kiva seems less likely to have been used for defense since it was almost certainly a ceremonial structure. Builders constructing a monumental kiva could have intended it as a public declaration that Kin Klizhin was related to Chaco, referencing ideas surrounding visibility that were popularized during the Chaco phenomenon (Van Dyke 2007:137-168, 2004). The presence of a great house likely corresponds to a shift in the nature of the relationships between Chaco Canyon and Kin Klizhin inhabitants, but people at Kin Klizhin had connected through visibility long before.

Shrines and Herraduras

The number of shrines and herraduras is so small that it is not clear what role these structures played in the visibility network or otherwise at Kin Klizhin. Based on the common association between herraduras and roads (Kincaid 1983:Section 9-14), I would expect a large-scale sample of these to be more relevant to outside networks of visibility. Shrines are slightly different in that they are often associated with particular sites but are also on very recognizable, high landscape features visible from far distances (Windes 1974).

At Kin Klizhin, the herradura and tower kiva were intervisible, and both were located at the edges of the community. The tower kiva was also visible from nearly every contemporaneous habitation site within the community (Table D12-D14). The herradura was only visible from half of the contemporaneous habitation sites, none of which had been constructed in the previous 50 years (Table D12-D13). It is not appropriate to make generalizations based on this one example, but it seems likely that the tower kiva and herradura operate similarly with respect to visibility: they were part of both the community and regional-level networks. Robinson et al. (2007) have already demonstrated that the tower kiva is connected to a regional network of intervisibility. The fact that herraduras are usually associated with road features (Kincaid 1983:Section 9-14) leaves open the possibility that the herradura could have referenced an external network; this herradura could be positioned on an ancient road associated with this great house, like the roads found in Chaco Canyon itself.

The only datable shrine, on the other hand, was virtually invisible from any other contemporaraneous sites. The Basketmaker-era shrine (29SJ2476) was only visible to

people at the adjacent habitation (29SJ2490), and perhaps people walking in the northern periphery of the study area, or along the Chaco river. The only other shrine (29SJ2429) was not dated by surveyors so it is unclear whether it was visible or not from contemporaneous structures or not.

Contrary to my hypothesis, the one shrine for which complete data is available seems to be positioned for viewing by a very limited audience. Because they are difficult to categorize and even more difficult to date, the variety of shrines in this region is not well-documented. The unexpected results I got in this project indicate that shrines operate in ways that need to be teased apart before their roles in the network of visibility are understood. There are likely multiple purposes for shrines and further studying them at Kin Klizhin could help narrow down the characteristics of typical network-connected shrines.

Landscape

Although I did not set out to study the visibility of the landscape itself in this study, it has played an important role in my interpretations. Most of the subtle differences I observed involved the land surrounding each site and whether it was also visible from afar. Because this community is located in a landscape without vegetation blocking visibility, even slight changes in how much land was visible would have been easily noticeable.

Although today there is view-obstructing vegetation near the closest water source (Kin Klizhin Wash), the rolling nature of the hills at Kin Klizhin has a more significant impact on visibility. During fieldwork, myself and other members of the field crew looked toward the great house constantly and found that what looks on the map and in

person like a small knoll can completely obstruct your view, even when you are relatively nearby. So, although the vegetation makes it seem that visual connections between sites may be coincidental, moving many of the observed sites 100 yards in most directions would remove it from the network of visibility.

One aspect of visibility that I did not explicitly study here is the ability to see to and from the land which the researchers of the Chaco Additions Survey deemed likely agricultural land (Powers and Van Dyke 2012). In maps from every interval studied, there is a large amount of land that spans the 'space' between the inhabited sites, but that 'space' itself was used and traversed on a regular basis by the people living there, whether or not it was farmed. Like the Basketmaker-era shrine, certain agricultural plots may have been sheltered from visibility and others not, but it is difficult to discern which areas would and would not have been used for this purpose without further study. What I can say from this work is that people who built habitations at Kin Klizhin understood which land was and was not visible to other inhabitants; not a single habitation in the 800 years of occupation was built in a place where no other habitations could see it, and that consistency implies intent. This intimate understanding of landscape suggests that people had a lot of experience in these 'places between' in which no buildings stood. Systematically addressing the visibility of this land is one methodological improvement I would make in future study on this topic, and which I will expand on in the next section.

Methodological challenges

The source data shaped the methods I used to study visibility at Kin Klizhin, so in this section I describe how these challenges may have impacted my work. Specifically, I

will discuss how the site forms, archaeological remains, and digital elevation model may have influenced my results.

The ceramic-derived dates recorded in the site forms I obtained from the Chaco Archives were in both 25 (e.g. AD 700, 725, 750) and 50-year (e.g. AD 700, 750) intervals. In order to standardize the date estimates for my work, I used 50-year intervals. A site constructed by AD 725, for example, would first appear in the maps I created for AD 750. Although maximum precision is ideal, the date estimates in the site forms were derived from ceramic typologies that have been constantly re-evaluated by archaeologists. In other words, there is a certain level of error built into the date estimates which I could not account for, so using 50-year intervals may actually reduce the impact of that error. I do not expect that greater precision in the dates would have led to more defensible conclusions, and I cannot speculate on whether visibility relationships identified here would have been impacted by this.

Another challenge I encountered was incomplete data. Some sites were not datable, which prevented me from assessing their intervisibility with contemporaneous sites. One such site was the shrine 29SJ2429. Dating this particular site might not be possible using the method applied at other sites in the community; we observed no ceramics at the site (July 2010), and there were no prehistoric artifacts recorded in the 1980s survey.

The site assessment we conducted for this study also produced some incomplete data: at least one archaeological site has been destroyed since the initial community survey, and we were not able to locate others. Spatial information for these sites is available through the New Mexico Archaeological GIS database, but it is significantly

less precise than GPS data collected for this study. If I had included these sites in calculations of intervisibility, I might have been able to establish a greater degree of confidence in my findings, however, I don't believe that had I used this less precise data that it would have significantly altered my interpretations.

The precision of the digital elevation data I used to calculate intervisibility also impacted my ability to discuss the implications of my analysis. The most precise data available for Kin Klizhin are a series of 1/3 Arc Second images from the USGS National Elevation Dataset, with cells approximately 10 by 10 meters and vertical accuracy of +/- 7 meters. On a human level, this means that about five people could lay end-to-end within one cell, which is assigned a single elevation value. The vertical error margin is equivalent to the height of about four people in either direction. I adjusted the elevations of sites that we located based on the GPS data (see Appendix B), but the landscape surrounding those points could be shaped differently, possibly blocking or enabling visibility connections that I could not identify using these methods.

Finally, I did not assess the original height of buildings at Kin Klizhin which I revisited for this project. This, too, has had an impact on what conclusions I can draw from this work: instead of assessing what is visible from the second story or roof of a structure, I was limited to today's ground level. The Kin Klizhin community has not been excavated and I did not have skills to assess the height of the buildings from the refuse scatters and surface finds I encountered during the fieldwork portion of this project. For that reason I did not model their heights here, but instead focused on visibility from a ground surface which has changed comparatively little in the last 1000 years. Had I been able to assess visibility from second or third floor perspectives, I expect that the overall

ubiquity of intervisibility would only have been reinforced. However, it has to be acknowledged that building height not only affords greater visibility, at the same time it presents a greater possibility of elements of the visual field being obscured by the building itself.

Although I had to account for significant limitations of my data, my application of methods was consistent and I am confident that my results reflect real archaeological phenomena that took place at Kin Klizhin. Habitations in the community shared intervisibility until the great house was constructed and, coincidentally, visible space around the landscape decreased. Although these structures could still be seen from one another, the land around them was visible to fewer of their neighbors during this time. Near the end of their habitation of this location, people began to construct habitations surrounded by highly visible land again. This general pattern suggests a strong connection not only between architecture and visibility, but also between the built environment and "empty space"; studying the ability to see the land between sites is likely to further clarify the history of this community insofar as it might give us insight into land use associated with residential structures, specifically agricultural use.

In summary, scholars seeking to extend this study would ideally address building height and "empty" spaces so that models would more accurately reflect how the inhabitants may have experienced the landscape.

Chapter 9: Conclusion

In this work I have used GIS-based viewshed analysis to investigate the nature of intervisibility within the Kin Klizhin community, and to comment on the connection between this local community and Chaco Canyon. Using visibility as an entry point, I have observed patterns of persistence and change over the history of the community that have convinced me that this relatively small group of people both expressed and constituted community cohesion by constructing visual relationships between their residences.

This study is important because it serves to further inquire into the identity of the residents at Kin Klizhin, and by extension, at outlier communities. Insofar as Ancestral Puebloans are understood to share a preoccupation with visibility, my demonstration of the ubiquity of visibility between and among sites supports the assertion that this is a Puebloan site. My research is premised on the understanding that the construction of intervisible buildings does not simply express the existence of a community, but that the practice of intervisibility is itself a technique of community constitution. That is, the expression of belonging is furthered, at least in part, through mutual visibility.

This work contributes to what is known about how visibility was used by Ancestral Pueblo people, but more analyses need to be conducted on multiple spatial scales before we can assess the significance of visibility at specific places. The relationship between Chaco Canyon and visibility is complex and future research efforts are needed to tease apart the patterns we see by tracing historical and spatial variation, looking for hints as to how visibility actually operated among Ancestral Puebloans at different spatial scales (landscape, community, household, individual experience).

Further study on tower kivas like the one at Kin Klizhin are also warranted, especially comparing all three tower kivas together.

In order to truly understand the way visibility was materialized among Ancestral Puebloans, scholars will need to conduct research that compares the long-term network of visibility and evidence of smaller-scale networks such as the one I have identified at Kin Klizhin. A multiscalar assessment of visibility in the past is needed before archaeologists can confidently connect the preoccupation of Ancestral Puebloan people with visibility to the ethnographically-documented principles of visibility. This study and future studies must also address the inadequacy of archaeological data to fully account for past peoples' visual experiences; we may be able to identify it as a factor used by past people in constructing buildings, but we will never truly understand their worldview.

In this study, I have focused on tracking historical changes in visibility over time in order to better understand visibility itself. My results indicate that on the community (rather than landscape) scale, people were able to see their neighbors consistently for 800 years. Kin Klizhin residents experienced subtle, but archaeologically noticeable, differences in their visual landscape during a period of Chacoan influence. The ubiquity and continuity of visibility points to this being an important principle for the residents of Kin Klizhin. I conclude it is likely that people were building intervisible habitations and modifying the landscape on a large scale significantly before Chaco became a center of influence. Perhaps visibility was not introduced by Chacoan people, but instead appropriated by Chacoans and residents of Kin Klizhin from shared Ancestral Puebloan ideology as a way of taking hold of the landscape, and of signaling to a variety of people that they took control of it.

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APPENDIX A: SPATIAL DATA TABLE

- Origins of column data:
- Field collection: OBJECTID, DATE, POINT_X, POINT_Y, POINT_Z, POINT_M
- Site forms from Chaco archives: SJNUM, TYPE, EARLIEST, LATEST
- Digital Elevation Model: RASTERVALU
- Lab analysis for this project: DIFFERENCE, OFFSETA

APPENDIX B: DATA PROCESSING PROCEDURE

- Begin with: data from site forms, field collection (see Appendix A)
    - Each row represents one point collected, and is attached to corresponding Smithsonian number (SJNUM)
- Add columns with earliest and latest dates assigned to that site by ceramic analysis, as shown in site forms (EARLIEST, LATEST)
- Use ArcGIS process to create a column which shows the ground elevation (according to the Digital Elevation Model) of the point (RASTERVALU)
- Create column (DIFFERENCE) which shows the difference between ground-truthed data (POINT_Z) and approximate elevation (RASTERVALU)
    - Subtract RASTERVALU from POINT_Z
    - This makes it so that the calculations done by ArcGIS on visibility are based upon the ground-truthed data taken in the field, rather than the approximation provided by the DEM. Essentially, this is a strategy for overriding the program's default reliance on the DEM.
- Create column (OFFSETA) which adds 1.6 meters to the value of DIFFERENCE, so that all calculations are done based on structures and eyes being at the height of 1.6 meters.
    - This is the height of my eye level – approximately 5 feet 3 ¾ inches – and reasonably consistent with the average stature of Chacoans as approximated by Aikens.

