New Tools for Understanding Plains Indian Sites in Grasslands National Park, Canada

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Abstract: With over 3000 Native sites containing more than 20,000 features, site survey in Grasslands National Park has an ongoing issue of trying to get good research information while conducting rapid surface surveys and still providing cultural resource management tools. All of the original survey was done by hand recording techniques. Recently, we have been using GPS to record sites at the feature level and taking some basic feature information. This information has been analyzed within SPANS GIS to provide far more accurate and detailed site maps, at times raising the whole concept of what is a site. It has also been used to analyze tipi rings in large sites to look for patterns of settlement, as it is highly unlikely that large sites with 20 to 200 rings resulted from a single occupation. This technique has successfully broken some of these large sites into patterns that can be hypothesized as individual camps within the larger area. This talk will demonstrate how we have improved on initial survey techniques and how the intrasite analysis has been used with some positive results.

Introduction

This paper presents some initial findings on survey field methods that take advantage of Geographic Positioning and Geographic Information technologies to produce better results than previous methods, saving time, money, and promoting better research in an applied situation. The paper has three basic objectives:

1. To identify issues of survey mapping
2. To describe field recording techniques used in Grasslands National Park, and
3. To present results of an analysis of feature mapping.

Grasslands National Park was established in 1981 to represent Canada's mixed grass prairie. With its establishment, a small portion of North American Great Plains has been protected and made available for public use. The Great Plains are characterized by relatively little topographic relief, wide expanses of grassland, and a semiarid climate. The northern portion, where this park sits, is further characterized by short, hot summers, long, cold winters, and periodic, intense droughts. The former habitat of the bison, it is still the home of pronghorn antelope, elk, and such endangered species as the swift fox, burrowing owl, and prairie dog. The park is accented by a massive glacial spillway through which the Frenchman River flows.

The park is established in two separate blocks. The West Block features the Frenchman River valley and its surrounding terrain. The East Block is oriented to open prairies, running from the Wood Mountains, prominent hills that mark the north-south continental divide, south to a large erosional feature called the Kildeer badlands. The entire park is actively being created from the purchase of private lands on a willing buyer - willing seller basis. To date, approximately 50% of each block has been transferred to the park.

The Evolving Methodology of Area Surveys

Simply because it is so open and accessible, the park initiated an intensive archaeological survey of the surface remains on all owned properties. At that stage, the primary objective was simply to find the sites (Adams and Filopoulos 1995:3-6) and describe their approximate nature and extent. Two field workers spent a month or two each summer over six years between 1985 and 1995 hiking the park and recording its cultural features. The basic methodology was to establish a daily traverse over a given set of terrain features, using air photographs as guides. Each encountered site was recorded on a survey form that included basic site information and a sketch map. Even the most significant of sites with 50 or more features seldom took a half hour. Locations were then transferred from the air photos to a 1:50,000 topographic map to obtain coordinate information and to a 1:20,000 air photo mosaic to identify terrain features and the site boundaries. To determine site entities in a highly concentrated area of cultural features, the practice was to create a new site if 100m or more distance occurred between cultural entities, or, if the terrain contained a major break, like a cliff wall. The surveyors ignored small, isolated flakes of chipped quartzite, otherwise the whole park would have been designated as a half dozen sites.

From the onset, it was realized that following this form of survey, the surveyors could miss major features and links between sites. In one practical test of the methodology, an instrument survey of a single site in 1991 revealed just how much error there might be. The site was originally described as 35 tent rings spread over a piece of knob and kettle terrain around a small slough. Three people working for two days with an alidade and plane table, broadened that to 65 tent rings that came dangerously close to merging with three other sites.

