

Chapter II

The Goals of Archaeological Survey

It is easy to think of examples of surveys that failed to detect the sites of greatest interest, that provided biased estimates of a site's date or importance, or that yielded none of the contextual information or economic evidence needed to investigate a particular research problem. Most failures of archaeological survey, however, are due to inappropriate survey design and especially to failure to tailor that design to the survey's objectives.

The results of any archaeological survey depend heavily on the objectives it was designed to achieve. No one should expect a survey to be good at discovering small, open-air campsites if it employs methods suitable for finding caves or large town sites. Nor should methods that preferentially discover certain kinds of site at the expense of others be useful for estimating the proportions of site types on an archaeological landscape. Surveys designed to discover highly clustered material culture, such as sites, cannot be expected to be effective for helping detect or understand ancient human activities that were dispersed on the landscape. Furthermore, surveys designed to provide representative samples of populations, a very common design in archaeology, are not at all effective at finding rare materials or detecting some kinds of spatial structure. It is essential that the strategies and methods for implementing a survey are consistent with the survey's goals.

1. TYPES OF GOALS

These goals are not self-evident, as indicated by the commonly held and often uncritical assumption that all surveys aim to produce representative samples of populations (e.g., Lewarch and O'Brien, 1981:298; Schiffer et al., 1978:1). In fact, archaeological surveys fall broadly into three categories. Sometimes a survey's goal is simply to find archaeological materials of a particular type or age, or that can be used to test very specific hypotheses. Survey of this kind is "prospection." Quite commonly, surveys are designed with the goal of estimating the number or density of sites or artifacts, identifying the range of site types in a region, the proportion of each type, or the proportions that satisfy certain environmental or cultural conditions. More generally, their goals involve estimating parameters of some archaeological population or populations, testing some statistical hypothesis, or generating some predictive model. Achieving these goals does

indeed require samples representative of a population, and projects of this type are thus "statistical surveys." Other surveys aim to identify spatial structure in the distribution of archaeological materials. The kinds of pattern they may seek can include the way settlements are arranged relative to their nearest neighbors, or relative to roads and waterways, as well as whether archaeological materials are clustered or evenly dispersed or how the probability of cultural remains being present varies over space. I propose calling survey of this type "structural survey," although some authors favor such terms as "total survey," "siteless survey," "off-site survey," or "non-site survey" for some surveys of this type.

Some survey designs satisfy more than one of these goals. For example, a survey might be suitable for determining the proportions of several site types and also to find at least one example of a type of site that is so rare that it would not likely turn up in a statistical sample.

The goals of archaeological assessment, as in Cultural Resource Management, typically are of the statistical type, as the managers of cultural heritage usually need to know what kinds of archaeological materials are under their care and how they are distributed. They are also concerned with the construction and use of predictive models for the distribution of archaeological and other heritage occurrences. However, identifying and protecting rare and significant sites is also typically in their mandate, making prospection quite useful. Furthermore, there is no reason why cultural resource managers should not also show interest in the relationships among sites, one kind of spatial structure, or how "non-site" materials are distributed. Assessing the significance of archaeological entities and using predictive models are issues to which we will return in chapter 8.

1.1 Prospection

Although prospection is common in archaeology, there is sometimes a tendency for archaeological prospectors to use methods more appropriate for statistical surveys, probably out of fear of seeming "unscientific." The common answer to the question of how to find archaeological sites is to use a statistical sample. Yet a statistical survey is actually a very poor way to discover specific, and especially rare, kinds of archaeological materials because it is explicitly designed to find mainly the typical and common ones (Asch, 1975; Cowgill, 1975; Redman, 1974:22). Only an extremely large statistical sample can dependably include observations of rare phenomena, and detecting rare classes of material culture by this means is very wasteful of resources. More generally, sampling is not meant to optimize the discovery of archaeological materials, but rather to make generalizations about them. Prospection is the type of survey involved in *finding* sites.

Well designed prospection, often called "purposive survey," takes advantage of any information available that may improve the chances of discovering the archaeological remains of interest, or the "target." For example, if previously discovered Paleoindian sites in a survey region have all occurred on fossil beach ridges, in spite of attempts to find them elsewhere, to ensure very thorough inspection of all the fossil beach ridges would be prudent (e.g., Storck, 1978; 1982; 1984). If the goal is to find lithic quarrying

sites, surveyors should consult geological maps to concentrate inspection in areas where suitable lithic raw material was likely to occur at or near the surface. In some cases, furthermore, a survey's objective may be to find the raw material sources themselves, and not "sites" as conventionally defined. If the goal is to locate and map Roman roads, meanwhile, it might make sense to concentrate effort on strips of land between known Roman cities, with particular attention to topographic features, such as mountains and rivers, that probably affected roads' locations.

Prospecting concerns the recovery of archaeological data ('recovery theory,' Sullivan, 1978), with particular emphasis on optimizing the probability of detection. Most archaeologists will be surprised to learn that there is a large body of literature on how to do this. Research on how to detect targets quickly and efficiently was intense as long ago as the Second World War, and today informs search-and-rescue operations, mineral exploration, optimization of computer disk drives, and even internet searches (Banning, 2002). This body of theory is also applicable to archaeological searches.

Typically, a well designed prospection combines a wide range of background information to determine which locations are most likely, and which only somewhat probable, to contain the type of archaeological evidence we seek. Surveying only locations where the probability of detecting such materials is high makes the results of survey inappropriate for generalizations about whole populations; such generalizations require statistical survey instead. Yet generalization is not the goal of prospection, and informed search of the most likely locations is the most efficient way to detect the evidence of interest. Objecting to prospection on the grounds that its results are biased is like objecting to search-and-rescue missions that detect lifeboats rather than open sea.

