Detecting the Past

Conducting Effective Archaeological Surveys

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Anthropology 493
May 6, 2011

Table of Contents

List of Figures

Introduction

How do archaeologists know where to dig? Archaeologists cannot simply label a tract of land an archaeological site and begin excavation. They must follow a long, complicated, and sometimes dull survey process targeted at detecting sufficient cultural remains to designate site status to any one area on the landscape. Sometimes the site is clearly visible to the naked eye. Sometimes archaeologists get lucky and detect materials with little work. However, more often than not, archaeologists must approach site discovery through a detailed plan, thought out before the first piece of equipment even enters into a worker's hand. Behind the scenes, researchers consider a long list of variables, from regional environment to past archaeological research, in order to select the optimal survey methods and sampling strategies for their given project. This paper examines such behind-the-scenes work, using Virginia Piedmont archaeology as a case study, first through previous archaeology in the region and then in a sample survey research proposal.

In Chapter 1, I provide a brief overview of important factors in Virginia archaeology, illustrating the regional environment, identifying pre-historic cultural periods, and introducing general site types and site sizes. Chapters 2 and 3 offer an introduction to the available survey methods and sampling strategies from which archaeologists can choose in planning their specific projects. In Chapter 4 and 5, I more closely examine these methods and strategies through a literature review which shows how researchers have employed and promoted these methods and strategies, revealing their perceived strengths and weaknesses. Next, in Chapter 6, using a site database and three case studies, I examine past archaeology in the central Virginia Piedmont, such as specific results and average site sizes, in the hopes of establishing the viability of some methods and the optimal strategy for others. Finally, in my conclusion I offer a research proposal for further survey work at Morven Farm, a locale in the central Virginia Piedmont. Additionally, I address issues with the concept of "sites" in archaeological work.

Sources of Previous Archaeology in Virginia

In discussing previous archaeology in the central Virginia Piedmont, I repeatedly make references to two sources. Through the Thomas Jefferson Foundation, the Monticello Archaeology Department examines Jefferson's plantation home in Albemarle County, located in the central Virginia Piedmont. Because of their continuous extensive survey work and proximity to and involvement in the Morven Project, Monticello's approach serves as a valuable illustration of viable survey methods and strategies in the central Virginia Piedmont region.

Additionally, I often refer to the Virginia Department of Historical Resources (DHR) which provides state guidelines for archaeological work. Though I focus on their discussion of Phase-I survey, during which site detection receives priority, the DHR also offers guidance for further exploratory testing. In Chapter 6, I rely heavily on the DHR Data Sharing System (DSS), which provides information on the majority of discovered sites throughout Virginia in a single, convenient database. Theoretically, each DSS entry includes information such as survey method, site size, site location, and artifact presence[1]. Through this resource, I examine site size by each pre-historic site type and site period, further defined in Chapter 1 and Chapter 6. This examination serves as an invaluable context for my subsequent recommendations for Morven Farm.

Morven Farm

Morven Farm rests in Albemarle County, located in the central Virginia Piedmont. With the Morven Project a number of institutions--most notably Monticello Department of

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[1] See Appendix D for information categories included in DSS.

Archaeology, the University of Virginia, and Washington and Lee University--intend to use the donated 3,000 acres for interdisciplinary research and education. Under one project, an inter-institutional archaeological team including archaeologists from UVA, Monticello, W&L, and the private archaeological firm, Rivanna Archaeological Services—the Morven Archaeological Survey Team—conducted a survey of a 250-acre portion of the Morven landscape (MAST 2009:1). This study area borders Indian Camp Creek in the Southeast corner of the property (RAS 2010:1). Currently, the Morven study area consists of both wooded and farmed land, and rests on a moderately southward slope with alluvial[2] and colluvial[3] deposits dispersed across the property (Don Gaylord and Steve Thompson, personal communication, October 2, 2010).