At the conclusion of the survey, 3100 archaeological sites were inventoried and entered into a database. The major features that were encountered included:

- Tipi Rings: 13,000 circular configurations of cobbles left behind from a tipi. They were originally used to hold down the skin covering. These are critical archaeological resources as they outline households, define living space, and establish both community and landscape settlement patterns
- Cairns: 2,700 large piles of rocks with many purposes including burials, caches, beacons, ceremonial functions
- Bison Kills: 11 major communal hunting sites where bands congregated to herd bison over cliffs or into pounds where they could be dispatched in large numbers for feasts, immediate needs, and preserves of meat. Identified by linear rock lanes that extend up to 10 km and funnel toward the kill site,
- Vision quests: 14 small cobble nests where a young man would retreat for a period of fasting and meditation to obtain a vision that would set his name and his destiny
- Effigies: three cobble configurations laid out in human or animal forms
- Medicine wheels: 11 wheel-like rings with spokes and a central hub that were probably used in ceremonial activities
- Cobble configurations: 62 undefined alignments of cobbles.

The original methodology suited the purposes of rapid recording and creating an overall inventory, but had severe limitations on quality of data. Periodic quality checks demonstrated that small sites were occasionally misplaced due to the problems of map placement. The survey test identified that large, but nonlinear sites could have as many as half the features unrecorded. There was very little data being generated for further analysis and, finally, there was little confidence that the original site border descriptions were accurate. However, this was offset by the benefit of a complete initial mapping of the park. The quality checks indicate that approximately 95% of all surface sites larger than 10 m^2 have been recorded. It gave both park managers and researchers a base line inventory of what to expect when called back to evaluate land for environmental impact assessments, trail development, prairie fire damage, threatened resources, or new research.

The known data gaps and quality problems began to be addressed in 1998 (Adams 1999). Some of the initial sites are now being reinvestigated as part of an ongoing project to monitor and evaluate resources. Though this program is multifaceted and conducted with limited resources, one aspect is to examine the whole survey methodology. The current survey component is focused on intrasite mapping of selected sites where significant research or interpretation potential was evaluated in the initial visit. The methodology for the re-survey has changed substantially.

First, two surveyors traverse a defined geographic area with a single site or several closely spaced sites, locating as many features as possible and marking each with a flag. Once an area is prepared, the team returns with the G.P.S., a tape measure, and a compass. While the coordinate readings are being taken, a specially prepared sheet is filled out to identify and number the feature, measure its diameter in two directions, and record incidental notes. If it is a tipi ring, it is divided into eight pie-shaped pieces from magnetic north, and the number of perimeter cobbles for each segment is counted. Additional features like internal hearths, double lines, and cobble platforms were also noted. In some sites, a minimum of 40 individual readings are taken with a Trimble Navigator Basic Plus at the centre of each feature. Readings were differentially corrected with Pathfinder Office version 1.10 software using base station data from the U.S.F.W. office in Lewiston, Montana and averaged to provide a point location with about +/- 3m of accuracy. When the selected availability is turned off, Garmin G.P.S. 12 XL units are used without correction to obtain averaged readings with similar error magnitudes. That done, the surveyors recheck the area for any additional features. The flags are all removed at the end of the survey. Two people, using a form for consistent observation and recording, can map and describe between 50 and 150 features in a day, depending on the number of attributes recorded.

Feature mapping has one very practical benefit. It allows the archaeologists to create reasonably precise site maps with a minimum of effort by superimposing the archaeological data points over a geographic base map. One major problem is that the scale of feature mapping incorporates accuracy factors that are not yet available in the core data sets. Most of the background data for the park was generated from the 1:50,000 National Topographic System maps. When attempting to overlay individual features with coordinates that are often less than 10 m apart onto this background, numerous small errors have very visible implications.

The Problem of Large, Complex Sites

In many parts of the park, the initial survey had identified clusters of large tipi ring sites, converging on a favourable location or accompanying a communal bison drive site. After the experience of hand mapping one such area and doubling the number of rings in the site, the archaeologists were concerned about validity of the previously identified site boundaries and the accuracy of the original feature counts. In these compacted habitation areas, there was also some doubt as to the applicability of the original definitions of a site. The working definition used to characterize a site has created a situation where the Archaeologists have defined their very nature is based upon a few spatial constructs that make good management sense but may not have related to the original settlement pattern.

