A Nested Approach to Survey in the Egiin Gol Valley, Mongolia

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Defining an appropriate and adequate survey area is usually the first and most difficult step in survey research design. This paper presents an example from the Egiin Gol Survey project in which current models for nomadic polity development were evaluated against spatial data collected from a valley in north central Mongolia. The survey presented methodological challenges since no prior systematic survey had been conducted in Mongolia and the mobility of steppe groups likely produced significant variation in social scales across the region in question. To address these factors, we did not select a pre-defined survey area with a fixed boundary. Instead, we expanded our regional perspective by creating zones of different survey resolution and applying knowledge of site location from higher resolution surveys to areas still unstudied. Through this nested resolution method, we acquired data at progressively lower cost, enlarged our survey coverage dramatically, and accounted for shifts in socio-spatial scales relevant to our research problem.

Introduction

A classic problem in designing archaeological surface survey is how to define the boundaries of a survey area relative to a particular research question about early social groups. Social process is intrinsically nested, scalar, and interconnected and relates to geographical space in complex ways. The challenge of delimiting a survey area is made all the more difficult when research occurs in a region having little or no precedent for systematic survey, where the range of site types is unknown, and where populations may have been mobile, as is the case over much of the Eurasian steppe. These considerations played a major role in guiding the first pedestrian survey in Mongolia at Egiin Gol (FIG. 1). Our solution was to employ a nested approach that moves from intensive to extensive survey and which is useful for studying how local herding groups were periodically integrated into regional steppe polities.

We describe an example of a project in which very little was known at the outset and which was then faced with changing circumstances as it progressed. The one variable that did not change during the course of the survey was our research question, which required the recovery of a diachronic series of site distributions to study potential changes in boundaries, centralization, and integration across a sub-regional space that might be called the "local area." The local area as we envisioned it would have corresponded spatially to a set of interacting communities, though we did not know how this social entity might have been distributed over the complex riverine geography of Egiin Gol. Having little idea of how to define a relevant socio-spatial area for examination, our approach evolved from a small-scale intensive project to a regional survey having multiple zones of resolution, designed to explore a landscape inhabited by mobile groups.

One of our intentions in emphasizing the nested research design is to demonstrate the utility of "value-added" survey, especially with regard to studying socio-spatial scale over time. Value-added, in this case, refers to the locational learning in the process of conducting survey that can be harnessed to provide additional data at comparatively low cost. This approach is contingent on having results from a high resolution survey to begin with and then applying that information to unexplored areas. By assimilating and applying high quality information from one section of the survey area to an unknown area, despite a less intensive degree of observation, we achieved a substantial level of data recovery. These perspectives were sufficient for the purpose of studying early settlement patterns in terms of spatial distributions, inter-site relationships, and locational emphases, what Edward Banning (2002: 34) refers to as "spatial structure."

The Region, the Place, and the Problem

By the end of the 1st millennium B.C., a novel organizational form emerged in the NE Eurasian steppe, and was first described in Chinese documents detailing devastating conflicts with a regionally integrated and militarily powerful steppe polity known as the Xiongnu (Watson 1993). From 200 B.C. onwards, the historical records document large-scale, hierarchically organized, integrated polities of pastoral peoples, or "states on horseback," as a defining feature of steppe history. The most familiar example of this long-standing tradition of steppe politics is the medieval Mongolian empire of Genghis Khan. Steppe polities emerged from a setting of extensive agro-pastoralism, mobile populations, fiercely independent local groups, and marginal environments, features commonly associated with more egalitarian organization (Salzman 2004: 68–69). How and why such polities were constructed and maintained is one of the foremost research questions for Eurasian steppe archaeology (Honeychurch and Amartuvshin 2007).

Dominant approaches for explaining complex regional organization among eastern steppe groups share the proposition that nomadic polities emerged in this region by way of economic and political dependence on Chinese states (Jagchid and Symons 1989; Barfield 2001, in press; Kradin 2002). The framework used in many of these models, whether implicitly or explicitly, is a core-periphery relationship where core processes within a mature state determine much of the development that occurs in the periphery (Champion 1989). Accordingly, the steppe polity is hierarchically organized for complex external interactions, but internally it is confederated, consensual, and loosely structured. A second approach to explaining steppe polities attributes their formation to actions taken by steppe peoples themselves, building on indigenous processes and events (Di Cosmo 2002; Honeychurch and Amartuvshin 2006; Rogers 2007). In this case, groups inhabiting regions adjacent to mature states are able to define the conditions and processes of interregional interaction. This framework explains steppe polities as creations of nomadic traditions of statecraft emphasizing long-distance sources of finance and political changes locally to support regional leadership.

These two approaches argue for very different responses when an area such as Egiin Gol becomes integrated into a regional organization. In the first approach, if interregional interaction gives rise to the regional steppe polity such that upper tiers of hierarchy and authority are functional in the external arena but not so internally, a local area should change little in relation to the steppe polity. The construction of regional organization would be a "modular" joining together of multiple local groups as opposed to an "integrative" process. From the perspective of the second approach, interregional contacts present opportunities for emerging regional elites to stabilize and expand centralization through novel integrative techniques. Therefore, the local area should experience changes related to integration within a regional structure of centralized authority. These changes might consist of the disruption of local structures and articulation of local areas with higher levels of management and control. From a survey perspective, such transformations might result in substantially different habitation and landscape patterns occurring at the end of the 1st millennium B.C. The Egiin Gol survey was carried out to evaluate these different approaches to modeling steppe polity organization at the local scale.

The Survey Area, Objectives, and Approach

The Egiin Gol river of north central Mongolia (FIGS. 1, 2) is a major tributary of the Selenge drainage which flows into Lake Baikal, Siberia. Near its confluence with the Selenge, the lower Egiin Gol river flows in a southeast direction along a floodplain that varies in width from 0.8 to 1.5 km. Elevations within the survey area range between 840 and 1250 masl, and the landscape is characterized by northeast trending ridges that alternate with narrow valleys formed by tributaries to the Egiin Gol river. Land cover consists of steppe grasses, shrubs, and medium density forest of birch, pine, and larch along ridge tops. Mean annual precipitation in the area is 340 mm with a majority of rainfall occurring during the summer season. Soil quality is sufficient to support extensive dry-farmed mechanized agriculture at present, and intensive canal irrigated agriculture was practiced during the 19th and early 20th centuries.