APPENDIX C: VIEWSHEDS

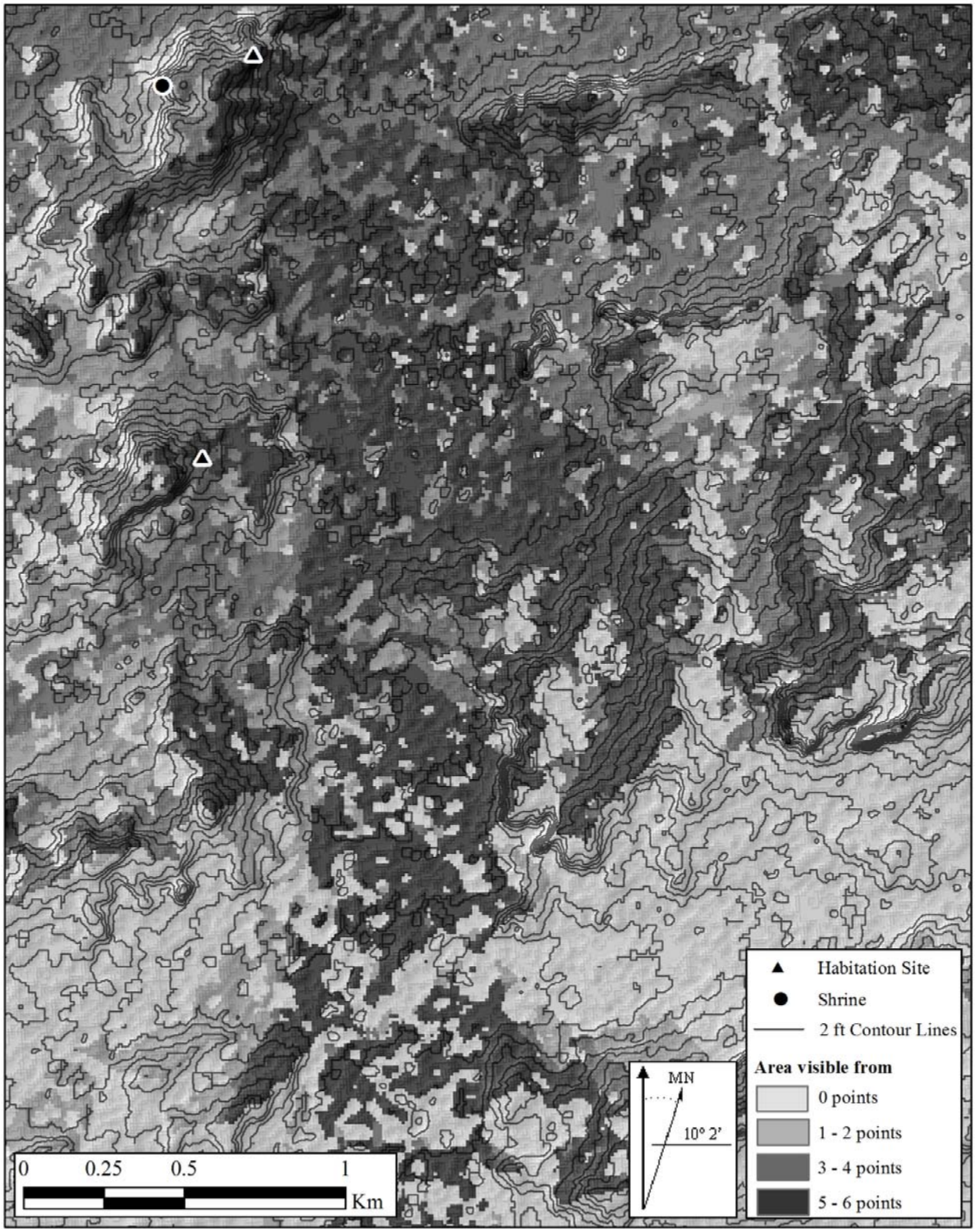

Figure C1. AD 500: Cumulative Visibility from Habitations with Selected Archaeological Sites

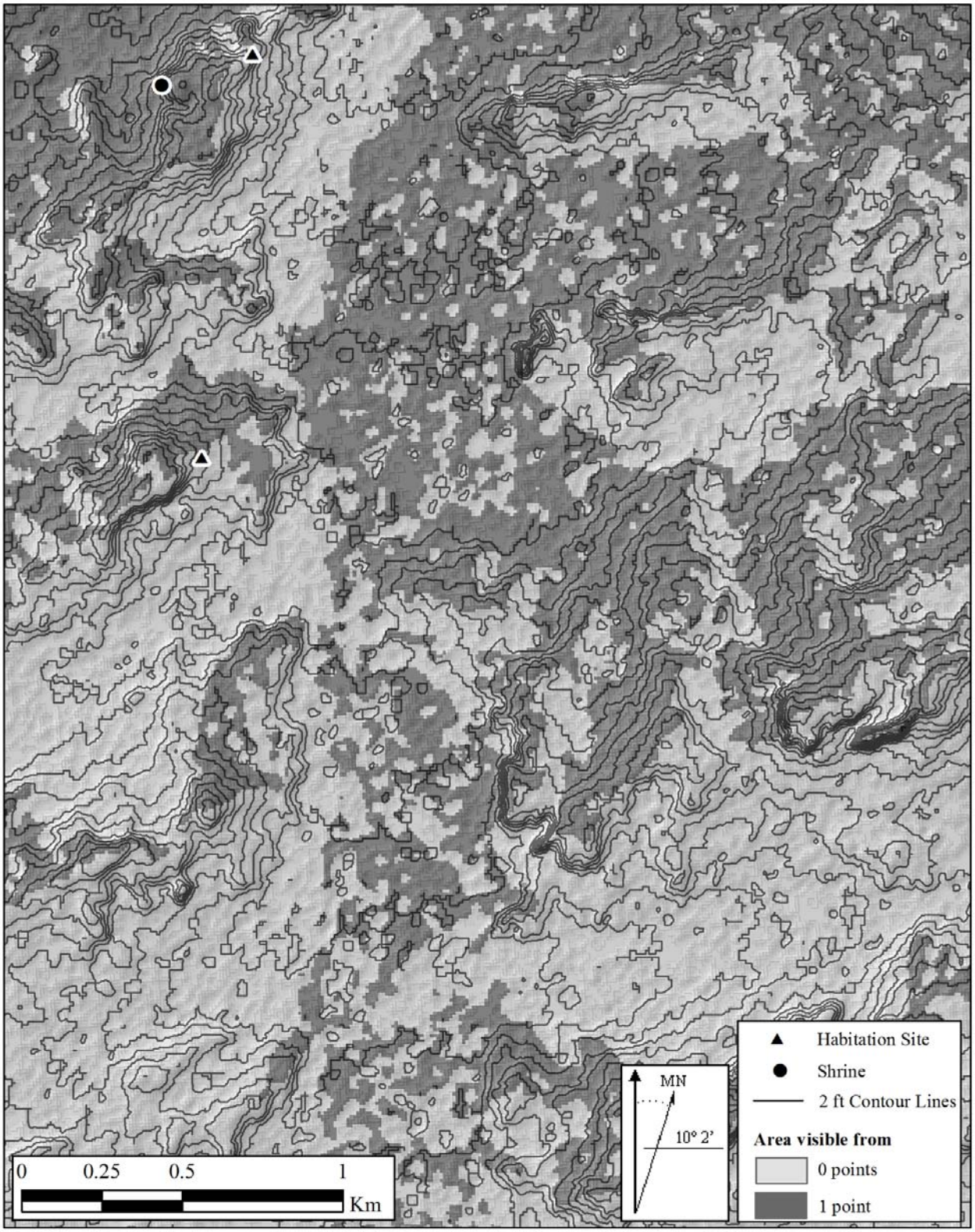

Figure C2. AD 500: Visibility from Shrine (29SJ2476) with Selected Archaeological Sites

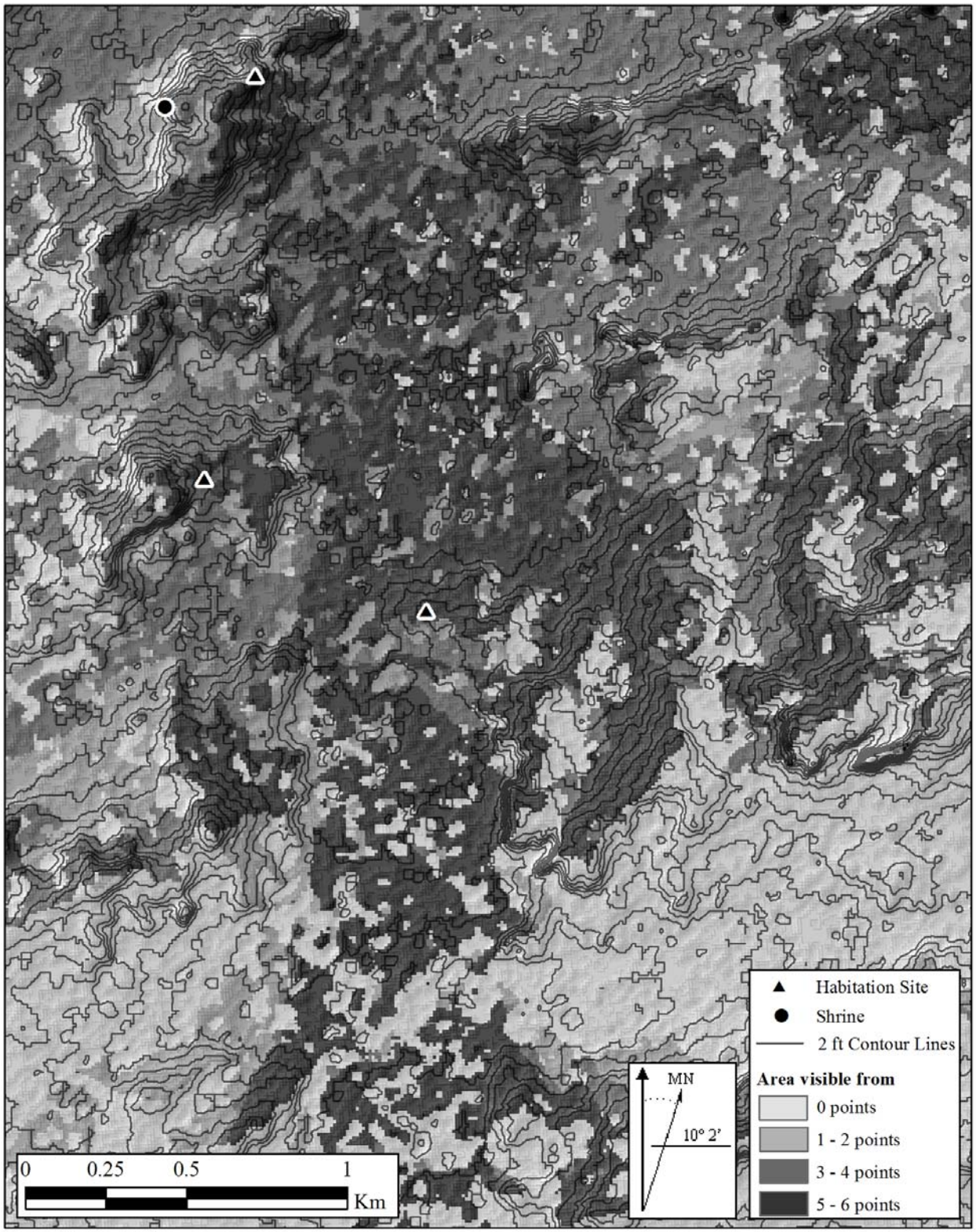

Figure C3. AD 550: Cumulative Visibility from Habitations with Selected Archaeological Sites

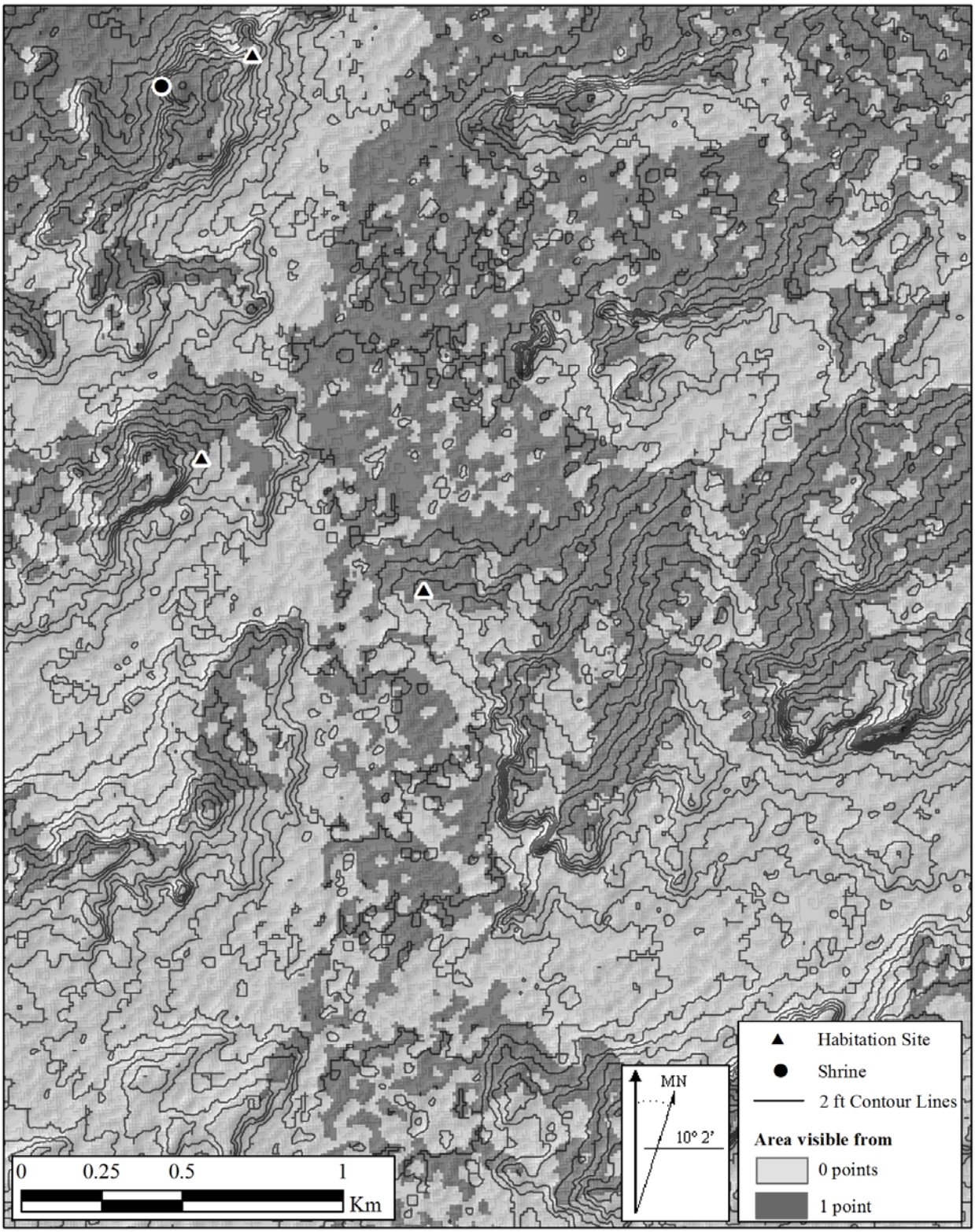

Figure C4. AD 550: Visibility from Shrine (29SJ2476) with Selected Archaeological Sites

