Archaeological Sampling Strategies

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Two questions often asked of archaeologists are, "How do you find a site?" or "How do you know where to dig?" Archaeologists use a variety of methods to find and/or test sites. Three basic strategies are often used, Systematic Sampling, Random Sampling, and Judgmental Sampling.

When archaeologists are working in areas which have not been previously explored, they must decide how best to determine if the area contains artifacts or sites. Usually, time and resources do not allow for the total excavation of a site, so archaeologists must develop a cost-effective strategy to allow for the maximum coverage. Sometimes there is evidence on the surface, such as in a plowed field or an arid environment with little vegetation or soil development. Surface finds often provide important clues regarding the presence of buried assemblages or features. Other times, especially in the wooded environments of eastern North America, there is no surface evidence.

In the following examples archaeological sampling strategies are applied to two different kinds of sites. One site contains surface evidence for prehistoric occupation and the other does not.

Part 1: How do archaeologists find sites?

Let's see how the results of different sampling strategies can lead to different results using a short example. Suppose a small parcel of land (100x120 meters) near the Farmington River is going to be developed for a convenience store. Before the property was bought by developers, it was cultivated for corn and there is no surface vegetation. A preliminary inspection of the property by archaeologists identified prehistoric artifacts on the ground surface. The distribution of surface finds is shown below.
The next question is: given the presence of artifacts on the ground surface, are there buried artifact assemblages at this site? Since it is both time and labor intensive to excavate the entire 100x120 meter area, a sampling strategy must be developed. Working within budgetary and time constraints, archaeologists can only excavate part of the area to determine the presence of buried artifacts. You estimate that there is only enough time to excavate 42 units, each measuring 5x5 meters. That's less than 9% of the total area! Better hurry, the bulldozers are on their way.

**Systematic Sampling Strategy**

In a systematic sampling strategy, the goal is to provide equal, and *unbiased* coverage of a suspected site. This method is useful for determining the boundaries of a site.
Systematic Sampling Results

Using the systematic sampling strategy, artifacts were found in 10 excavation units (23.8% of all the units), marked by the green dots. If each green dot represents five artifacts (such as flakes, bifaces, or projectile points) then a total of 70 artifacts were recovered. While all the three of the major artifact concentrations were discovered using the systematic sampling method, many other artifacts were missed.

Random Sampling Strategy
A random sampling strategy is the least biased sampling method. Using this method, the locations of excavations are determined by generating a list of random coordinates. This method introduces the least sample bias.

**Random Sampling Results**

Using the random sampling strategy, artifacts were found in 10 excavation units (23.8%), marked by the green dots. If each green dot equals five artifacts, then a total of 70 artifacts were recovered. Interestingly enough, all three of the larger artifact concentrations were encountered using the random sampling method. While the frequency of pits containing artifacts was relatively low compared with the judgmental strategy, you feel safe in knowing these artifacts were found with little bias introduced on your part.
Judgmental Sampling Strategy

Judgmental site sampling has the highest degree of bias. Using the judgmental sampling method, the locations of excavation units is often directed towards maximizing the recovery of artifacts at a known site. In the diagram shown above, excavation units are clustered around surface finds in the hope that these artifacts represent buried artifact concentrations.

Judgmental Sampling Results
Using the judgmental sampling strategy, artifacts were found in 22 excavation units, marked by the green dots. If each green dot equals five artifacts, such as flakes or projectile points, then a total of 140 artifacts were recovered. However, artifact concentrations in the northeastern and western parts of the site were missed because the archaeologists chose only to excavate areas around surface find spots. Using the judgmental strategy, artifacts were found in 52.38% of all the test pits, but areas which could have provided valuable information were missed completely!
Sampling Strategies

<table>
<thead>
<tr>
<th>Systematic Sampling</th>
<th>Random Sampling</th>
<th>Judgmental Sampling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Size=12,000 sq. meters</td>
<td>Site Size=12,000 sq. meters</td>
<td>Site Size=12,000 sq. meters</td>
</tr>
<tr>
<td>Site Sample=8.75%</td>
<td>Site Sample=8.75%</td>
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</tr>
<tr>
<td>N of Excavation Units=42</td>
<td>N of Excavation Units=42</td>
<td>N of Excavation Units=42</td>
</tr>
<tr>
<td>Area Excavated=1050 sq. meters</td>
<td>Area Excavated=1050 sq. meters</td>
<td>Area Excavated=1050 sq. meters</td>
</tr>
<tr>
<td>N Pits w/Artifacts=10</td>
<td>N Pits w/Artifacts=10</td>
<td>N Pits w/Artifacts=22</td>
</tr>
<tr>
<td>% Pits w/Artifacts=23.8</td>
<td>% Pits w/Artifacts=23.8</td>
<td>% Pits w/Artifacts=52.3</td>
</tr>
<tr>
<td>N Recovered Artifacts=70</td>
<td>N Recovered Artifacts=70</td>
<td>N Recovered Artifacts=140</td>
</tr>
</tbody>
</table>

Discussion

In this hypothetical case, it appears that the Judgmental Sampling Strategy was the most effective. Using this strategy, twice as many pits contained artifacts and twice as many artifacts were recovered. However, the Judgmental sampling strategy only works effectively when there is a reason to choose particular areas for excavation. In this case, the location of surface finds influenced the decision of where to dig. In the real world, archaeologists are not as fortunate in discovering archaeological sites.