The Egiin Gol Survey (EGS) was carried out as a full-coverage surface survey designed to discover traces of minimal habitation sites and surface features. A full-coverage approach was chosen for several reasons. Having no systematic survey precedent in Mongolia, we wished to recover the full range of possible sites, including unique,

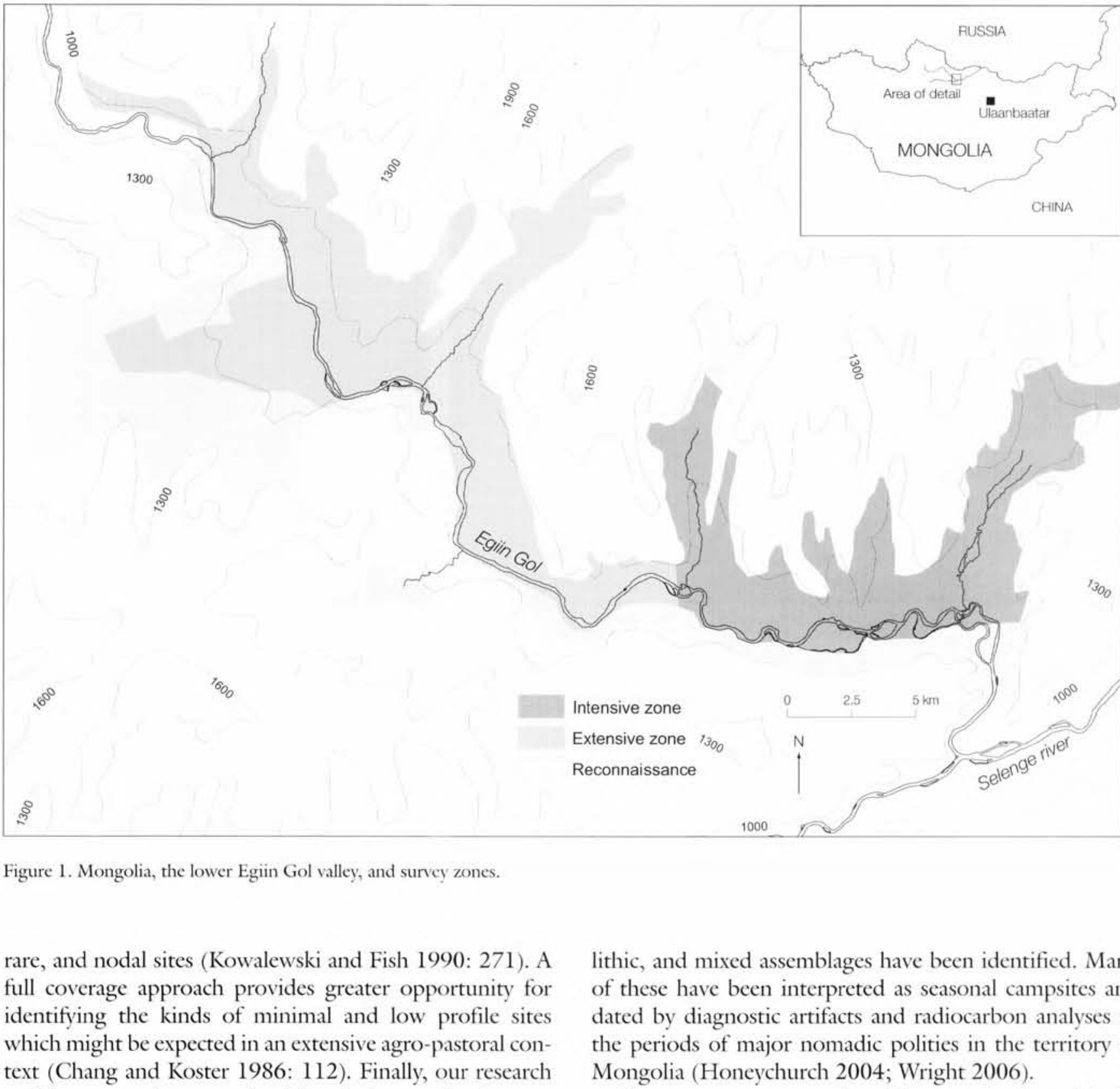

Figure 1. Mongolia, the lower Egiin Gol valley, and survey zones.

rare, and nodal sites (Kowalewski and Fish 1990: 271). A full coverage approach provides greater opportunity for identifying the kinds of minimal and low profile sites which might be expected in an extensive agro-pastoral context (Chang and Koster 1986: 112). Finally, our research problems were best examined by placing emphasis upon settlement as a relational network of sites, for which observation of a contiguous area is preferable (Parsons 1990: 13). Systematic pedestrian survey was carried out over a five-year period (1996–2000) and covered a 310 sq km area consisting of the main Egiin Gol valley, tributary valleys, ridge systems, and passes linking tributary valleys. Brief re-visits to Egiin Gol occurred in 2002 and 2003. More than 500 archaeological sites have been recorded dating from the Early Upper Paleolithic to the mid-20th century and include cemeteries, settlements, ritual stelae, and petroglyphs. Over 100 artifact scatters with ceramic, lithic, and mixed assemblages have been identified. Many of these have been interpreted as seasonal campsites and dated by diagnostic artifacts and radiocarbon analyses to the periods of major nomadic polities in the territory of Mongolia (Honeychurch 2004; Wright 2006).

The survey area was selected in consultation with the Mongolian Academy of Sciences based on government proposals for a hydroelectric station on the Egiin Gol river (Asian Development Bank 1992). The flood zone was originally expected to cover an area of 125 sq km up to the 900 m contour which initially defined the upper limits of survey transects. The systematic survey was initiated in 1997, and as the construction date of the dam was postponed, the survey grew in scope and in methodology. By 1999, when it became apparent that the dam would not be constructed and the valley was not under threat of imminent flooding, the focus of data collection shifted from an

Figure 2. The Egiin Gol river, forest-steppe, and surrounding mountains.

intensive effort in a limited area based on the proposed flood zone to a broader study of the valley as a sociocultural landscape. Initial success in recovering both the kinds of habitation sites needed to establish early settlement organization and the chronological range needed to compare different periods suggested that the Egiin Gol valley was a promising space over which to study shifts in organizational pattern and scale.

The lower Egiin Gol is a well-defined topographical region with mountain passes and tributary valleys controlling movement into or out of the area. Though this topographic character delimits the lower Egiin Gol as a semi-enclosed sub-region, the question of defining a survey area was nonetheless an issue for consideration (Parsons 1972). The survey was therefore conducted using a nested resolution approach that provided progressively greater scales of spatial inclusion at lesser intensities of observation. Multiple scales of survey intensity extending outward from a core survey zone had several benefits for the Egiin Gol research. These nested survey intensities gave us an informational check on conclusions arrived at based on the initial intensive sample, an opportunity to detect sociocultural boundaries beyond the core survey area, and spatial data better suited to analyzing the scalar properties of long-term social processes. The different survey resolutions employed were intensive survey, extensive survey, reconnaissance (FIG. 1), and vehicular survey.