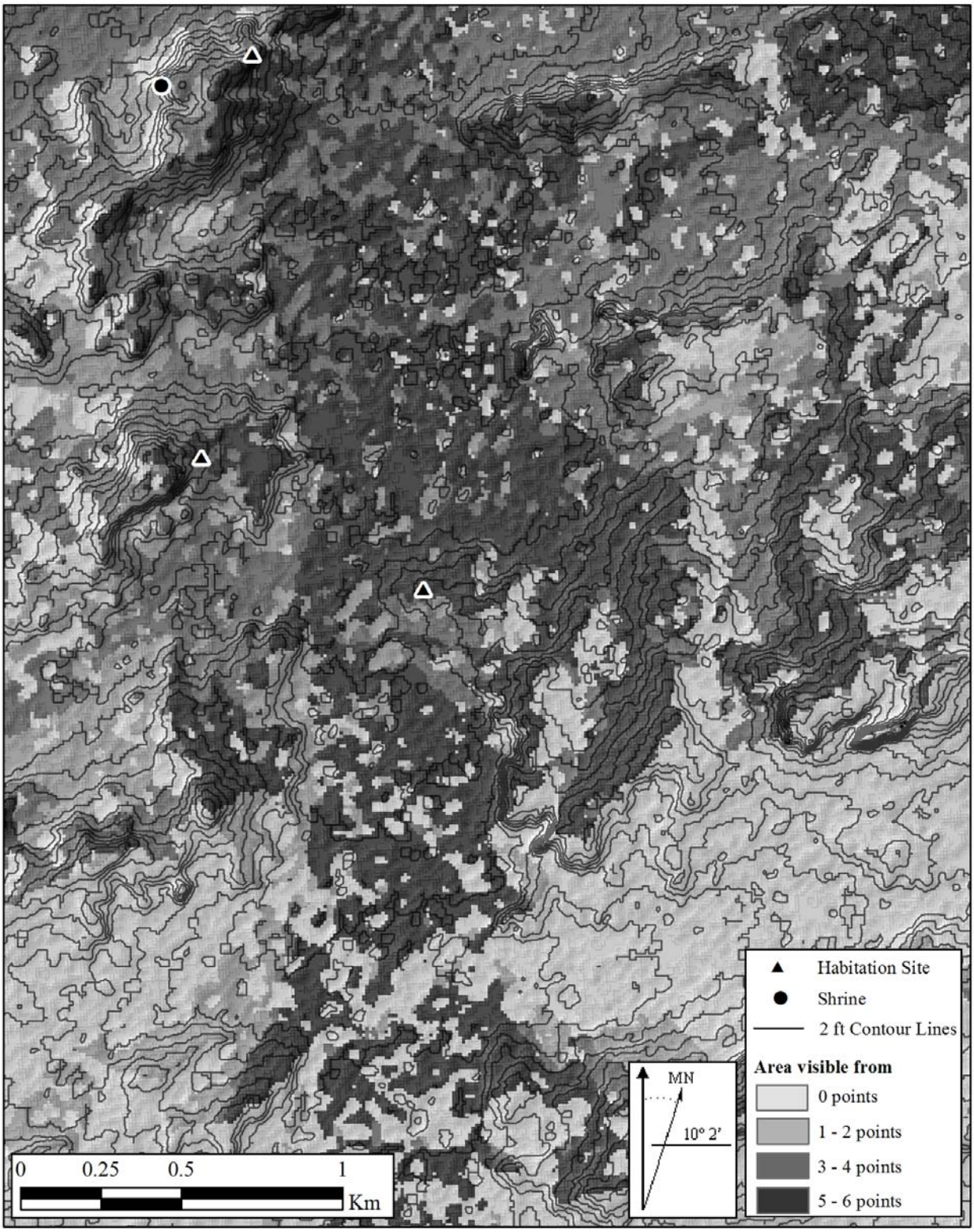

Figure C5. AD 600: Cumulative Visibility from Habitations with Selected Archaeological Sites

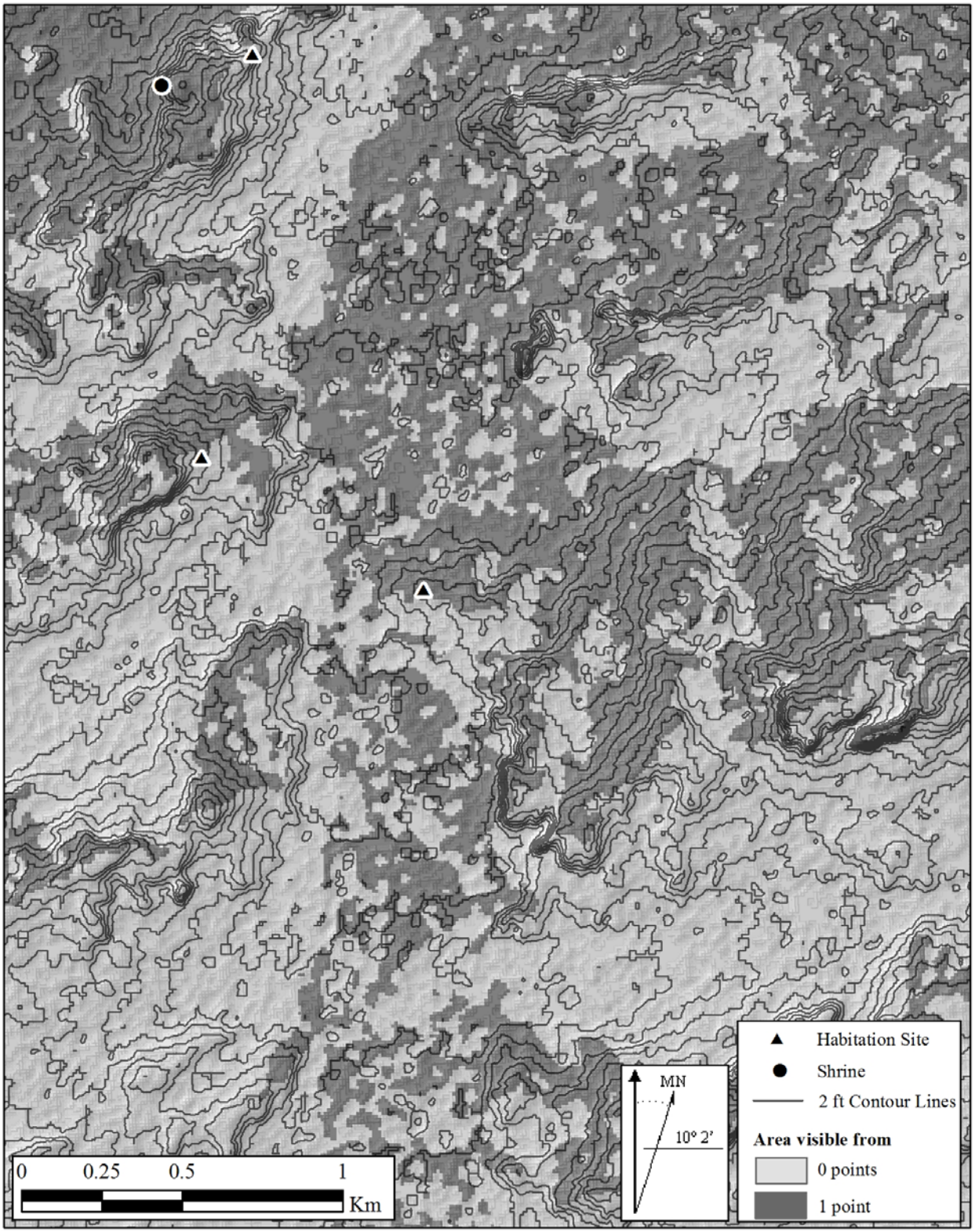

Figure C6. AD 600: Visibility from Shrine (29SJ2476) with Selected Archaeological Sites

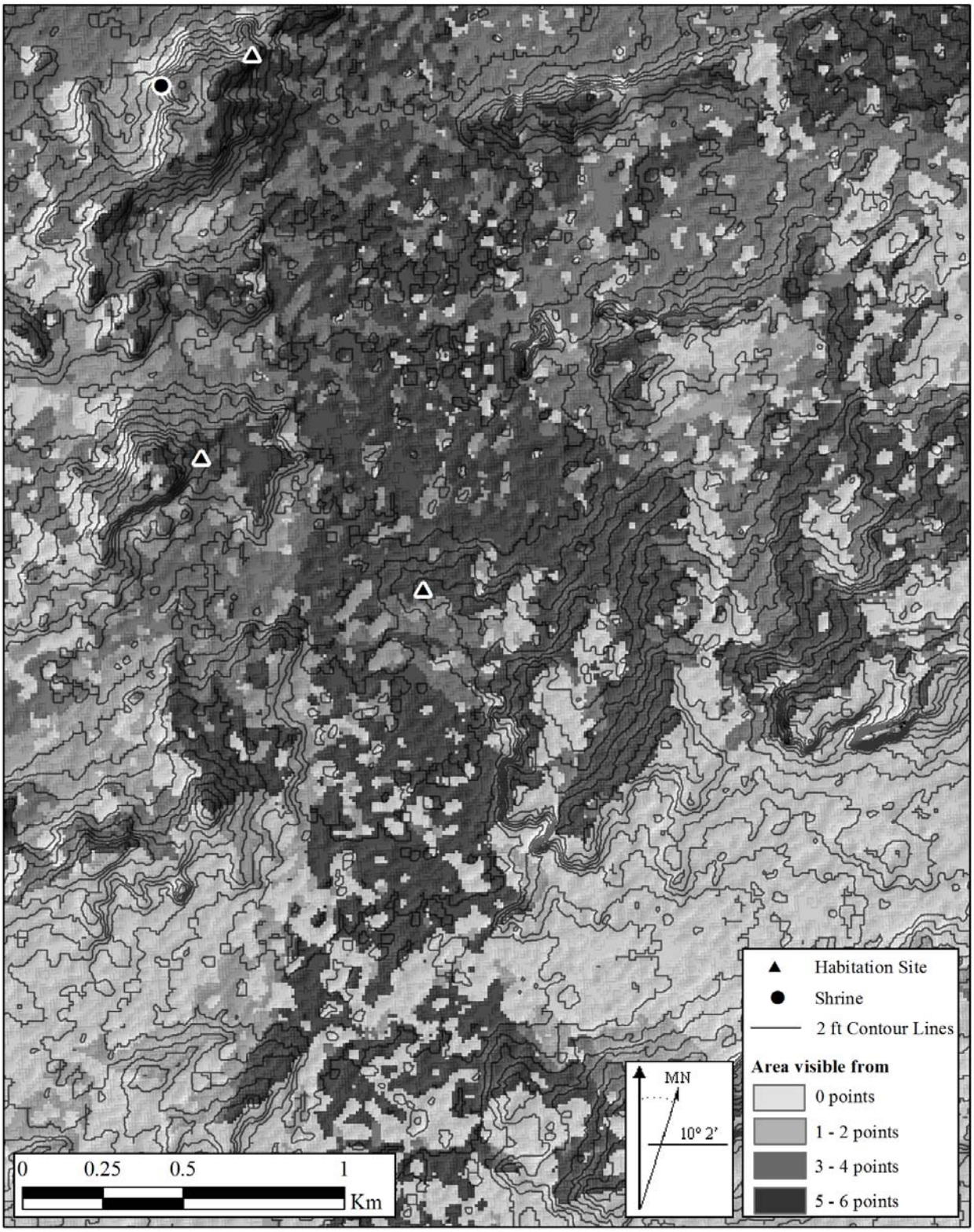

Figure C7. AD 650: Cumulative Visibility from Habitations with Selected Archaeological Sites

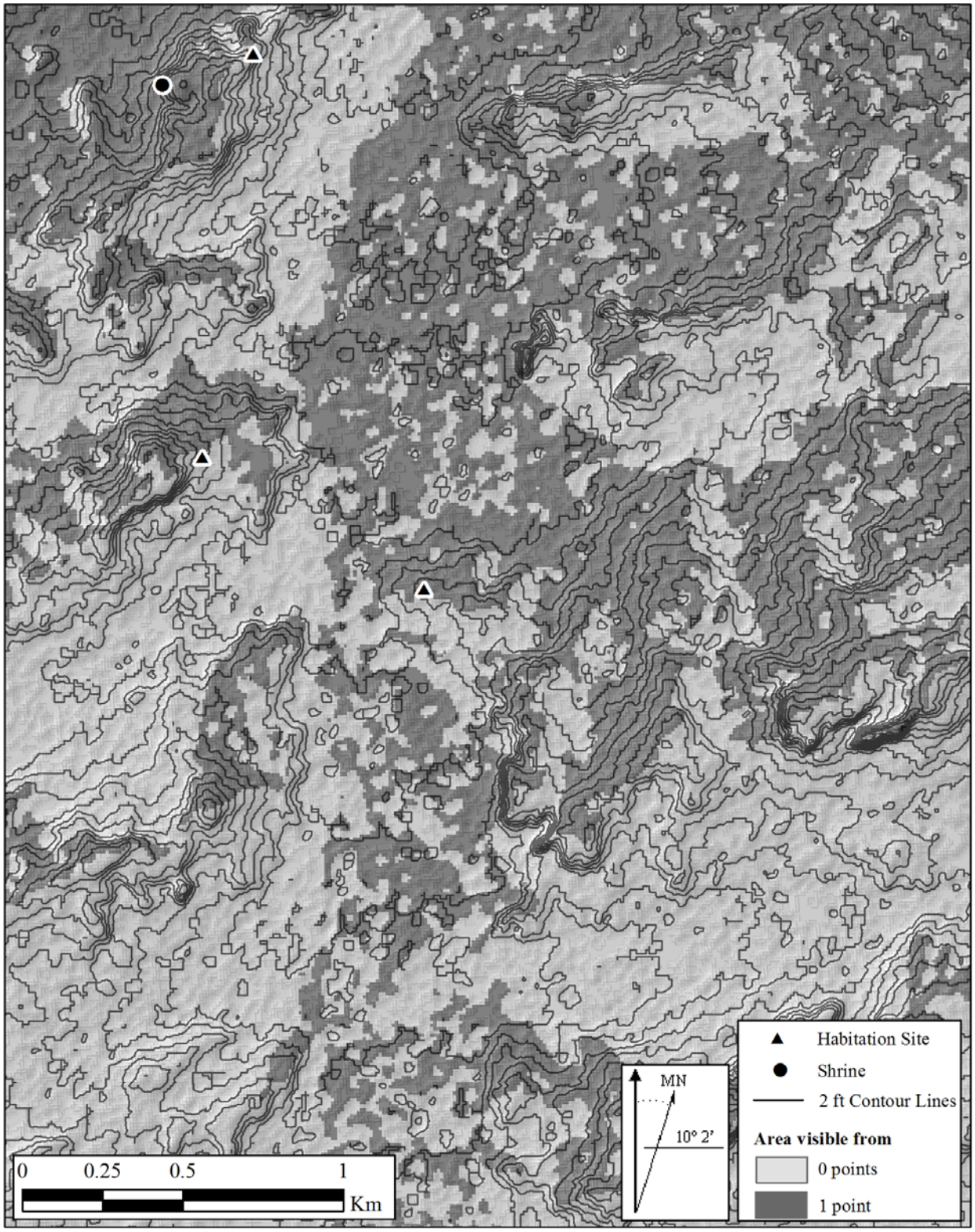

Figure C8. AD 650: Visibility from Shrine (29SJ2476) with Selected Archaeological Sites