The first part of this problem, a more accurate count and description of the features has been adequately addressed by the shift in methods. Though there undoubtedly a few features within a given site that are still unrecorded, the vast majority are now identified, correctly located in relation to each other and described with enough attribute data to permit further analysis of settlement patterning.

An experiment to address the aspect of border definition was conducted at a locale called the "Buttress" (a term given to the hills because of their fortress-like shape). The Buttress contains a particularly dense collection of sites that incorporates almost every kind of feature within a small geographic area. The original, manual survey identified 18 sites in a small land holding containing less than two sections (518 ha). In this area, the northern sites are all habitations of four to 50 tipi rings and associated features. The southeastern sites are processing sites with few features. Bison drive lanes run right through the complex. This configuration has always implied some interesting research problems related to settlement patterns. Was the Buttress heavily used as the gathering spot for small groups to camp together and direct a communal bison hunt? It appears to have all of the constituent parts to make that a possibility; ring sites, processing areas, drive lanes, large and small cairns, diverse terrain, access to water, and even a bison gathering basin. Alternatively, was it a favorite campsite for small groups that reused the area repeatedly for centuries, creating the impression of a large site complex?

In a specific portion of the Buttress, measuring 1400 by 600 m, the initial survey had identified ten sites and half of an eleventh site that continued outside the test area. This entire area was re-surveyed using the feature methodology, with no reference to the known sites and the data from the two surveys were compared by superimposing them on a GIS map. It became immediately apparent that the original survey data bore little resemblance to the spatial distribution of the features. While some of the smaller sites retained their original distinctions, three of the largest coalesced into a single "supersite" even though the total number of features within the test area remained relatively similar. Experiments in two other site concentrations have not yielded the same magnitude of error. It is now believed that the degree of error is directly related to the surrounding terrain. The problem is considerable where there are no natural boundaries like river channels, valley rims, or large hills that the surveyors could use to establish and reaffirm their bearings in the initial survey.

Intrasite Feature Patterning to Define Occupations

The shift in tipi ring patterning noted in the test area led to a more detailed analysis to determine whether culturally defined settlements might be hypothesized within the test area and its 89 habitation features. The test for cultural patterning presupposed that there was some organization to how camps were arranged. Laubin and Laubin (1957:231-242) go into some detail about camp circles and the different ways large gatherings establish circular camp patterns in summer and linear patterns in winter. Other historic accounts refer to camp circles being preferred in homogenous environments while linear arrangements were common along watercourses or other linear features. Small camps rarely conformed to these patterns. Instead, the primary determinants of camp patterns in small sites were simply distance and family relationships (reviewed in Quigg and Brumley 1984). Across the Northwestern Plains, archaeological surveys mostly encounter the remains of small camps with no apparent pattern. However, even larger archaeological sites seldom exhibit any distinctive camp pattern. One explanation might be that superimposed camping obscures the patterns of the individual camps. If a large site was a preferred camp location, several small encampments would leave the impression of one large one on the ground. One 38-ring site in Alberta is known to have at least six cultural groups represented over a range of 4000 years. Yet every ring was visible on the surface (Stuart 1990).

Within the test area, a map of the features surveyed revealed two obvious patterns of rings. Each of these concentrations has four or five rings in a north-south alignment, and a single tent to the east. The north to south alignment is a good initial indicator as it is an ideal arrangement to provide an opening to the rising sun. Using these two subsets as guides, a series of assumptions was used to test whether or not other patterns could be discerned.

The first assumption was that if families lived in a single group at one point in time, and shared a very similar technology, then it would follow that their tents would be very similar and their footprint on the ground would be similarly sized. The validity of this assumption is very questionable as no researcher into Northwestern Plains tipi rings has yet to demonstrate any relationship between ring diameter and age or cultural affiliation. Quigg and Brumley (1984:30), in fact, offer a completely different perspective. However, for the purpose of this study, a contour analysis was run to create contour intervals for each size of ring in metres. In that analysis, the two guiding areas appeared to have similar sized rings though the ring to the east was different in both cases.