The Survey in Detail: Intensive Coverage

Prior to our project and in preparation for a salvage effort, archaeological work in the Egiin Gol valley was conducted by Mongolian teams in the early 1990s (Torbat, Amartuvshin, and Erdenebat 2003). In 1996, participants of the EGS carried out reconnaissance in a limited number of areas having road cuts and erosional depressions and located two substantial artifact scatters. These initial successes led us to conclude that a systematic surface survey would reveal some evidence for habitation sites as well as a sample of stone features. Whether or not enough evidence could be recovered to establish broader habitation patterns was a significant question given the surface vegetation in the valley during the summer months.

In order to maximize our potential for recovering multiple habitation sites, we developed a high-resolution, high-cost survey design to cover the area most susceptible to flooding by the hydroelectric project. This intensive survey was conducted over a core area of approximately 76 sq km in two major tributary valleys and the southeast section of the lower Egiin Gol valley. Topographical maps and aerial photos for the entire lower Egiin Gol were obtained at a scale of 1:25,000, and sample transects were overlaid onto base maps and images which were used by the survey teams to orient themselves on the ground. Transects were contiguous, oriented in cardinal directions, and varied in width from 160 to 200 m. Transect boundaries were marked by either the Egiin Gol river, an arbitrary upper limit to each tributary valley, or by valley slopes. Once lined up along a transect boundary, survey crews consisting of eight to ten members spaced at 20 m intervals walked the length of the transect using compasses, GPS units, and local topography for orientation. A few impassable areas such as vertical ridges and riverine swamps were not surveyed.

Transect width was adapted to suit conditions and crew size. Due to the lack of forest cover over the majority of the survey area, we encountered few difficulties maintaining our lines. One end of the line was anchored by a crew member with field maps who located and monitored transects as we progressed, while at the opposite end of the line, another person monitored crew spacing. Individual sherd and lithic finds along the transects were collected and noted in a transect notebook. In this way, the background artifact density of each transect was recorded without having to specifically locate single artifacts on the maps.

Our definition of a site was an area with surface scatters or sub-surface deposits of sherds or lithics consisting, at a minimum, of five artifacts and densities of two or more artifacts per square meter over at least two square meters. This definition was devised with the expectation that artifact scatters would be low-density and small. Areas with earthen features (e.g., walls, mounds, ditches, and embankments) or stone features (e.g., stelae, mounds, alignments, and groups of embedded stones) also qualified as sites. Sources of metallic ore and clays were noted on the survey field maps and samples collected. Historical agricultural remains, threshing stones, and millstones were recorded on survey maps as well. Information recorded for each site included an EGS number, transect number, date, site type according to site categories, local environment, site description, dimensions, orientation, and a GPS reading. Compass and pace sketch plans were made of all sites with surface features and estimated surface densities reported for artifact scatters. Artifact site dimensions were determined by walking in cardinal directions until finds diminished to fewer than one artifact per three to four steps. Those artifact sites without areas dense enough to qualify as a "site" proper were recovered as part of the transect collection.

Collections and Recovery

Our relative lack of knowledge concerning artifact types and their chronology led us to choose a conservative strategy designed to recover comprehensive site samples of diagnostic and non-diagnostic artifacts. Our understanding of artifact distribution across the landscape was according to a "site" model that focused on clusters of artifacts contrasted against a generalized background of very low density distribution. In order to keep track of background scatters of artifacts, all non-clustered artifacts were collected in a transect bag. These distributional data provided a check on our use of sites as loci for attention by giving us a broader sample of artifact deposition to be contrasted with site distributions. Our collection procedures were different for transects, low density sites, and high density sites. In transects all sherds, easily portable lithics, and small finds were collected, bagged, and labeled with the appropriate transect number, date, and comments. Small and low density sites were subject to 15–20 minutes of intensive surface collection of diagnostics, non-diagnostics, and small finds. Diagnostic sherds included rims, decorated fragments, and bases, while diagnostic lithics included cores, tools, and retouched flakes. At larger and higher density sites we conducted 15 to 30 minutes of surface collection of diagnostic and non-diagnostic artifacts. After a sufficient non-diagnostic sample (a 1-gallon Ziploc bag) had been bagged, collection was restricted to diagnostics.

Surface Visibility and Subsurface Exposure

One of the major sources of variability for surface survey at Egiin Gol was the potential for sites to be obscured by sedimentation or covered by vegetation. Geomorphological processes affecting site visibility include colluvial deposition at the bottom of ridges and hill slopes and soil erosion and deposition at the mouths of side valleys and smaller gullies. Vegetation growth during the summer months and grazing patterns further complicate site exposure. While neither of these problems made the identification of the larger stone features difficult, the minimal artifact scatters that we sought to discover were many times invisible. The intensive portion of the survey employed three approaches to remedy these problems. Modern agricultur-

Figure 3. A typical artifact scatter site in an agricultural field at Egiin Gol.

al fields in some of the major tributary valleys and in the main valley provided a large sample of non-vegetated and sub-surface exposure. These fields proved to be particularly important in 1997 for establishing the initial site distribution and for learning the locational variables that might be used to predict the presence of habitation sites (FIG. 3).

In areas where fields were few, we paid close attention to erosional channels, road-cuts, recent herder camps, and rodent holes for evidence of artifact scatters. As an additional sub-surface check, in portions of the intensive survey area, crew members performed shovel probes at 100 m intervals along every transect. Survey crew members carried lightweight spades with a blade width of 40 cm, such that a probe of approximately 40 × 40 cm and 40–50 cm depth could be rapidly cut into most topsoils. Our first season of shovel tests in 1998 included screening each probe with half-inch mesh sieves, a size small enough to find diagnostic sherds and lithics. In order to not over-burden the survey members, half the crew carried spades while the other half carried screens. In 1999, we ended the screening and opted instead for doubling the number of spades and using "chop, scrape, and feel" techniques to sift through soil probes for artifacts.

Standardized procedures were used for the collection and documentation of subsurface artifact scatters. In areas with no agricultural fields, we chose to assign greater importance to individual surface and sub-surface artifact finds. Any find required a test of the area around the artifact using 50 × 50 × 50 cm screened test pits spaced outward from the original shovel test or surface find in cardinal directions at intervals of 1 m, 5 m, 10 m, 15 m, etc. Five-meter interval tests would continue outward if artifact occurrence did not drop off. All artifacts recovered by the tests were bagged individually and labeled with an EGS number, cardinal direction of the test line, and meter designation of the test (e.g., EGS 10, North 25 m). Such testing provided information on subsurface artifact densities, site extent, and general artifact assemblage. Employing this intensive methodology from 1997 to 1999, survey crews covered slightly more than 1 sq km per day.

Nested Resolution Coverage

By 1999, it became apparent that the Mongolian government would not go forward with the Egiin Gol hydroelectric project and there was no reason to pursue the survey with salvage objectives in mind. Jeep forays through the broader region revealed major sites to the northwest of the intensive survey area, suggesting that our initial survey sample formed one branch of an interaction network extending further up-river. These combined factors convinced us that our high resolution sample of the lower valley could be used as a guide for more rapid and lower resolution survey of additional parts of the valley.