During the initial stages of this project, due to the lack of prior archaeology in the study area, researchers organized the Morven Archaeological Survey Team (MAST), targeted towards the discovery and analysis of cultural remains through the range of pre-historic and historic site periods (MAST 2009:1). MAST archaeologists provided guidance and recommendations for archaeological survey, conducted through fields schools from UVA and W&L as well as contracted work by RAS. After consulting the documentary record surrounding Morven, the team carried out Phase-I archaeological testing on the 250 selected acres at Morven. Phase-I survey refers to the initial stages within an archaeological survey during which the primary goal is to locate cultural remains and establish sites. Through shovel test pits, MAST intended to locate four or more tenant sites, dating between 1793 and 1813. Additionally, RAS articulates not quite a goal, but a perspective on the greater possible implications of Morven research in the wider picture, writing: "This property holds the potential to illuminate little studied archaeological and historical contexts in central Virginia Piedmont region" (RAS 2010:1).

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[2] Soil and sediment deposited by water.

[3] Soil and sediment deposited downhill through gravitational forces.

While no previous archaeology had been conducted prior to these surveys, through a collection of documentary resources, including historical maps, deeds, lease agreements, county orders, and letters written by Thomas Jefferson, researchers fleshed out a historical context from which to work. Here, for the sake of introduction to the project, I only offer a brief outline to this context and richer detail can be found in other sources (see MAST 2009:3-8).

Today's Morven Farm emerges from the north end of a 10,000 acre land grant made to John Carter, Secretary of the Virginia Colony. The property became known as Blenheim and between the late 18th century and 19th century, the property repeatedly changed hands. In 1792, Carter's son, Edward Carter, leased a portion of his land to tenant farmers. Shortly thereafter, Thomas Jefferson purchased the south tract of the land, referred to as Indian Camp, for William Short to and for whom Jefferson wrote on the land's potential and created maps, illustrating his own survey of the land[4]. In his letters, Jefferson refers to the purchased property as Indian Camp and to the creek along the property as "Indian Branch", "Indian Camp Branch", and" Camping Branch" (MAST 2009:2-3). Such names have created interest in locating contact-era American Indian sites along the branch. The status report states:

> The property's specific association with Native Americans during second half of the 18th century remains unclear, however the name suggests that at least small groups of the local Monacan Indians may have occupied locations within the stream valley into the historic era (MAST 2009:2).

From the information provided in the historical context, MAST established two research targets: (1) pre-historic, possibly contact-era American Indian settlements, and (2) tenant farms and their role in Euro-American Piedmont settlement (MAST 2009:3).

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[4] Thomas Jefferson served as William Short's agent while Short was abroad, guiding this land investment (MAST 2009:2).

Research and Analysis in Later Chapters

Site detection is crucial in archaeology. Only through the efficient discovery of sites can archaeologists reach an understanding of past settlement patterns and their development. Just as settlement patterns analysis depends on site detection, site detection depends on survey methods and sampling strategies targeted at both research goals and the natural environment. In the Virginia Piedmont, I illustrate the need for smaller sampling intervals as current intervals do not effectively detect sites from all site periods and site types. I show how, in survey projects targeted at all site types and periods, researchers should employ the smallest interval possible, optimally a 25 foot sampling interval which theoretically will detect the majority of smaller sites often representative of mobile societies and older sites. Yet, if researchers choose to target a specific site period, such as younger pre-historic sites, based on previous archaeology they can apply a wider interval of preferably 40 feet.

In addressing further research at Morven Farm, I apply this analysis of previous Virginia Piedmont archaeology and the prior surveys at Morven to form a more specific approach. While Morven researchers detected seven sites in their survey area, I believe that tighter intervals and more targeted strategies will reveal higher site density more consistent with past surveys in the region.

In the following chapters, I seek to establish not only the importance of surveys in general, but also the importance of accurate, well-planned surveys. I flesh out the range of site discovery processes employed by archaeologists across different projects, moving from general definitions and descriptions to scholarly debates and then finally to applications in the central Virginia Piedmont. While sections of this paper merit further discussion, my purpose here is to draw out a better understanding of site detection as a whole, rather than specific aspects of it.