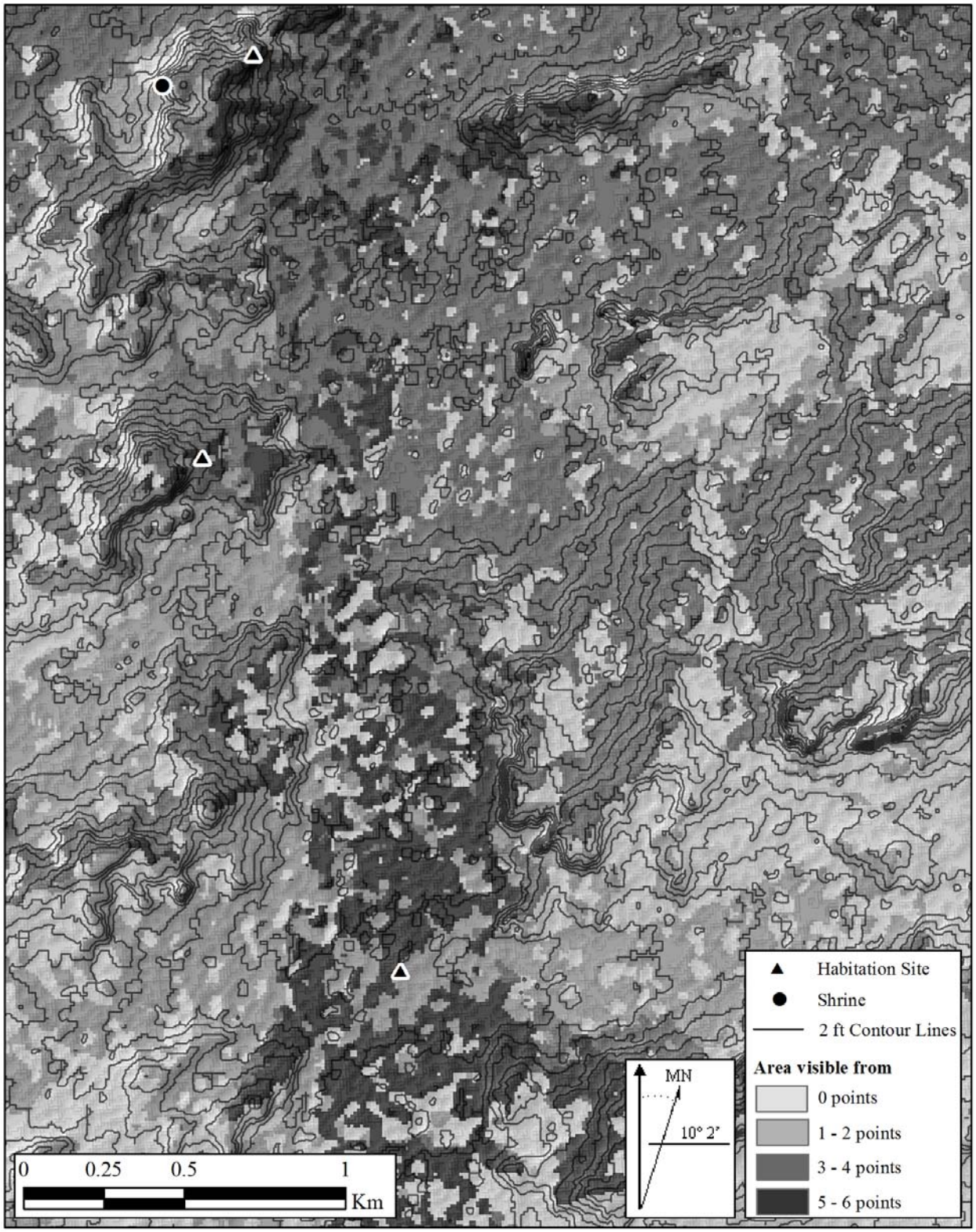

Figure C9. AD 700: Cumulative Visibility from Habitations with Selected Archaeological Sites

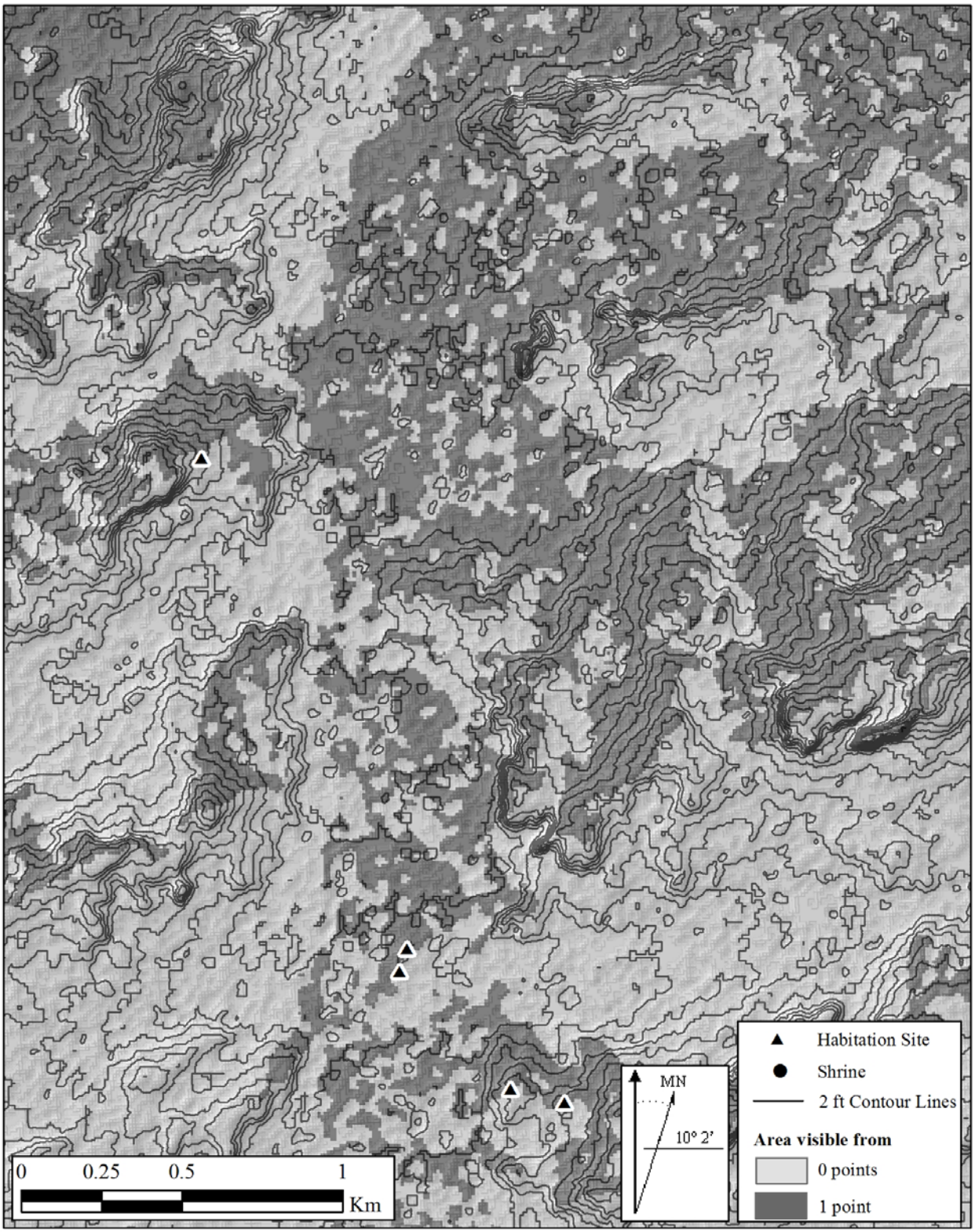

Figure C10. AD 700: Visibility from Shrine (29SJ2476) with Selected Archaeological Sites

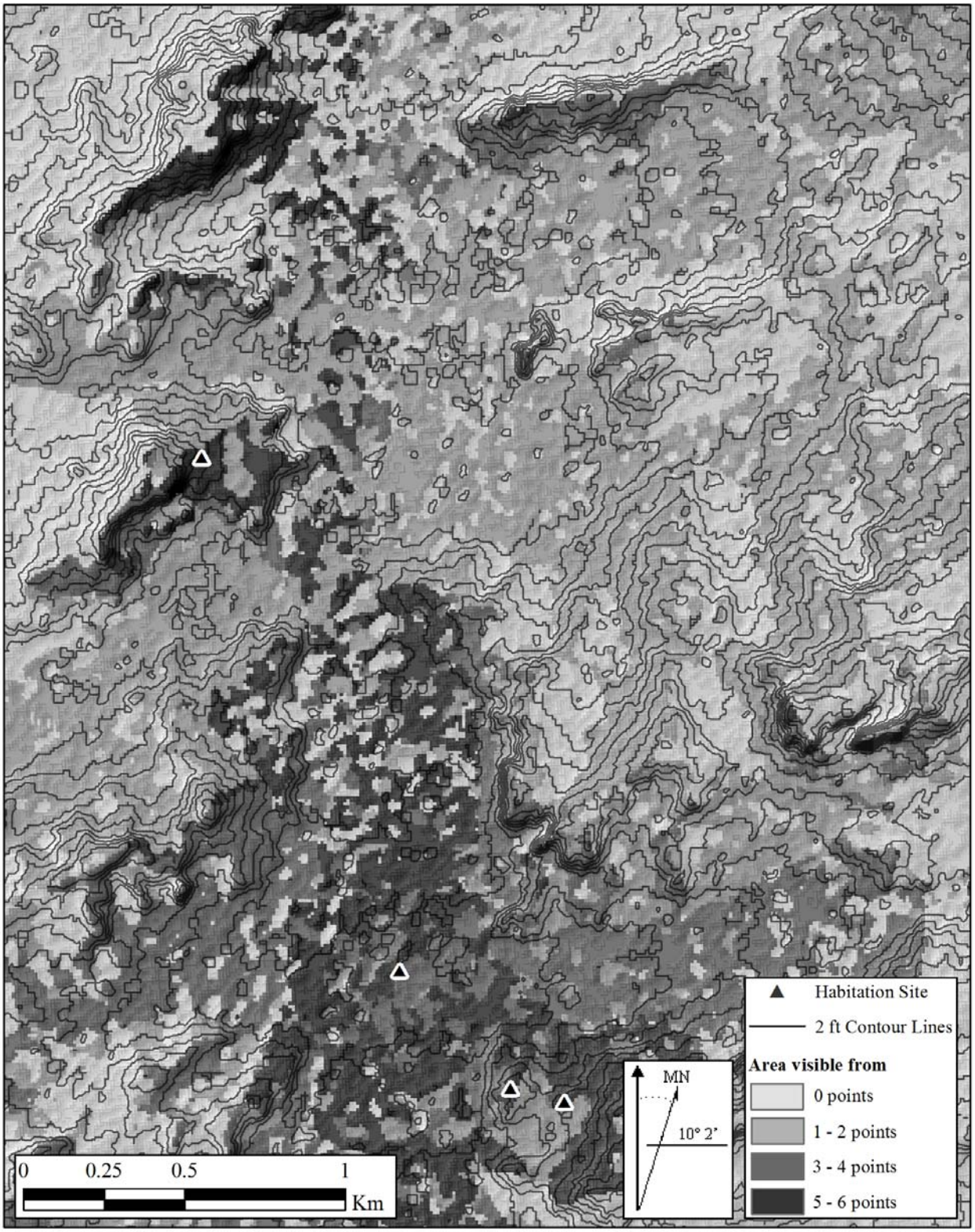

Figure C11. AD 750: Cumulative Visibility from Habitations with Selected Archaeological Sites

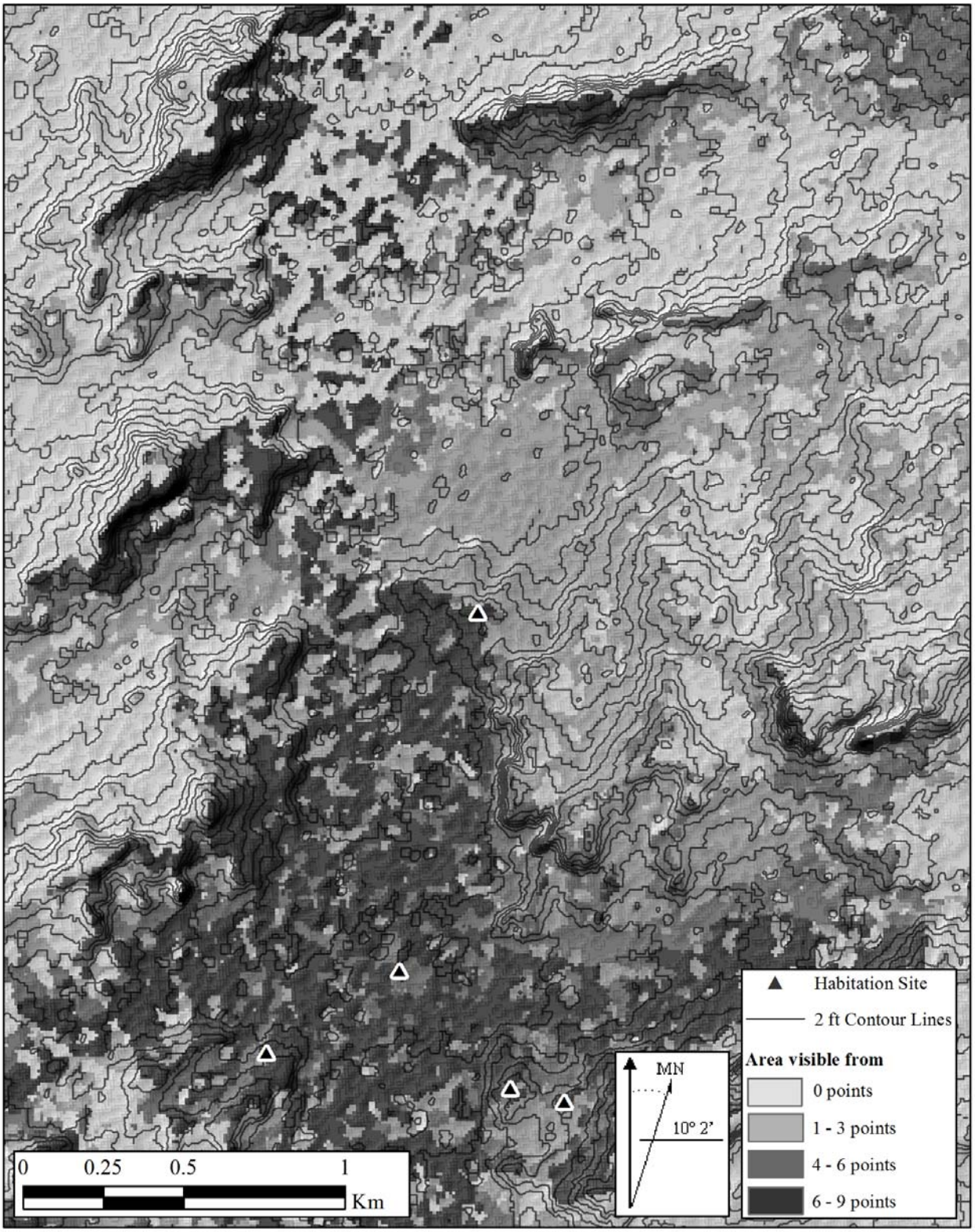

Figure C12. AD 800: Cumulative Visibility from Habitations with Selected Archaeological Sites