Extensive survey was conducted over approximately 121 sq km of the lower Egiin Gol, including several tributaries and a large section of the main river valley. Extensive survey included similar treatment of sites and site recording with the exception of drawing less detailed plans for stone features. The success of extensive survey in recovering sites was predicated on three years of intensive survey experience that gave us knowledge of what kind of settings might be expected to contain sites, especially artifact scatters. Most stone surface features were relatively obtrusive sites easily detected at some distance, and therefore we emphasized discovering habitation sites with artifacts and especially sherd and mixed artifact scatters. Topographical maps and aerial photos were used to block the survey area into quadrats of 1 sq km which were then surveyed by small groups of four to five crew members at 100 m intervals, followed by judgmental checking of areas having high potential for habitation sites. No shovel tests were conducted during this phase of the survey. Using extensive survey methods in 2000, two to three survey crews covered approximately 3.5 sq km per day.

Reconnaissance over approximately 113 sq km provided information on site distributions and site types in areas not included in the systematic portion of the survey. Survey crews carried out informal reconnaissance along the un-populated south bank of the river, on mountain ridges and peaks separating tributary valleys, through the mountain passes connecting three tributary valleys, and up smaller side-valleys bordering the survey area. Reconnaissance consisted of survey crews spread out with equal spacing across a given topographical feature and walking a transect line. In most cases intervals between field walkers did not exceed 150 m. Sites found in the reconnaissance phase of the survey were recorded in the same manner as those in the extensively surveyed area.

The vehicular survey produced the lowest resolution of surface observations in Egiin Gol. Highly visible sites were noted, located with handheld GPS units, and reconnoitered while driving along the roads leading in and out of the systematic survey area. Sites documented by this method were large monumental surface features including stone mounds, burials with standing stones, and stelae. Some less visible burial features and cemeteries were also found close to the roadside. These low resolution observations provide a sample of judgmental transects across the landscape useful in assessing the presence or absence of sites beyond the survey area.

Complementary Fieldwork

Excavation of settlement sites was an integral part of the Egiin Gol Survey project. While the survey was successful locating sites in and around the Egiin Gol valley, major gaps remained in our understanding of site chronology, function, seasonality, and associated subsistence behaviors. These questions were addressed by excavation of small-scale test units in settlement sites to probe soil stratigraphy and recover more comprehensive artifact assemblages. Larger excavation units recovered information on site function through the examination of pit, ditch, and hearth features that provided samples for radiocarbon, faunal, and botanical analyses. The test units were 1 × 1 m and located according to density and distribution of surface or subsurface finds. Sites thought to be representative of specific types and periods were excavated using 2 × 2 and 5 × 5 m units to expose approximately 200 sq m of habitation deposits down to depths of 40 to 75 cm. All excavated soils were screened using 1/4-inch sieves, and both dry soil and flotation samples were taken from promising cultural contexts for macro-botanical and phytolith analyses. Settlement site periodization was assessed using a combination of radiocarbon dating, local artifact chronology, published collections, and collections made by Egiin Gol crews at well-known type sites across central Mongolia.

The other main source of archaeological data recovered in the Egiin Gol valley was from the excavation of burials. These proved important for developing a local ceramic chronology and provided artifacts for compositional analyses. Burials were selected for excavation according to chronological period (based on a surface feature typology developed by Mongolian archaeologists). Surface features and internal structures were drawn and all excavated soils were screened using 1/4-inch sieves. All contexts and artifacts were documented, and human and faunal osteological assemblages were visually analyzed for basic age, sex, species, and paleopathology data. In addition to the limited number of burial excavations conducted by the Egiin Gol Survey project, we drew on publications of Egiin Gol mortuary research by Mongolian and French expeditions to the valley (Torbat, Amartuvshin, and Erdenebat 2003).

Table 1. Site type and recovery data by survey resolution zone.

Site data					*Site density (sites/sq km) by survey zone*		
Site type	*Period*	*Description*	*Size**	*Visibility rank*	*Intensive*	*Extensive*	*Reconnaissance*
All site types	All periods	–	–	–	3.54	1.64	0.54
Lithics	Upper Paleolithic, Mesolithic	Sparse artifact scatters	1866 sq m	1	0.29	0.08	0.04
Sherd and mixed artifact	Multiple periods	Sparse artifact scatters	3881 sq m	2	0.46	0.31	0.04
Mongol burials	Mongol medieval empire	Oval shaped stone features	2.98 × 0 m	3	0.75	0.26	0.04
Xiongnu burials	Iron Age	Ring shaped stone features	6.82 × 0.2 m	4	0.04	0.02	0.00
Buddhist stelae	19th–early 20th century	Standing stones	0.5 × 0.9 m	5	0.78	0.46	0.07
Slab burials	Late Bronze and Early Iron ages	Standing slabs with rectangular configuration	4.27 × 0.7 m	6	0.57	0.31	0.04
Khirigsuurs	Bronze and Late Bronze ages	Stone mounds with external features	9.24 × 0.9 m	7	1.93	1.33	0.59

* Area or horizontal by vertical mean size.

Evaluating the Nested Resolution Survey Design

The Egiin Gol Survey recorded 571 sites in the valley in the intensive, extensive, and reconnaissance survey zones. Some areas designated as sites have multiple features and assemblages from different phases. Site mapping was done in a manner that permitted individual features, for example multiple burial mounds within a site, to be assigned individual spatial coordinates. In total, the survey recorded over 1100 archaeological features and artifact scatters on the ground. We evaluated the nested resolution approach by comparing recovery rates from the different survey zones and assessing the survey data in relation to our research questions. Our evaluation focuses on the degree to which the application of knowledge from intensive survey facilitated discovery in the extensive survey zone and how the addition of lower resolution survey areas significantly informed the research.

The "value-added" nature of our survey design depends upon using insights from a high-information sample to accelerate recovery in unsurveyed areas with less effort. Two examples of the application of high quality information include using the same survey crew for each field season to make judgmental survey more effective and using locational data from a known site sample in a predictive model to guide survey efforts according to site probability distributions. Models based on logistic regression and constructed from GIS-based geographic and environmental data have been used in regional CRM site assessments, but caused controversy among archaeologists with the assumption that environmental, as opposed to social or ideological factors, primarily determine areas of habitation (Warren 1990; Wheatley and Gillings 2002: 179–181). These models, however, are appropriate and useful in conjunction with full-coverage survey to improve the recovery of unobtrusive site types.