In fact, some archaeological surveys have the goal of locating very specific targets, such as a particular shipwreck or a particular colonial outpost known only from historical records. In these cases, archaeologists can not only take advantage of clues in the historical evidence, they can sometimes exploit the extensive theoretical literature on optimal search (e.g., Koopman, 1980; Stone, 1989).

In addition, as Cowgill (1975) has emphasized, testing some kinds of archaeological hypotheses requires what he calls "selection," rather than statistical samples. For example, a predictive model for the distribution of archaeological materials in the Reese River Valley that is based on Steward's ethnographic observations is testable by intensive search of locations where the model predicts materials should and should not occur (Thomas 1972; Williams, et al., 1973). Survey of random spaces in this valley would be at best an inefficient way to test the model. This is a situation that clearly calls for prospection instead.

Modern prospection can take large amounts of information into account by using Geographic Information Systems (GIS) to classify areas on a map by their probability of yielding archaeological remains of the type specified, once a GIS model has been built on the basis of previous knowledge. "Groundchecks" — survey targeted at the predicted locations and a sample of places where the models predict none should occur — serve to test the GIS model and recover relevant data.

1.2 Statistical Survey

Surveys with the goal of estimating population parameters, building predictive models, or testing probabilistic hypotheses are usually achieved through sampling designs (chapter 5). In these cases, it is not necessary to detect all archaeological materials, or to find specific sites. Instead, a survey can satisfy its goals as long as it recovers a sample that is representative of the population of interest, and is of sufficient size for estimates to be reasonably precise and accurate. Sampling rather than examining whole populations reduces the cost of fieldwork and analysis while also, in some cases, preserving unsurveyed parts of the archaeological record for future generations. This is the type of survey that many archaeologists today regard as standard. In fact, even among statistical surveys there can be great variety in both goals and methods.

1.2.1 Populations, Parameters, and Estimation

It is useful to review briefly the difference between the archaeological population or “universe” of interest and samples, which are what archaeologists actually study. Whether or not archaeologists employ sampling theory, their analysis is based on only a subset of the evidence that could, in principle, be studied or could have existed in a study area. For example, one could define a population as all the prehistoric artifacts lying within a “universe” bounded by the Reese River Valley’s watershed, while the sample might consist of only a few thousand artifacts found at various locations within this universe. More commonly, the population consists of a set of spatial units, such as square quadrats, and the sample is a subset of these units. When archaeologists use statistical inference, statistics of the sample, such as average artifact density, serve as estimates of *parameters* of the population, which are unknown. Many archaeological surveys aim to estimate such parameters as the number of Archaic sites, the proportion of Hohokam sites larger than 0.5 ha, or the density of Neolithic artifacts.

1.2.2 Estimating Densities of Sites

A common goal for a survey of a previously unexplored region is to estimate the number or density of all archaeological sites of each major period, cultural type, or technocomplex. As long as estimated site density is accurate, estimating the number of sites simply involves multiplying the density by the area of the survey universe. If, for example, a well designed sample of 500 m x 500 m quadrats has allowed estimate of the density of Iron Age farmsteads as 0.15 ± 0.05 sites/km², the number of such farmsteads in a survey universe 40 km² in area would be about 6 ± 2 .

McManamon’s (1981) survey of the Cape Cod National Seashore, Massachusetts, is an example of this type of survey. Its goal was to facilitate management and interpretation of the region’s archaeological resources by allowing estimates of their location, frequency and some of their characteristics. In effect, locations were classified as be-

longing to one of four environmental strata in a stratified sample, and in each stratum McManamon attempted to estimate site frequency, or density (average number of sites per sample unit).

1.2.3 Estimating Densities of Artifacts on the Landscape

Today it is increasingly common for surveys' goals to require information on whole archaeological landscapes, and not just on the clustered remains associated with "sites." Although the ultimate goal of most such surveys is to decipher the structure of material culture in space (see section 1.3), some of them concentrate on estimating the densities of material culture in different environmental zones. The underlying assumption of these surveys is that elevated densities in particular kinds of geographical contexts reflect repeated or persistent use of these places as preferred locations for settlement or as favored resources (see chapter 1, 3.1.5). In some instances, the densities are in space-time, rather than only in space, in order to account for the fact that more artifacts can be expected to accumulate over long periods than short ones (Foley, 1981:176). Rather than simply number of artifacts per hectare, for example, it might be better to estimate number of artifacts per hectare-century.

Survey of the Amboseli Basin in Kenya (Foley, 1980) is an example of a project in which the goal was to use the densities of material culture to identify preferred habitats and infer aspects of prehistoric subsistence behavior. To accomplish this goal, it is not strictly necessary to measure artifact density continuously over large landscapes, but only to measure it at locations in a stratified sample. The subpopulations or strata correspond with different kinds of habitats and significant differences between the subpopulations in artifact density would help us identify the ones where human use or occupation was persistent, repeated, prolonged, intensive or produced unusual amounts of refuse.

1.2.4 Estimating Proportions of Site Types

Many surveys have as their principal aim the estimate of the proportions of sites that belong to different size classes, chronological periods, cultural taxa or functional type. This was a major component of the first attempts to reconstruct ancient settlement systems (e.g., Willey, 1953; Adams, 1965).

A common goal of survey is to document site hierarchies. The ratio of different site types to one another can even help us infer the structure of a settlement system, although to demonstrate its existence would require further survey of a different type. For example, a distribution that included approximately 12 small settlements and two or three medium-sized settlements for every large one might hint at a hexagonal settlement lattice, but would not be sufficient to demonstrate it (see chapter 7).

An even more common goal is to determine the proportions of sites belonging to each time period. This information may be essential for Cultural Resource Management. Often archaeologists view these proportions as having at least a crude relationship with changes in regional population size.



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