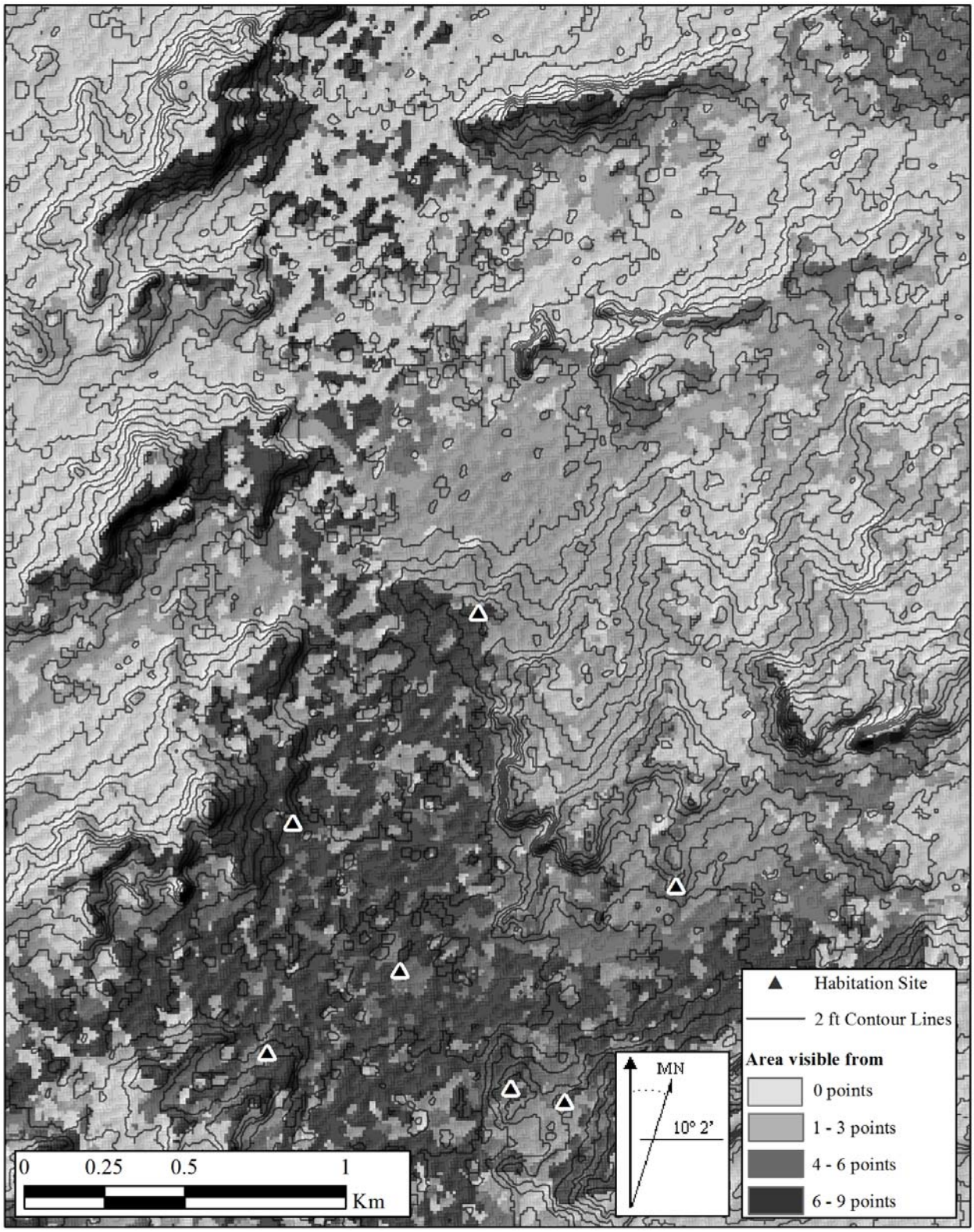

Figure C13. AD 850: Cumulative Visibility from Habitations with Selected Archaeological Sites

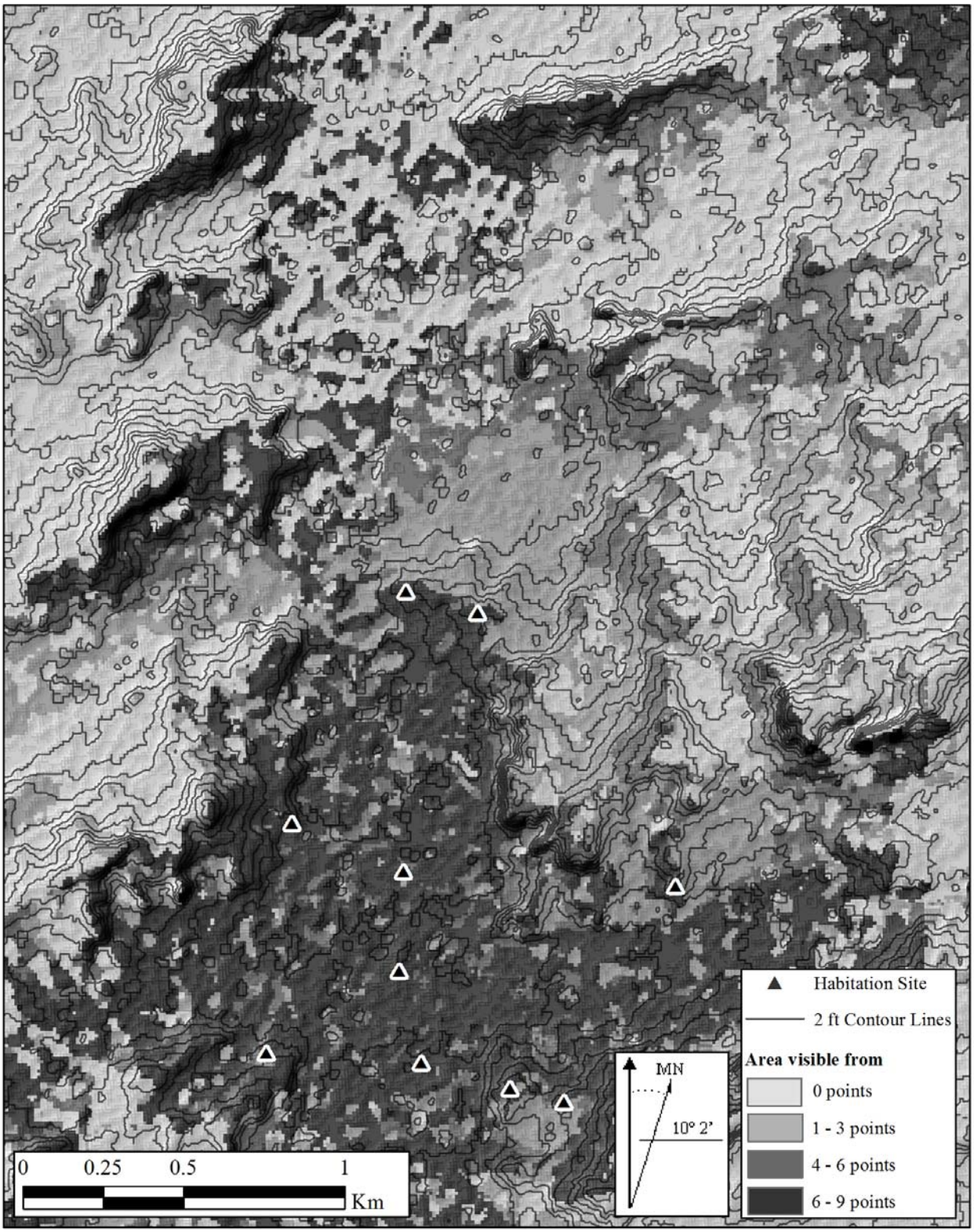

Figure C14. AD 900: Cumulative Visibility from Habitations with Selected Archaeological Sites

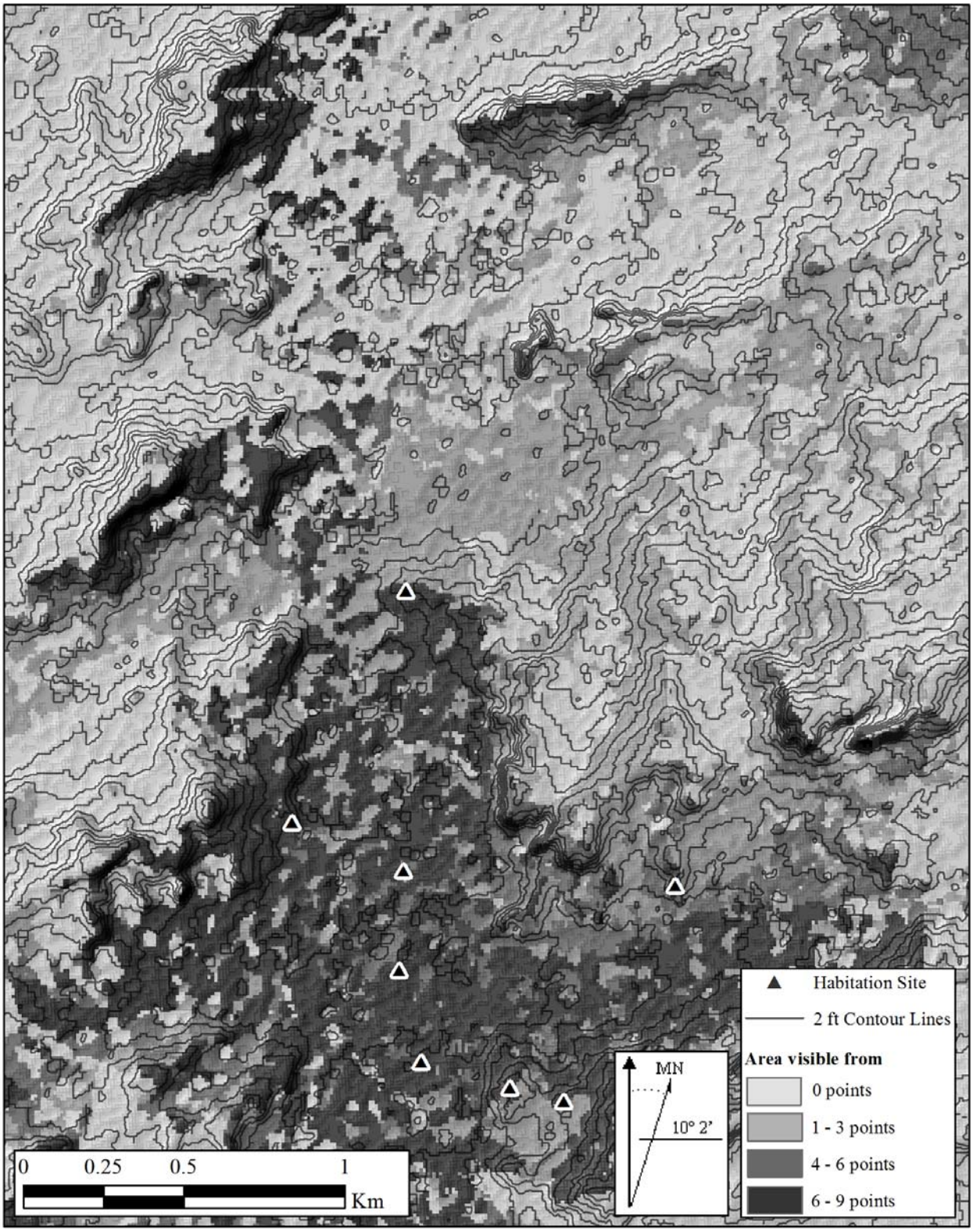

Figure C15. AD 950: Cumulative Visibility from Habitations with Selected Archaeological Sites