Both of the above techniques were employed during the extensive portion of the Egiin Gol survey to discover low density sites with either sherds or mixed artifacts. Table 1 lists site type densities per square kilometer of survey and shows how our site samples varied over the different survey resolution zones. We assigned a relative visibility rank to site types based on a measure of obtrusiveness using horizontal and vertical exposure on the surface. There are a wide number of variables that influence obtrusiveness (Schiffer, Sullivan, and Klinger 1978), but in this case horizontal and vertical exposure are used as a general proxy for ease of locating sites during survey. We assigned prominent site types to the following categories: minimal obtrusiveness includes artifact scatters with no vertical exposure, ordered according to mean site area (ranks 1 and 2); moderate obtrusiveness includes stone features with little or no vertical exposure, ordered according to mean horizontal size (ranks 3 and 4); and finally, high obtrusiveness includes stone features ordered according to degree of mean vertical exposure and mean horizontal size (ranks 5, 6, and 7).

As expected, different zones of observation yielded greater site densities at higher resolutions of survey, though a closer look at site type densities shows a range of variation in recovery rates between intensive and extensive surveys. This is best demonstrated by a comparison between the visibility rank for each site type (i.e., expected

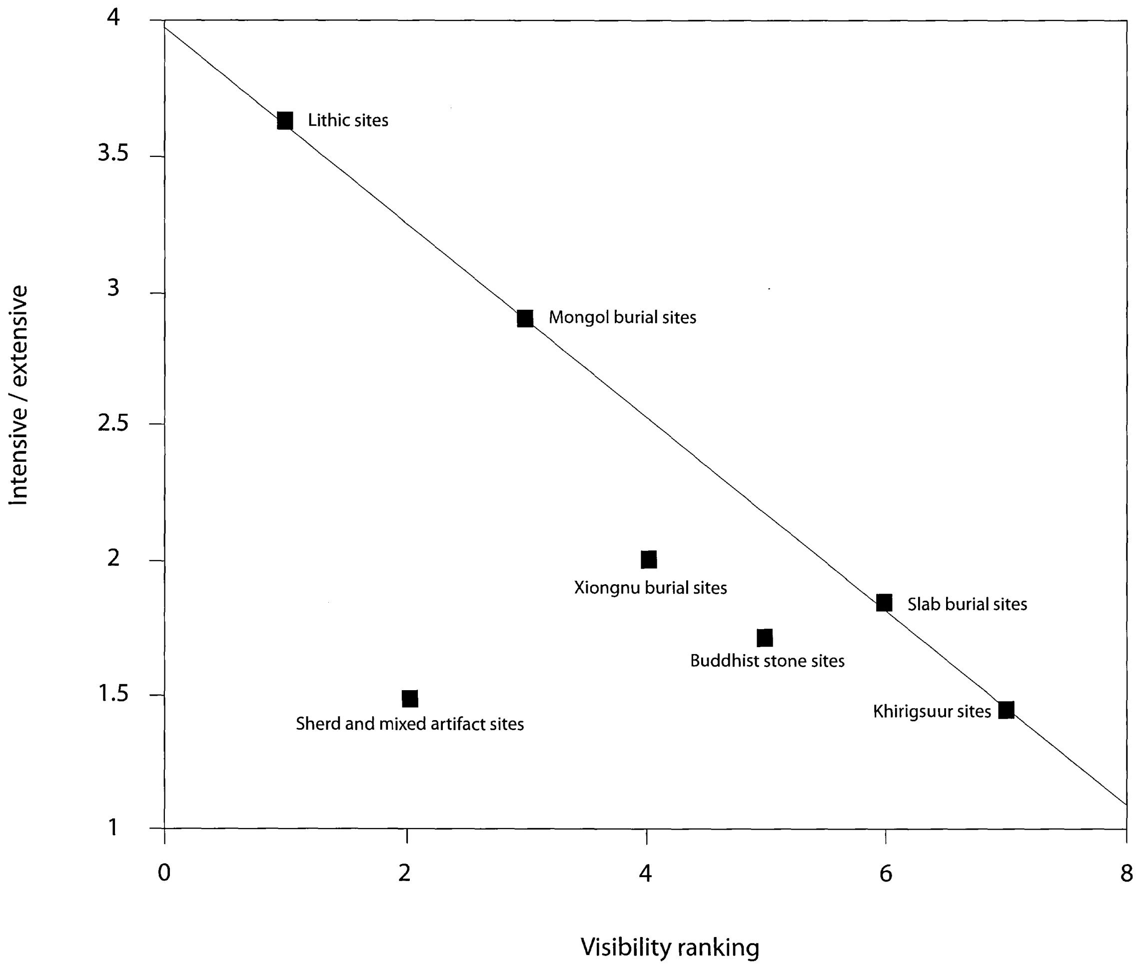

Figure 4. Comparison of visibility rank and ratio of intensive to extensive site survey density.

obtrusiveness) and the ratio of intensive survey site density divided by the extensive survey site density. When this ratio approaches the value of one, recovery rates for intensive and extensive surveys approach equivalency. Higher values of this ratio indicate an increasing discrepancy in recovery rates for the two survey zones. We would expect site types that are less obtrusive with lower visibility ranks to have higher ratio values, though at least for some site types this is not the case, as Figure 4 demonstrates.

The unobtrusive sherd and mixed artifact scatters that we targeted had a recovery ratio comparable to that of the most obtrusive sites in the field, the large *khirigsuur* stone mounds. For the artifact site type, densities in the two zones differ by only 0.15 sites per sq km. To test whether this difference is significant, we applied a "goodness of fit" test using observed site counts and expected counts derived from the percentage of total area represented by the intensive and extensive zones (39% and 61%, respectively). A one-sample chi square test with one degree of freedom shows that the difference in site recovery is statistically significant above the 90% confidence level ($p = 0.0945$, $\chi^2 = 2.796$, $n = 72$). While per kilometer intensive and extensive recovery rates are not equivalent, site recovery was still surprisingly similar given the 80 m difference in transect intervals between the two survey zones.

In order to explore this similarity, we calculated the probabilities for discovery based on site size and survey line interval (Banning 2002: 68). A roughly circular artifact scatter of 23 m in diameter has only a 0.042 probability for discovery with the 100 m line interval used during the extensive phase of survey. The same site has a 1.00 probability of encounter during the intensive survey, which used a 20 m interval. Therefore, the distribution of site sizes recovered within the two survey zones should be quite different if transect resolution is the means of detection. By comparing the size distributions of the sites discovered in the intensive and extensive survey zones, we found that there is little difference in their make-up. The mean and median site sizes for the intensive zone are 3795 and 625 sq m ($n = 35$), while the mean and median for the extensive zone are 3900 and 775 sq m ($n = 37$), respectively. The size distributions of the two site samples cannot be differentiated with any confidence (Wilcoxon ranked scores test, $p = 0.95$). These analyses suggest that extensive zone sherd and mixed artifact scatters were detected on the basis of an informed search strategy and not only on the basis of transect observations made at 100 m intervals. This additional information was systematically incorporated in the extensive survey from our prior experience with intensive survey. By assimilating and applying high quality information from an intensively examined area to an unknown area, we achieved a substantial level of recovery despite a less intensive degree of observation. In conclusion, for our research objectives the intensive and extensive samples are sufficient for understanding the spatial structure of settlement at Egiin Gol.