A long-standing argument in archaeological literature debates the value of "rock loading," a process by which more rocks are found in the octants (one-eighth) of a stone circle that face the prevailing winds. Brumley and Dau (1988:127-130) found a general correlation between mean octant rock loading and mean yearly wind velocity in Forty Mile Coulee but were less successful in identifying the month of year or contemporaneity with a set of rings (see also Krozser and Hjermstad 1995 for a discussion). The numbers of rocks for each octant, starting from magnetic north, were recorded. The initial mapping of these contained too many tied numbers and spurious concentrations so the data was reorganized in two segment units. The two adjacent segments with the highest numbers of stones were plotted. This analysis demonstrated that there was no precise uniformity in the two guiding areas but there was general agreement. For instance, in one control, two rings had rock loading to octants 1&2, one to 2&3, and one to 3&4. This led to a categorization of rings with identical rock loading and adjacent rock loading characteristics.

Many tipi sites have central hearths within them for cooking, heat, and light but many do not. There are also several styles of hearths, some with rock liners or rock bases and others that lie flat on the prairie with no liners. Absence of internal fires can only be a summer phenomenon when there are long light periods, and cooking fires would actually create more heat than is desirable. This resulted in the third assumption that rings in close proximity with or without surface evidence of fires may indicate contemporaneous seasonal occupation. Since none of the sites are excavated, evidence of fire was taken in a hierarchical approach. No evidence of fire; evidence of fire broken rocks in or near the ring; small clusters of cobbles within rings that could be hearths; and both forms of evidence; increasingly indicate the presence of an internal fire.

The final assumption made was that tipis within a single occupation would be set up in relatively close proximity to each other. Therefore, tents with very similar attributes but great distances apart would not be considered as part of the same set.

Even at this simplified level of analysis, the variables were difficult to handle. Eventually, 13 clusters (B to N) were isolated, each with consistent attributes of proximity, size, rock loading, and fireplaces. Category M was unusual in that all of the rings were of large diameters, a metre larger than the other rings but they did not cluster together. Instead they seemed to be almost regularly spaced across the large hill that served as the focal point of the study area. The residual rings were then reexamined to find close, but not perfect, fits with the existing categories. In this way, eight of the categories developed variants (C1 and C2 or D1 and D2, for example). These variants were interpreted together as a single category since the differences between the rings were minor. See fig. 1.

Several of the clusters (B, C, D, H, and L) did organize into straight lines, suggesting linear arrangements of three to four tipis. Only one group (M) appeared to form an arc of five rings. As noted above, the largest rings (J) seemed to be spread out widely over the entire site area. If these are contemporaneous, the form a pattern as yet undefined in the literature. One other group (E) seems to be too widespread to be considered a single occupation though all three examples are within a small portion of the study area. Group G was discounted as it has only two rings. The remaining groups (F, I, K, and N) all appeared to be in tight, relatively formless clusters.

The existence of the groupings also delineated another pattern, formerly unrecognized. If the patterned groups of M and B are considered to be separate components and are removed from the landscape, the remaining rings in the northwest corned of the study area form an almost perfect camp circle, 120 m in diameter, incorporating group L and a number of ungrouped rings.

Concluding Comments

The observed patterns are all extremely tentative and of little direct applicability for interpretation. However, they have established a testable hypothesis for further investigation. This same technique can be applied in other large sites to determine which rings should be excavated in situations where developmental pressures are requiring environmental impact mitigation or where excavation research funding is available.

This paper was developed to demonstrate how Geographic Information Systems and Global Positioning Systems have improved or will benefit a field archaeologist, working under cultural resource management frameworks. Within that context, two points appear to stand out.

1. Without the GPS, none of this would have been started. In a non-research format, financial support does not exist to allow traditional intra site mapping on this kind of scale.