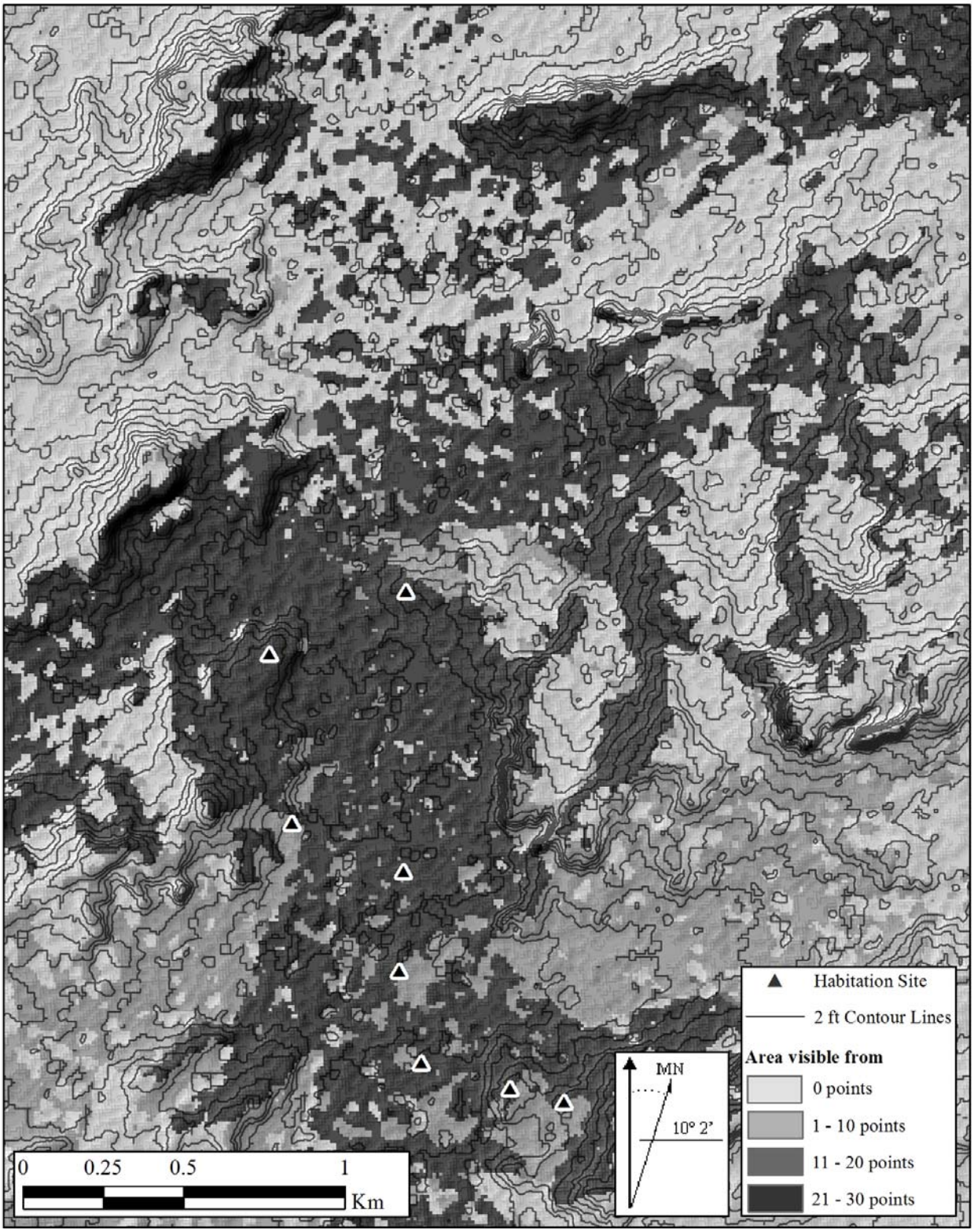

Figure C16. AD 1000: Cumulative Visibility from Habitations with Selected Archaeological Sites

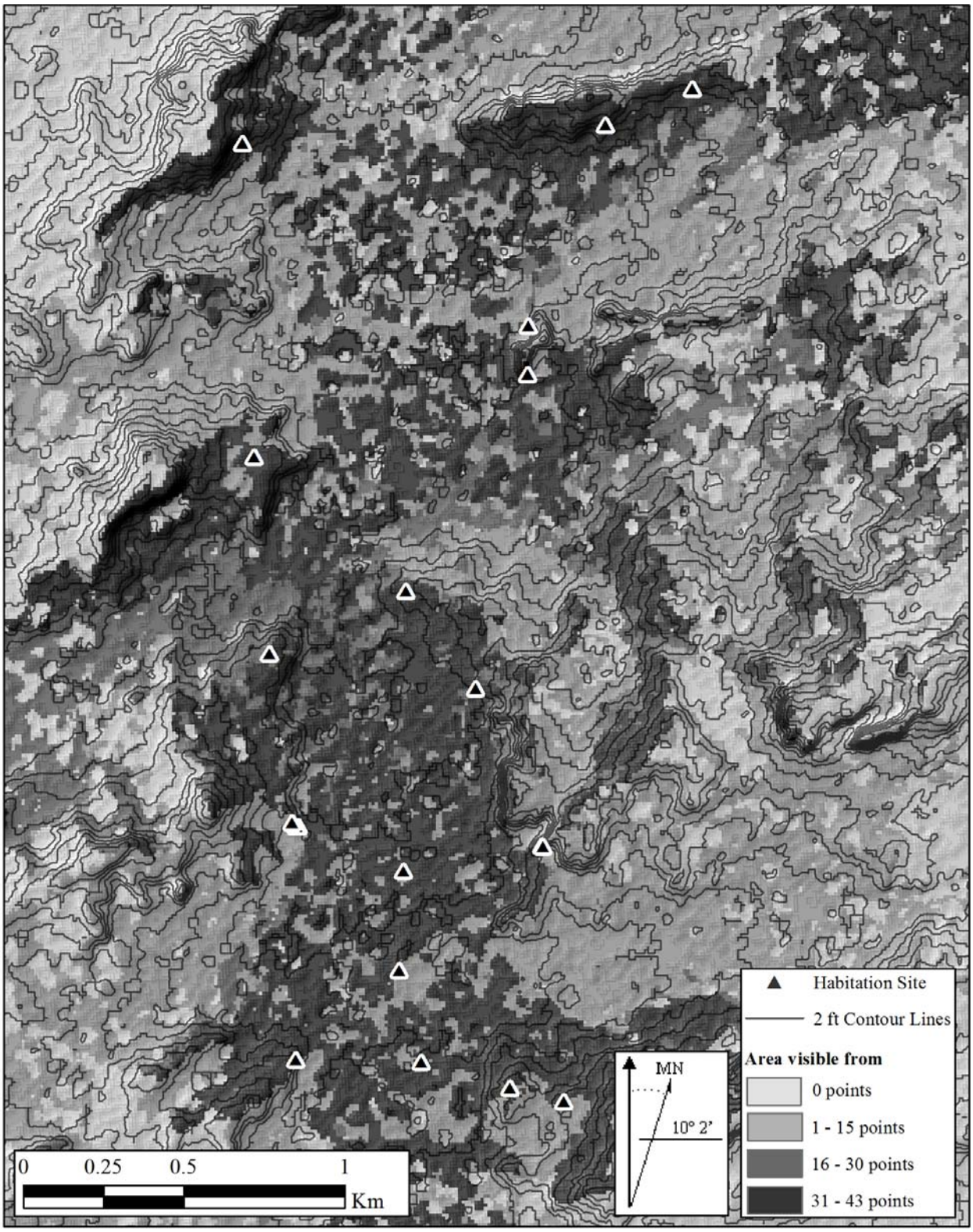

Figure C17. AD 1050: Cumulative Visibility from Habitations with Selected Archaeological Sites

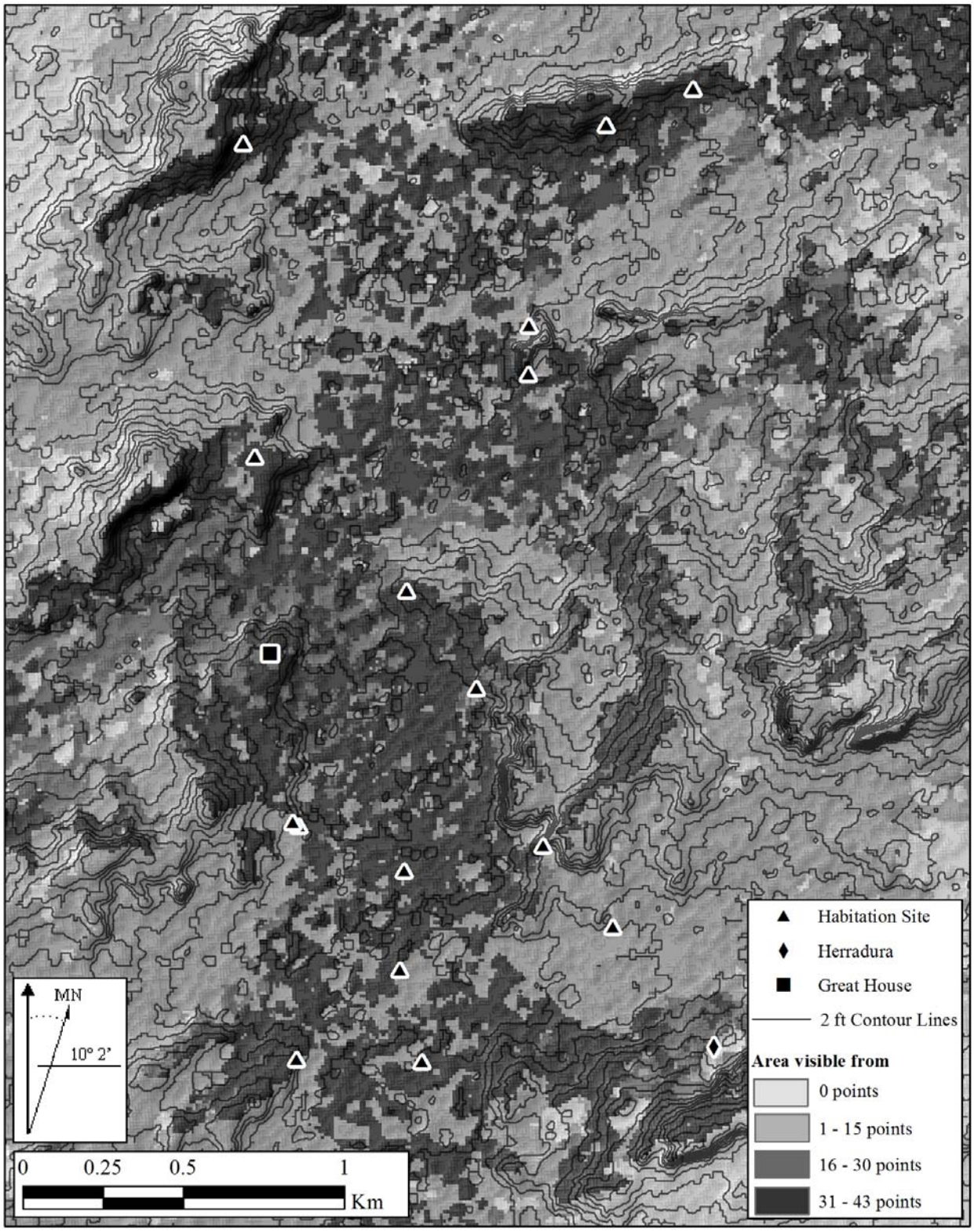

Figure C18. AD 1100: Cumulative Visibility from Habitations with Selected Archaeological Sites

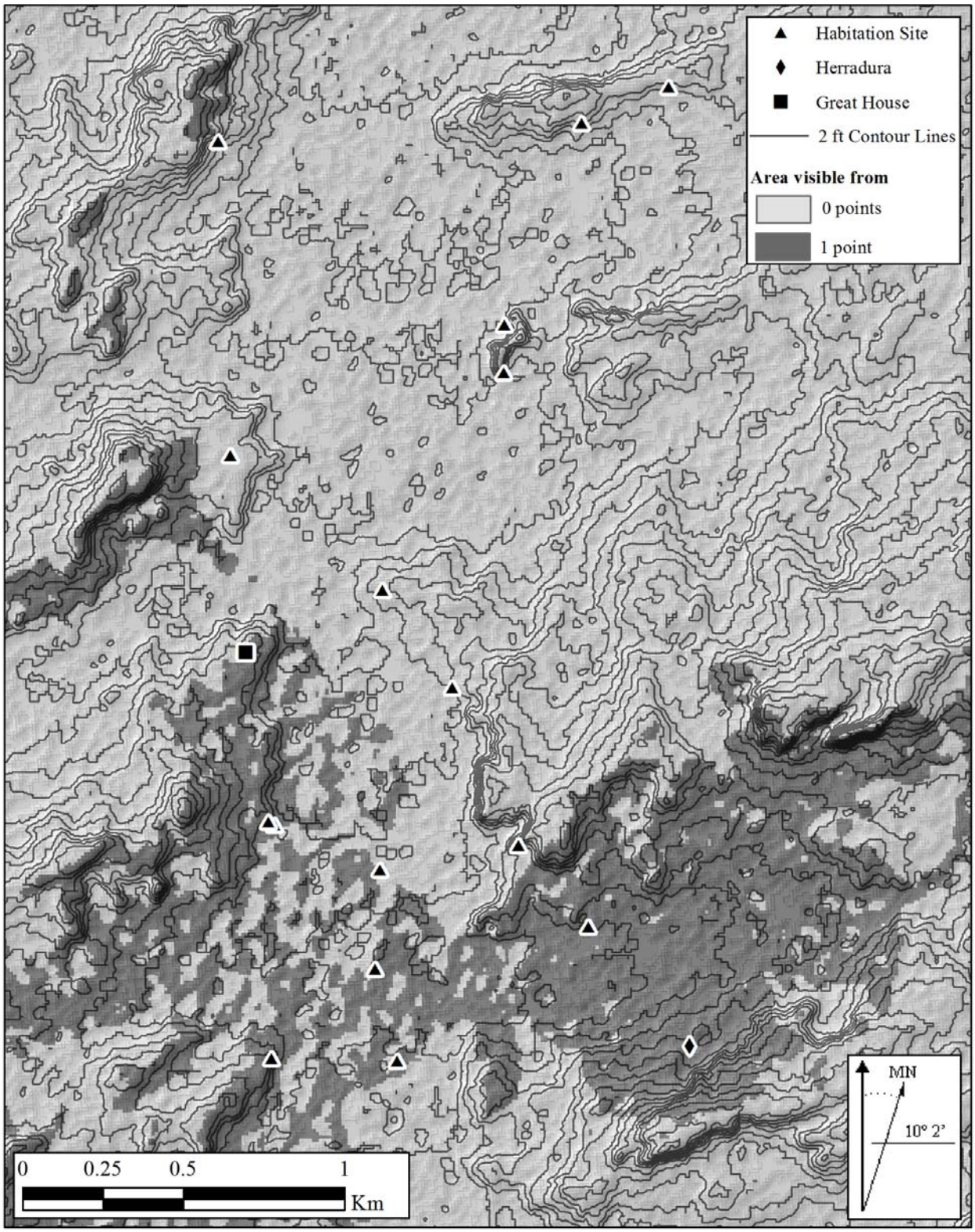

Figure C19. AD 1100: Visibility from Herradura with Selected Archaeological Sites