While recovery rates for all site types in the reconnaissance survey zone fall below those of the intensive and extensive survey zones, this phase of survey played an essential role in our research. We used this method to extend our understanding of the areas that either had little evidence for occupation, such as the forested south bank of the Egiin Gol river, or where additional checks were needed to confirm patterning suggested by the extensive and intensive survey. Reconnaissance was particularly useful for providing information about high mountain ridges and the upper reaches of tributary valleys. A notable example of this was the discovery by reconnaissance of extensive mountain passes and their associated archaeological sites. In this case, reconnaissance produced a more complete understanding of pathways and communication between tributary valleys which had organizational significance during the valley's history. Reconnaissance provided a rapid method for building up a picture at even larger scales, which helped to put results from the formal survey zones into a broader perspective.

Jeep survey beyond the Egiin Gol valley proper was another experiment in gathering extremely low-cost information at a large spatial scale. Given the informal nature of vehicle survey along a road network there is little need to calculate site densities for comparison. It is nevertheless clear that the large-scale perspective provided by these forays contributed substantially to our understanding of the presence and absence of at least the most obtrusive site types and especially for the monumental khirigsuur stone mounds. These sites were documented over an expansive area beyond Egiin Gol showing distinct spatial clusters at roughly 20 to 30 km spacing. This expanded understanding of the distribution of monumental surface features was useful in generating ideas for the way site patterns within the survey area might be related to neighboring river valleys.

The Research Problem from a Spatial Perspective

The Egiin Gol Survey project generated a number of lines of evidence for exploring the issues of diachronic changes in organization inside the valley as it was integrated with a regional political organization. Our survey captured different resolutions and scales of data extending outward from a core intensive survey zone. This allowed us to observe shifts in the effective scale of organization based on changes in boundary phenomena and redundancy of units (Marquardt and Crumley 1987).

As an illustration, we briefly consider data for the Bronze and Early Iron Age (BEIA, late 2nd–mid 1st millennium B.C.) and the Xiongnu regional polity period (3rd century B.C.–2nd century A.D.). The distribution of BEIA sites in the lower Egiin Gol valley (FIG. 5) suggests that the focus of activity during this period was clearly centered in tributary river valleys. Areas along the Egiin Gol river have comparatively lower densities of all site types. This lack of sites could be related to the geomorphology of the river's flood plain and site sedimentation or destruction. There, however, exist relatively large, low slope, non-flood plain grasslands between most of the tributary valleys which altogether lack BEIA sites, suggesting that the non-site areas in the main valley reflect socio-cultural behavior and not geological processes. Each tributary valley has roughly the same complement of site types. Sites also group in a fairly consistent pattern characterized by two clusters in each side-valley, one in the middle to upper elevations and the other at the valley mouth. Each side-valley, therefore, has a site assemblage and spatial structure similar to that of its neighbors. The distribution of BEIA sites points to a pattern of discrete, small-scale groups inhabiting side-valleys, each with sufficient pastoral resources and having uninhabited boundary areas between them, potentially due to spatial buffering.

Viewed at this large scale, it is clear that despite some segregation within the Egiin Gol area, side-valley groups acted together as a collaborative social unit on occasion, if not regularly. This is evident from the perspective of those areas surrounding Egiin Gol where a mixture of vehicle survey and reconnaissance was conducted. At distances of 20–30 km from the lower Egiin Gol, a drop-off of highly visible monument and burial complexes was noted, with the re-occurrence of such sites in river valleys similar to that

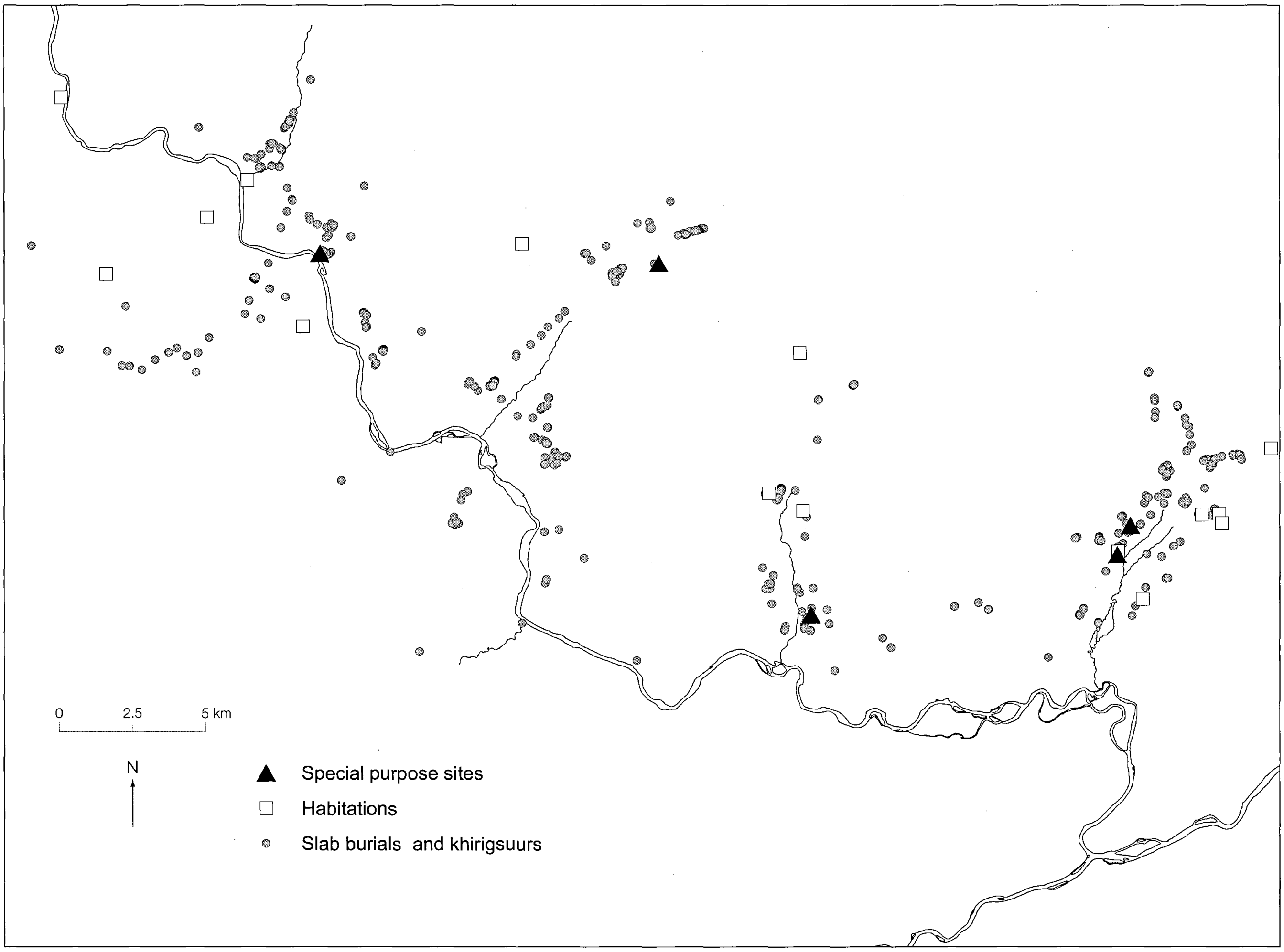

Figure 5. Late Bronze and Early Iron Age site distribution in the lower Egiin Gol valley.