The moral of this story is this: Different conditions in the field influence the kinds of strategies used by archaeologists in discovering sites.
Part 2: The Undiscovered Country

In the first example, the sampling strategy was in part influenced by the discovery of artifacts on the ground surface. As mentioned in the discussion above, archaeologists are not always that fortunate. In areas of thick vegetation such as mature forests or tropical settings, artifacts and features become buried over time as soils develop. In this example, the three basic sampling strategies are implemented in an area of unknown site potential. As you will see, the results of the different strategies are markedly different from the preceding example.

In this example, an area of approximately 12,000 square meters is to be impacted by construction of a housing development. The area consists of mature second growth forest of maple, ash, and oak trees. The northern boundary of the project area is marked by a swamp. The eastern boundary is defined by a steep slope and bedrock outcropping. Most of the project area is relatively flat.

As in the first example, you have time and resources to excavate 42 5x5 meter units. This will provide an 8.75% sample of the entire project area.
Systematic Sampling Strategy

In a systematic sampling strategy, the goal is to provide equal, and unbiased coverage of a suspected site. This method is useful for determining the boundaries of a site. In this case, the 5x5 meter blocks are arranged in a 20 meter grid across the entire project area.

Systematic Sampling Results

Using the systematic sampling strategy, artifacts were found in only 9 excavation units (21.4% of all the units), marked by the green dots. If each green dot represents five artifacts (such as flakes, bifaces, or projectile points) then a total of 85 artifacts were
recovered. Notice that only 2 of the 3 artifact concentrations were encountered using this method. The concentration in the northeast corner of the project area was completely missed.

**Random Sampling Strategy**

A random sampling strategy is the least biased sampling method. Using this method, the locations of excavations were determined by generating a list of random coordinates and placing each excavation block at those assigned coordinates. This method introduces the least sample bias.
Random Sampling Results

Using the random sampling strategy, artifacts were found in 13 excavation units (30.9%), marked by the green dots. If each green dot equals five artifacts, then a total of 130 artifacts were recovered. Interestingly enough, all three of the larger artifact concentrations were encountered using the random sampling method.

The random sampling method encountered the highest number of artifacts of the three strategies used. This method also introduced the smallest degree of bias to the sample.
Judgmental Sampling Strategy

Judgmental site sampling has the highest degree of bias. Using the judgmental sampling method, the location of excavation units is often directed towards maximizing the recovery of artifacts at a known site. In the diagram shown above, excavation units are clustered around surface finds in the hope that these artifacts represent buried artifact concentrations.

Judgmental Sampling Results
Judgmental Sampling Results

When there is no surface evidence upon which to base judgment, archaeologists often use geological and/or topographic features to place judgment test pits. In this case, excavation units were placed in the northwestern part of the project area, adjacent to the swamp, and against the steep slope in the eastern part of the site.

Using the judgmental sampling strategy, artifacts were found in 14 excavation units, marked by the green dots. If each green dot equals five artifacts, such as flakes or projectile points, then a total of 85 artifacts were recovered. However, artifact concentrations in the northeastern and southern parts of the site were missed. Using the judgmental strategy, artifacts were found in 33% of all the test pits, but areas which could have provided valuable information were missed completely! While this strategy had the highest number of pits containing artifacts, it did not locate the highest number of total artifacts.

Sampling Strategies

<table>
<thead>
<tr>
<th>Sampling Strategy</th>
<th>Site Size=12,000 sq. meters</th>
<th>Site Sample=8.75%</th>
<th>N of Excavation Units=42</th>
<th>Area Excavated=1050 sq. meters</th>
<th>N Pits w/Artifacts</th>
<th>% Pits w/Artifacts</th>
<th>N Recovered Artifacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systematic Sampling</td>
<td>Site Size=12,000 sq. meters</td>
<td>Site Sample=8.75%</td>
<td>N of Excavation Units=42</td>
<td>Area Excavated=1050 sq. meters</td>
<td>N Pits w/Artifacts=9</td>
<td>% Pits w/Artifacts=21.4</td>
<td>N Recovered Artifacts=85</td>
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<tr>
<td>Random Sampling</td>
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<td>Site Sample=8.75%</td>
<td>N of Excavation Units=42</td>
<td>Area Excavated=1050 sq. meters</td>
<td>N Pits w/Artifacts=13</td>
<td>% Pits w/Artifacts=30.9</td>
<td>N Recovered Artifacts=130</td>
</tr>
<tr>
<td>Judgmental Sampling</td>
<td>Site Size=12,000 sq. meters</td>
<td>Site Sample=8.75%</td>
<td>N of Excavation Units=42</td>
<td>Area Excavated=1050 sq. meters</td>
<td>N Pits w/Artifacts=14</td>
<td>% Pits w/Artifacts=33.3</td>
<td>N Recovered Artifacts=85</td>
</tr>
</tbody>
</table>
Discussion

In this hypothetical case, it appears Random Sampling Strategy was the most effective. Using this sampling technique, a relatively high number of pits were found to contain artifacts (30.9%) and the highest frequency of artifacts (130) was recovered. While the judgmental sampling strategy had more "hits" (n=14) it recovered only 85 artifacts. In this case the systematic sampling strategy was the least successful, but it still managed to recover 85 artifacts from 9 units. The advantage of the systematic approach, however, was that it allowed for equal inspection of the entire project area, which neither the random or judgmental techniques provided.

Once again, there is not really a "best" technique which always provides the best results. Common sense would probably eliminate judgment testing in this kind of situation. Use of systematic or random sampling is often one of preference on the part of the archaeologist.

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