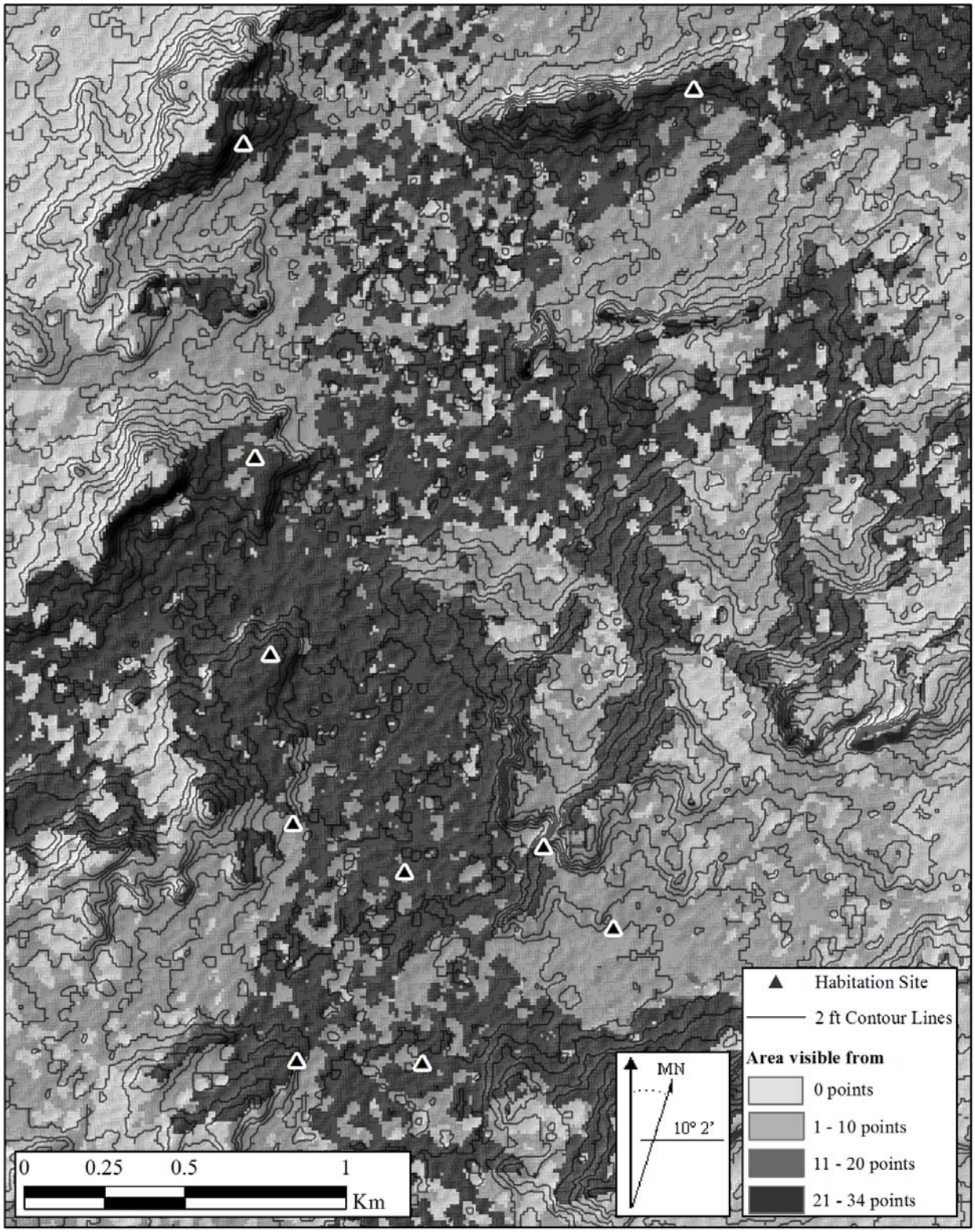

Figure C20. AD 1150: Cumulative Visibility from Habitations with Selected Archaeological Sites

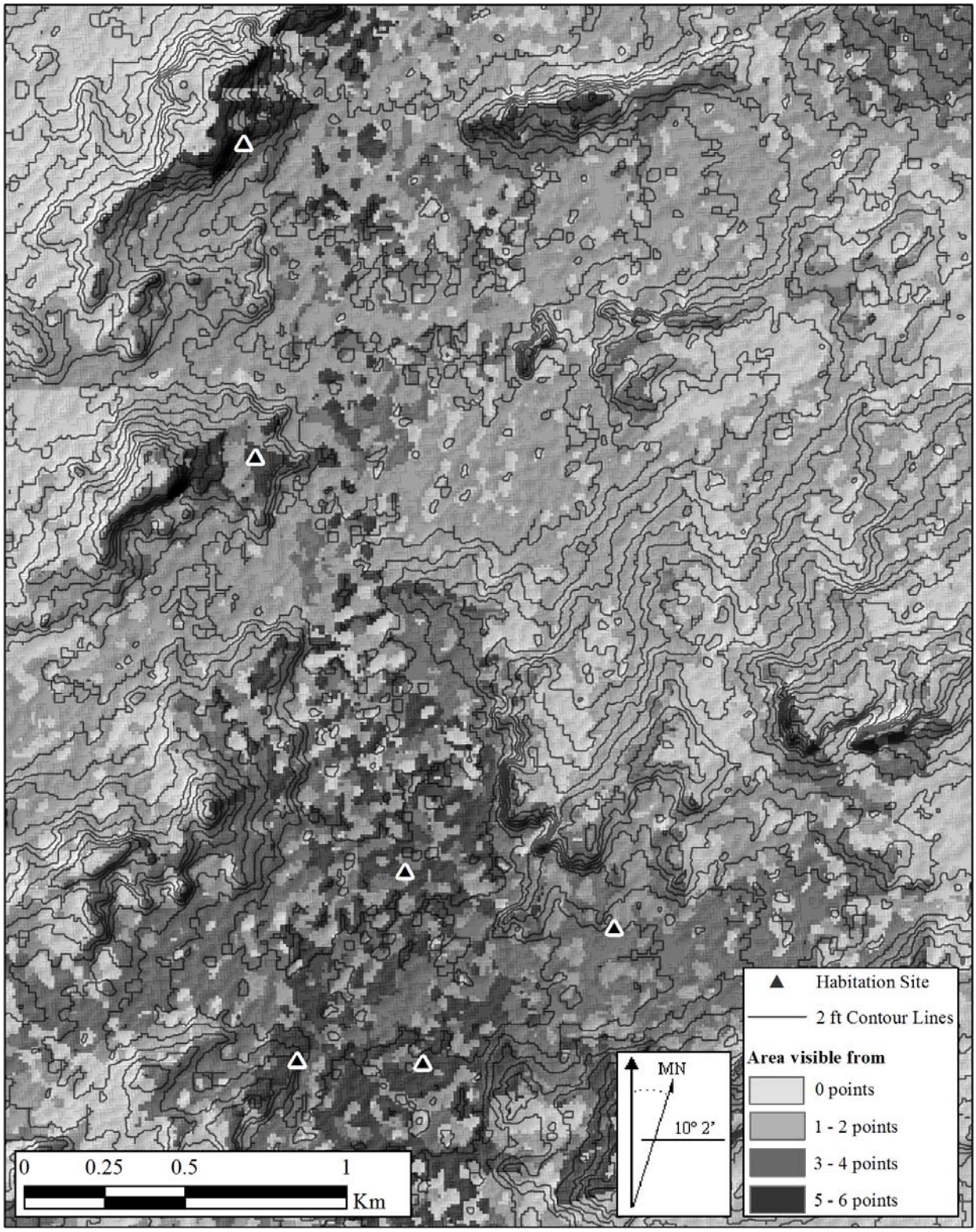

Figure C21. AD 1200: Cumulative Visibility from Habitations with Selected Archaeological Sites

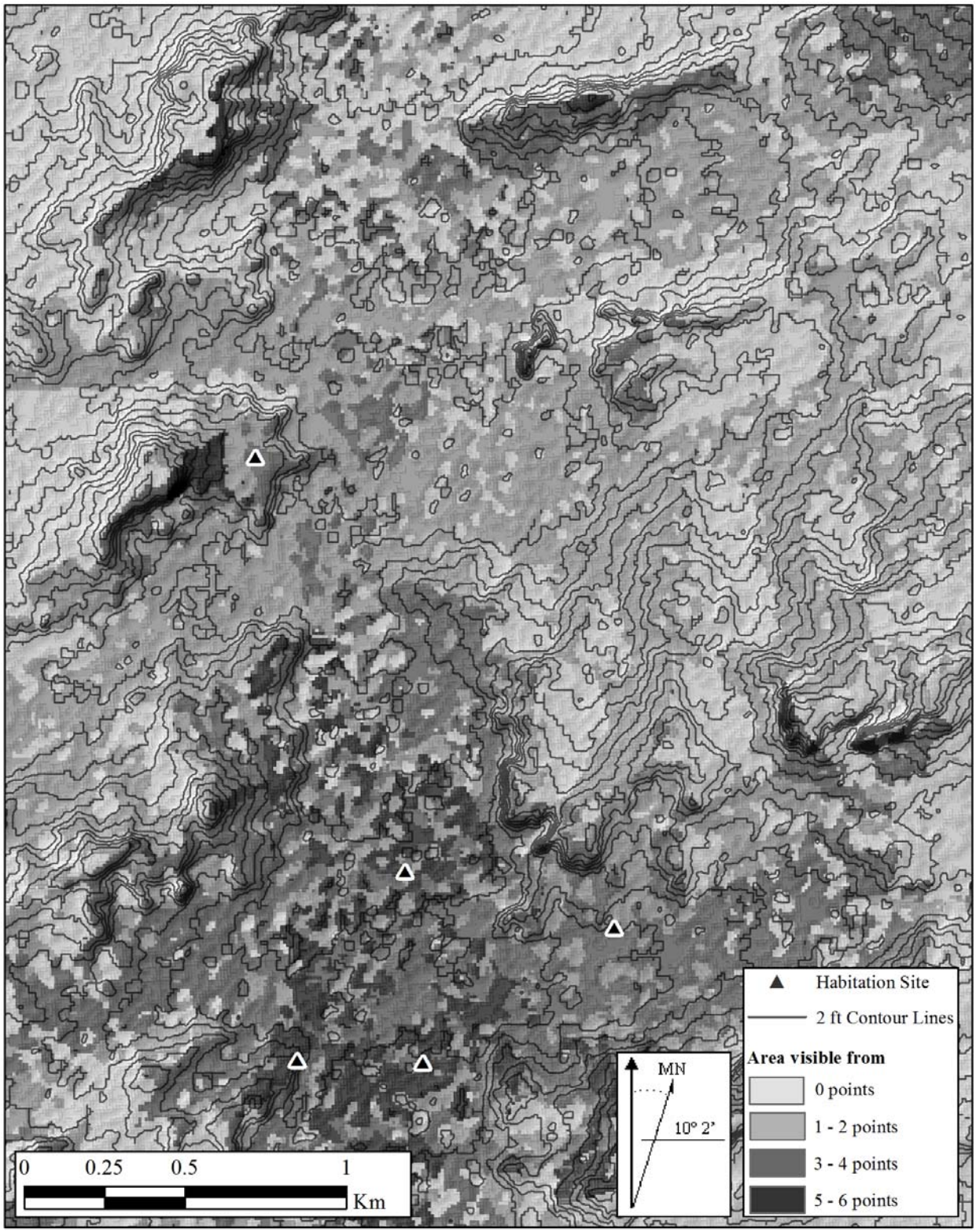

Figure C22. AD 1250: Cumulative Visibility from Habitations with Selected Archaeological Sites

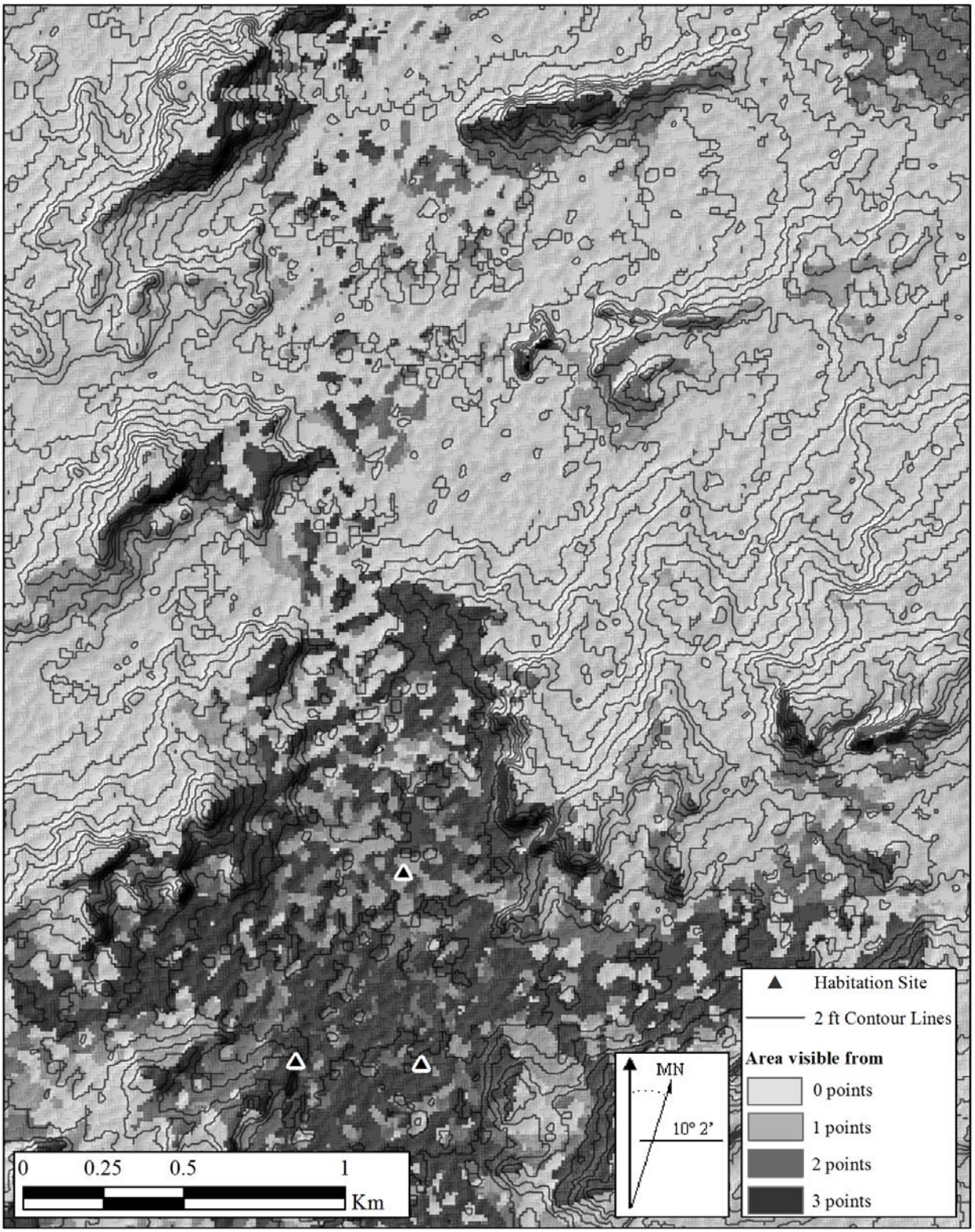

Figure C23. AD 1300: Cumulative Visibility from Habitations with Selected Archaeological Sites

APPENDIX D: VISIBILITY MATRICES BY DATE

Note: Only sites for which elevation data was collected in the field are represented here.