of the Egiin Gol, at or beyond this distance (FIG. 6). Such large-scale patterning indicates that during the BEIA the Egiin Gol valley groups may have formed a single cluster among a number of groups dispersed over several river valleys in the forest-steppe region. A preliminary assessment of the intra-valley Egiin Gol patterning suggests the nested modular structure with buffer zones expected to occur with classic segmentary organization.

A comparison of site patterns from the BEIA and the later Xiongnu phase in the valley reveals that a substantial re-structuring took place during these periods. The Xiongnu phase at Egiin Gol shows a different site distribution pattern from that of the preceding BEIA. The most dramatic transformation is a shift of the majority of habitation and mortuary sites from the tributary valleys to the main Egiin Gol river valley (FIG. 7). A five-fold increase in the mean size of habitation sites is associated with this shift, from 0.25 ha during the BEIA to 1.26 ha in the Xiongnu period. The size distribution of habitations expands to include three distinct tiers with the largest site in the valley measuring slightly greater than 4 ha.

Approximately 91% of Xiongnu period settlements identified by the survey are located in the main Egiin Gol valley. Based on ethnographic and ethnohistorical pastoral patterns, this emphasis on the main valley indicates that the Xiongnu occupation may have been in the summer and autumn. Immature ovacaprid teeth and an unfused humerus from one main valley habitation site showing the presence of animals 5 to 6 months of age support this conclusion (Honeychurch 2004: 139–140). The significant depths of Xiongnu tombs, as much as 3.7 m below the surface, favor an interpretation of warm-season burial construction, since between November and April, Egiin Gol soils are frozen. Winter and spring sites may have been located in areas outside the valley, potentially indicating an expansion of territory involving inter-valley instead of intra-valley seasonal

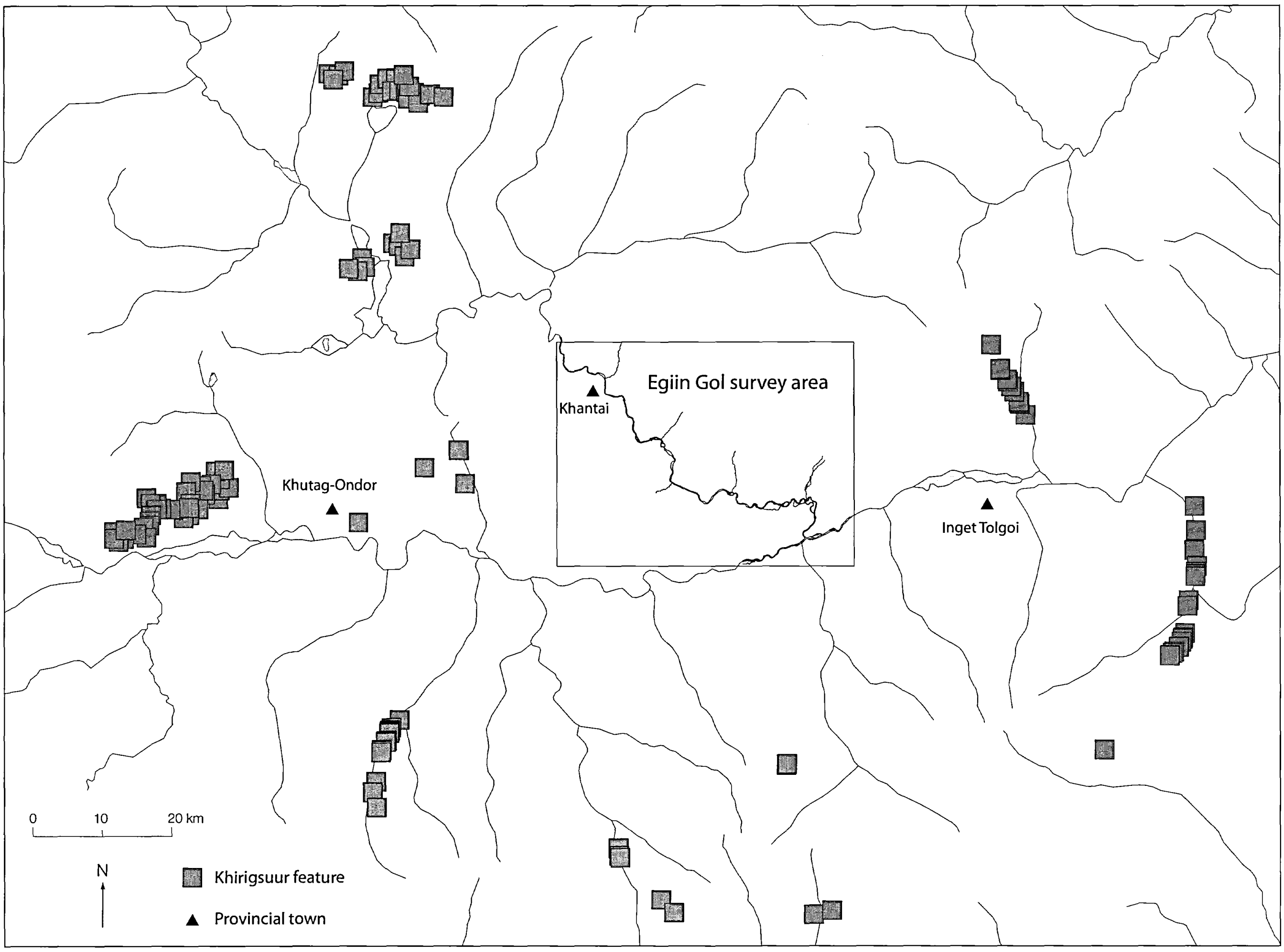

Figure 6. Vehicle survey observations beyond the lower Egiin Gol valley.

movement. Another interesting point evident from the Xiongnu settlement pattern is the appearance of large nodal sites marked by a lack of geographic centrality within the valley. An approximate geographical mid-point of the valley was in fact the location of the largest Buddhist monastery to the north of the river during the 19th century, a period of intensive agriculture and greater sedentism. During the Xiongnu period, we observe a very different pattern with the largest sites located in areas of entrance and exit to the main valley instead of near the valley's geographical center.