2. Without GIS, the analysis of the data would probably not have provided the same observations. The ability to read the attribute data spatially and make interpretations on the nature of that data was a crucial step in the analysis.

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Figures

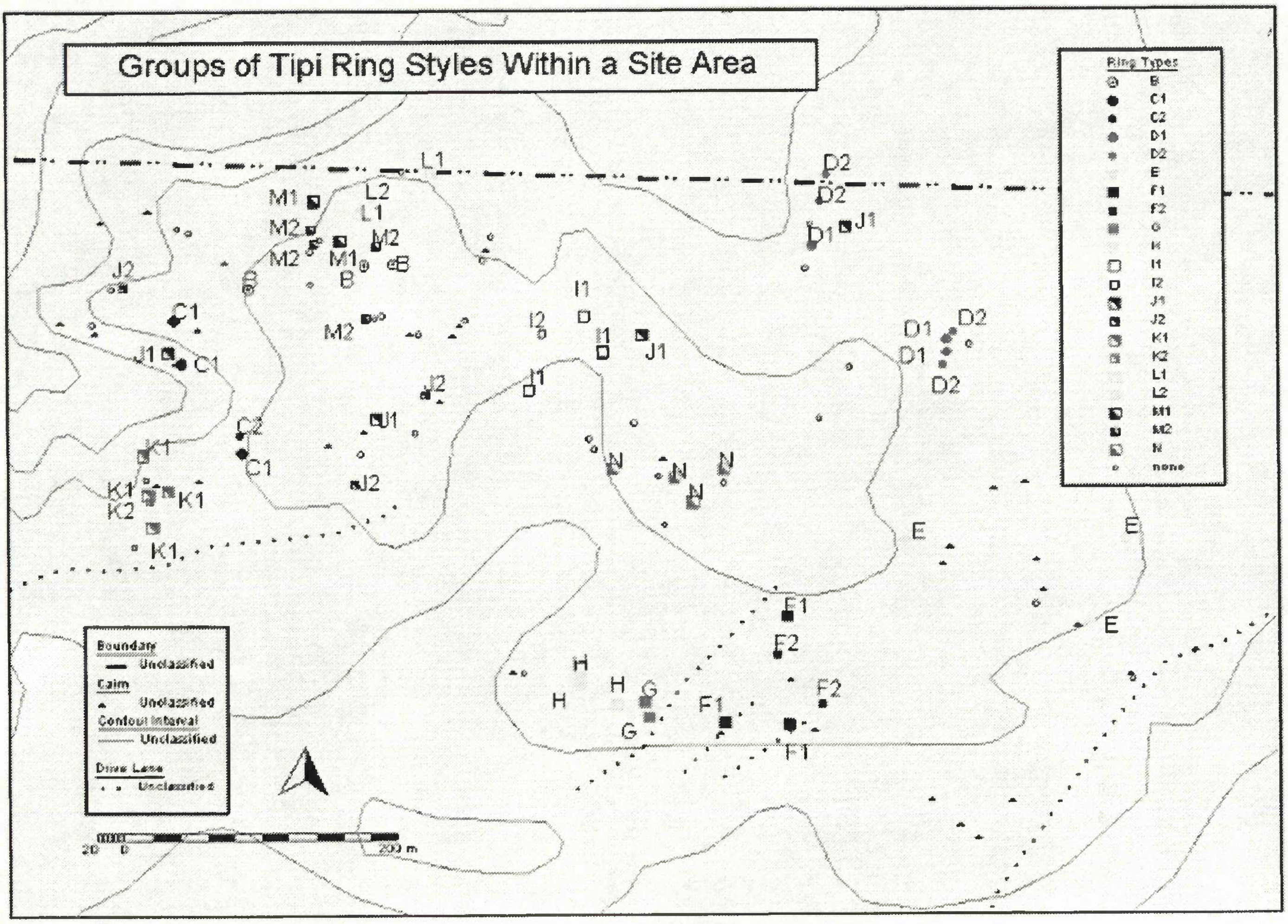

Figure 1.