Key:
x = Inter-visibility observed
Italic site numbers are habitations (only those for which elevation data was collected in the field)
Bold italic site numbers are non-habitations (only those for which elevation data was collected in the field and a approximate construction date is indicated in the site report)

Table D1. Intervisibility Between Sites at AD 500

Total sites: 4 (1 non-habitation)
Sites abandoned: n/a / New sites: n/a

Viewer location

Location being sought	29SJ2457	29SJ2490	29SJ342	**29SJ2476**
29SJ2457	x	x	x	
29SJ2490	x	x	x	x
29SJ342	x	x	x	x
29SJ2476		x		x
Proportion visible	2/3	3/3	2/3	2/3

Table D2. Intervisibility Between Sites at AD 550

Total sites: 4 (1 non-habitation)
Sites abandoned: 0 / New sites: 0

Viewer location

Location being sought	29SJ2457	29SJ2490	29SJ342	**29SJ2476**
29SJ2457	x	x	x	
29SJ2490	x	x	x	x
29SJ342	x	x	x	x
29SJ2476		x		x
Proportion visible	2/3	3/3	2/3	2/3

Table D3. Intervisibility Between Sites at AD 600

Total sites: 4 (1 non-habitation)
Sites abandoned: 0 / New sites: 0

Viewer location

Location being sought	29SJ2457	29SJ2490	29SJ342	**29SJ2476**
29SJ2457	x	x	x	
29SJ2490	x	x	x	x
29SJ342	x	x	x	x
29SJ2476		x		x
Proportion visible	2/3	3/3	2/3	2/3

Table D4. Intervisibility Between Sites at AD 650

Total sites: 4 (1 non-habitation)
Sites abandoned: 0 / New sites: 0

Viewer location

Location being sought	29SJ2457	29SJ2490	29SJ342	**29SJ2476**
29SJ2457	x	x	x	
29SJ2490	x	x	x	x
29SJ342	x	x	x	x
29SJ2476		x		x
Proportion visible	2/3	3/3	2/3	2/3

Table D5. Intervisibility Between Sites at AD 700

Total sites: 4 (1 non-habitation)
Sites abandoned: 0 / New sites: 0

Viewer location

Location being sought	29SJ2457	29SJ2490	29SJ342	**29SJ2476**
29SJ2457	x	x	x	
29SJ2490	x	x	x	x
29SJ342	x	x	x	x
29SJ2476		x		x
Proportion visible	2/3	3/3	2/3	2/3

Table D6. Intervisibility Between Sites at AD 750

Total sites: 4
Sites abandoned: 2 / New sites: 2

Viewer location

Location being sought	29SJ2457	29SJ342	29SJ2521	29SJ2522
29SJ2457	x	x	x	x
29SJ342	x	x	x	x
29SJ2521	x	x	x	x
20SJ2522	x	x	x	x
Proportion visible	3/3	3/3	3/3	3/3

Table D7. Intervisibility Between Sites at AD 800

Total sites: 5
Sites abandoned: 1 / New sites: 2

Viewer location

Location being sought	29SJ342	29SJ2521	29SJ2522	29SJ2442	20SJ2439
29SJ342	x	x	x	x	x
29SJ2521	x	x	x	x	x
20SJ2522	x	x	x		x
29SJ2442	x	x		x	x
20SJ2439	x			x	x
Proportion visible	4/4	3/4	2/4	3/4	4/4

Table D8. Intervisibility Between Sites at AD 850

Total sites: 7
Sites abandoned: 0 / New sites: 2

Viewer location

Location being sought	29SJ342	29SJ2521	29SJ2522	29SJ2442	20SJ2439	29SJ2413	29SJ2454
29SJ342	x	x	x	x	x	x	x
29SJ2521	x	x	x	x	x	x	x
20SJ2522	x	x	x		x	x	x
29SJ2442	x	x		x	x		x
29SJ2413	x	x	x		x	x	x
20SJ2439	x			x	x		x
29SJ2454	x	x	x		x	x	x
Proportion visible	6/6	5/6	4/6	3/6	6/6	4/6	6/6

Table D9. Intervisibility Between Sites at AD 900

Total sites: 10
Sites abandoned: 0 / New sites: 3

Viewer location

Location being sought	29SJ 342	29SJ 2521	29SJ 2522	29SJ 2442	20SJ 2439	29SJ 2413	29SJ 2454	29SJ 341	29SJ 344	29SJ 348
29SJ342	x	x	x	x	x	x	x	x	x	x
29SJ2521	x	x	x	x	x	x	x	x	x	x
20SJ2522	x	x	x		x	x	x		x	x
29SJ2442	x	x		x	x		x	x	x	x
29SJ2413	x	x	x		x	x	x	x	x	
20SJ2439	x	x		x	x		x		x	x
29SJ2454	x	x	x		x	x	x	x	x	
29SJ 341	x	x	x	x	x	x	x	x	x	x
29SJ 344	x	x	x	x	x	x	x	x	x	x
29SJ 348	x	x	x	x	x		x	x	x	x
Proportion visible	9/9	9/9	7/9	6/9	9/9	6/9	9/9	7/9	9/9	7/9

Table D10. Intervisibility Between Sites at AD 950

Total sites: 8
Sites abandoned: 2 / New sites: 0

Viewer location

Location being sought	29SJ 342	29SJ 2521	29SJ 2522	29SJ 2413	29SJ 2454	29SJ 341	29SJ 344	29SJ 348
29SJ342	x	x	x	x	x	x	x	x
29SJ2521	x	x	x	x	x	x	x	x
20SJ2522	x	x	x	x	x		x	x
29SJ2413	x	x	x	x	x	x	x	
29SJ2454	x	x	x	x	x	x	x	
29SJ 341	x	x	x	x	x	x	x	x
29SJ 344	x	x	x	x	x	x	x	x
29SJ 348	x	x	x		x	x	x	x
Proportion visible	7/7	7/7	7/7	6/7	7/7	6/7	7/7	5/7

Table D11. Intervisibility Between Sites at AD 1000

Total sites: 8
Sites abandoned: 0 / New sites: 0

Viewer location

Location being sought	29SJ 342	29SJ 2521	29SJ 2522	29SJ 2413	29SJ 2454	29SJ 341	29SJ 344	29SJ 348
29SJ342	x	x	x	x	x	x	x	x
29SJ2521	x	x	x	x	x	x	x	x
20SJ2522	x	x	x	x	x		x	x
29SJ2413	x	x	x	x	x	x	x	
29SJ2454	x	x	x	x	x	x	x	
29SJ 341	x	x	x	x	x	x	x	x
29SJ 344	x	x	x	x	x	x	x	x
29SJ 348	x	x	x		x	x	x	x
Proportion visible	7/7	7/7	7/7	6/7	7/7	6/7	7/7	5/7

Table D12. Intervisibility Between Sites at AD 1050

Total sites: 18
Sites abandoned: 0 / New sites: 0

Viewer Location

Location being sought	29SJ 342	29SJ 2521	29SJ 2522	29SJ 2454	29SJ 341	29SJ 344	29SJ 348	29SJ 1413	29SJ 2421	29SJ 2427	29SJ 2438	29SJ 2453	29SJ 2458	29SJ 2483	29SJ 2484	29SJ 2491	29SJ 2502	29SJ 2508
29SJ342	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x
29SJ2521	x	x	x	x	x	x	x	x	x	x	x	x	x			x		
20SJ2522	x	x	x	x		x	x	x	x	x	x	x	x			x		
29SJ2454	x	x	x	x	x	x			x	x	x	x						
29SJ 341	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x		x
29SJ 344	x	x	x	x	x	x	x	x	x	x	x	x	x			x		
29SJ 348	x	x	x	x	x	x	x	x	x	x	x	x	x			x		
29SJ1413	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
29SJ2421	x	x	x	x	x	x		x	x		x	x	x				x	x
29SJ2427	x	x		x	x	x	x	x	x	x	x	x	x					
29SJ2438	x	x	x	x	x	x	x	x	x	x	x	x		x			x	x
29SJ2453	x	x	x	x	x	x	x		x	x	x	x		x			x	x
29SJ2458	x	x	x	x		x	x	x	x	x	x	x	x	x			x	x
29SJ2483				x		x	x	x	x	x	x	x	x	x				
29SJ2484													x		x	x		x
29SJ2491	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
29SJ2502	x			x		x	x	x	x	x	x	x	x	x	x		x	x
29SJ2508	x	x		x	x	x	x	x	x	x	x	x	x	x	x		x	x
Proportion visible	15/17	14/17	12/17	16/17	12/17	16/17	14/17	14/17	16/17	15/17	16/17	16/17	14/17	9/17	5/17	8/17	8/17	10/17

Table D13. Intervisibility Between Sites at AD 1100

Total sites: 17
Sites abandoned: 2 / New sites: 1

Viewer Location

Location being sought	29SJ 342	29SJ 2454	29SJ 341	29SJ 344	29SJ 348	29SJ 1413	29SJ 2421	29SJ 2427	29SJ 2438	29SJ 2453	29SJ 2458	29SJ 2483	29SJ 2484	29SJ 2491	29SJ 2502	29SJ 2508	29SJ 2420
29SJ342	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x
29SJ2454	x	x	x	x			x	x	x	x							x
29SJ 341	x	x	x	x	x	x	x	x	x	x	x	x		x		x	x
29SJ 344	x	x	x	x	x	x	x	x	x	x	x			x			x
29SJ 348	x	x	x	x	x	x	x	x	x	x	x			x			
29SJ1413	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
29SJ2421	x	x	x	x		x	x		x	x	x				x	x	x
29SJ2427	x	x	x	x	x	x	x	x	x	x	x						
29SJ2438	x	x	x	x	x	x	x	x	x	x		x			x	x	x
29SJ2453	x	x	x	x	x		x	x	x	x		x			x	x	x
29SJ2458	x	x		x	x	x	x	x	x	x	x	x			x	x	
29SJ2483		x		x	x	x	x	x	x	x	x	x					
29SJ2484											x		x	x		x	
29SJ2491	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
29SJ2502	x	x		x	x	x	x	x	x	x	x	x	x		x	x	
29SJ2508	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	
29SJ2420	x	x		x		x	x		x	x							x
Proportion visible	14/16	15/16	12/16	15/16	12/16	13/16	15/16	13/16	15/16	15/16	12/16	9/16	4/16	6/16	8/16	10/16	7/16

Table D14. Intervisibility Between Active Archaeological Sites at AD 1150

Total sites: 10
Sites abandoned: 7 / New sites: 0

Viewer Location

Location being sought	29SJ 2454	29SJ 341	29SJ 344	29SJ 1413	29SJ 2421	29SJ 2438	29SJ 2458	29SJ 2491	29SJ 2502	29SJ 2404
29SJ2454	x	x	x		x	x				x
29SJ 341	x	x	x	x	x	x	x	x		x
29SJ 344	x	x	x	x	x	x	x	x		x
29SJ1413	x	x	x	x	x	x	x	x	x	x
29SJ2421	x	x	x	x	x	x	x		x	x
29SJ2438	x	x	x	x	x	x			x	x
29SJ2458	x		x	x	x	x	x		x	
29SJ2491	x	x	x	x	x	x	x	x	x	
29SJ2502	x		x	x	x	x	x		x	
29SJ2504		x			x					x
Proportion visible	8/9	7/9	8/9	7/9	9/9	8/9	6/9	3/9	5/9	5/9

Table D15. Intervisibility Between Active Archaeological Sites at AD 1200

Total sites: 6
Sites abandoned: 4 / New sites: 0

Viewer Location

Location being sought	29SJ341	29SJ344	29SJ2438	29SJ2458	29SJ2491	29SJ2404
29SJ 341	x	x	x	x	x	x
29SJ 344	x	x	x	x	x	x
29SJ2438	x	x	x			x
29SJ2458		x	x	x		
29SJ2491	x	x	x	x	x	
29SJ2504	x					x
Proportion visible	4/5	4/5	4/5	3/5	2/5	3/5

Table D16. Intervisibility Between Active Archaeological Sites at AD 1250

Total sites: 5
Sites abandoned: 1 / New sites: 0

Viewer Location

Location being sought	29SJ341	29SJ344	29SJ2438	29SJ2458	29SJ2404
29SJ 341	x	x	x	x	x
29SJ 344	x	x	x	x	x
29SJ2438	x	x	x		x
29SJ2458		x	x	x	
29SJ2504	x				x
Proportion visible	3/4	3/4	3/4	2/4	3/4

Table D17. Intervisibility Between Active Archaeological Sites at AD 1300

Total sites: 3
Sites abandoned: 2 / New sites: 0

Viewer Location

Location being sought	29SJ341	29SJ344	29SJ2438
29SJ 341	x	x	x
29SJ 344	x	x	x
29SJ2438	x	x	x
Proportion visible	2/2	2/2	2/2

APPENDIX E: 360-DEGREE PANORAMAS AND VIEWSHEDS FOR SELECTED SITE (AVAILABLE DIGITALLY ONLY)