The spatial evidence from the Egiin Gol valley during the Xiongnu period supports a model of political integration and restructuring at the local level as a result of the valley's inclusion within a growing steppe polity. Furthermore, the character of nodal site placement at Egiin Gol relative to pathways of movement suggests a local integrative strategy based on the management of mobility. Given the mobile and factional potential of steppe groups, organizational investments that exploit mobility to place controls on factionalization represent an approach to statecraft uniquely adapted to the steppe political environment. As Owen Lattimore wrote long ago, "the phases of steppe nomadic history are to be traced by the rise and fall of greater and lesser lords who are protectors of the right of movement of men" (1992 [1940]: 67).

Conclusion

The Egiin Gol Survey was successful in recovering necessary data for our research questions despite, or perhaps because of, the changes and difficulties encountered during the execution of this multi-year project. Our experiment with different resolutions and scales of survey observation is not unique; indeed, the basis for multi-stage research design was first advocated over 30 years ago (Redman 1973). Other uses of variable scales of resolution in survey include

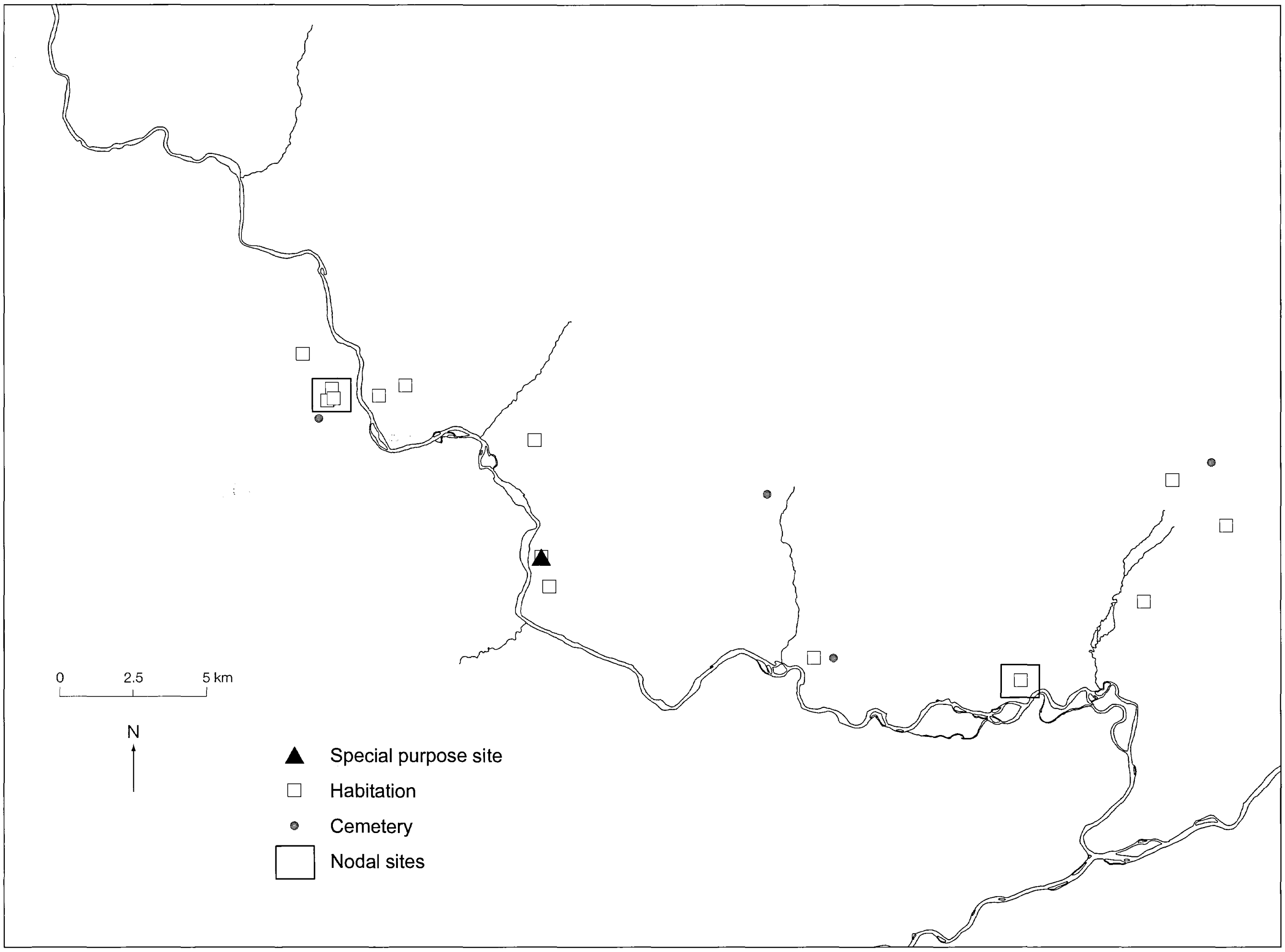

Figure 7. Xiongnu period site distribution in the lower Egiin Gol valley.

experimental designs to study recovery rates at nested intensities of observation (Burger et al. 2002–2004) and extensive reconnaissance used to contextualize systematic survey samples (Stanish et al. 1997). While it is clear that some research questions could not be addressed with our differential treatment within the survey area, we argue that our approach is useful under certain circumstances. Where little is known about the spatial characteristics of a specific archaeological record or the spatial qualities of the populations to be studied, an approach using different intensities of survey across a large region is one solution (Gaffney and Tingle 1989: 7).

Such an approach complements the standard multistage process of taking a large-scale, low resolution look at a region in the form of a pilot survey as the basis for making survey design decisions (Schiffer and Wells 1982: 375–381; Orton 2000: 98). For the Egiin Gol project, because we had little idea about the local archaeological record and no basis for determining a socio-spatial extent for study, we used input from an informal reconnaissance and then proceeded to collect a high-quality sample that informed a more "intelligent" and, consequently, lower cost survey of unexplored areas. In this way we avoided the pitfall of systematically overlooking or underestimating the spatial structure of small but potentially important site types that might be missed by low resolution approaches (e.g., Upham 1988). Our initial high information sample was enough to give us a sense of site range, variability, salience, interrelationships, and locational patterning. Additional resolution tiers added a broader interpretive context and permitted us to explore the problem of capturing greater ranges of socio-spatial scale beyond the core survey zone. In discussing survey intensity and spatial coverage, George Cowgill (1990) points out a persistent problem in survey design. Archaeologists may survey a larger area at lower resolution and risk losing small-scale patterns, or they may opt for high resolution survey over a small area and miss the larger picture. Our experience in Mongolia with a nested approach to survey research design has struck an advantageous balance between these two extremes.

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