Through general introductions and analyses, I illustrate the planning processes in which researchers should participate to ensure the most effective survey possible for their specific goals and region.

Chapter 1: Virginia Regional Overview

Introduction:

While much of this paper focuses on archaeological survey methods and sampling strategies, in later chapters I put theory into context, using Virginia as a case study. Setting the stage for this eventual analysis, the following chapter provides a regional overview on three important topics: (1) physiography; (2) pre-historic cultural periods; and (3) general archaeological site types and sizes. Each of these topics serves an important purpose for archaeologists.

First, the physiography overview provides the environmental setting, including factors such as vegetation and soils. An overview of cultural periods in the Eastern Woodlands provides further necessary. Without such information, period names such as "Middle Woodland" have little meaning. As I often examine sites in relation to their periods, concentrating particularly on the Middle and Late Woodland, readers should be familiar with how an archaeologist identifies site period and what the site communicates to the archaeologist. Finally, I provide a number of site types and general expectations for site size. As with site/cultural period, I later analyze sites based on site type. Together then, the components of this overview supply one with the necessary information to evaluate the following chapters.

Virginia Physiography

Virginia's physiography creates one of the most complex environments in the Eastern Woodlands. Though it falls in the Mid-Atlantic region[5], Virginia serves as the borderlands between the Mid-Atlantic and southeastern regions and, as a result, can claim physical characteristics from both (Stewart 1994:73). In terms of vegetation, Virginia contains the

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[5] See Appendix A for representation of the Mid-Atlantic region

southern end of Mid-Atlantic species and the northern end of southeastern species. For the most part, oak, hickory, and chestnuts dominate the Woodland regions with, in particularly fertile environment, comprised of forested areas. In dryer regions, sugar and black maples, eastern redbud, and chinakapin oaks cover the slopes. Other species include northern red oaks and various forms of shrubs. In the Piedmont physiographic region (discussed further below), which extends from Alabama to Virginia, one also finds lithophytic plants growing on granitic flatrocks (Virginia Department of Conservation and Recreation 2009).

To add to its diversity, Virginia spans across the coastal lowlands adjacent to the Atlantic Ocean and the ancient, heavily metamorphosed mountain ranges in the west. Thus Virginia includes a collection of sandstones, siltstones, diabase, basalts, greenstones, slates, shales, quartzites, fine-grained mafic rocks, a variety of metasedimentary rocks and other assorted rocks. Soils range between clay and sand. According to this picture, then, Virginia contains both "landscape diversity and biotic richness" (Virginia DCR 2009).

Based on such factors, Virginia has five physiographic provinces defined by both cultural and natural boundaries[6]. From east to west, these provinces include the (1) Coastal Plain, (2) Piedmont, (3) Blue Ridge, (4) Ridge and Valley, and (5) Cumberland Plateau (Blanton1992:66). Geologists assign regions to these provinces according to several factors such as relative elevation, relief, geological structure, and lithology (Virginia DCR). Due to the diversity between and within these provinces, some researchers further separate the provinces into subregions, but such assignments lack a consensus. For the sake of my analysis, I focus most specifically on the Piedmont province.

The Coastal Plain borders the Piedmont to the east and contains a sloping, low relief landscape. The Coastal Plain relief slopes from its highest point at the fall line towards the

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[6] See Appendix B for representation of Virginia provinces

Atlantic Ocean. Underlain by young, mostly unconsolidated sediments, the Coastal Plain soil is mostly sandy, though one can find other soils such as marine clays or fossiliferous shells in certain localities. Once the Coastal Plain reaches the Fall Line in the west, one enters the Piedmont province (Virginia DCR 2009).

At the Fall Line, the Coastal Plain's sandy sediment composition transitions into the more resistant rock materials of the Piedmont as the province is underlain by mostly resistant metamorphic and igneous rocks. Millions of years of deposition, uplift, deformation, and erosion have created a hilly landscape. The Piedmont elevation ranges between 160 feet in the east and 1,000 feet in the west, where the Piedmont borders the Blue Ridge Mountains. In terms of vegetation, the Piedmont has relatively low diversity and suffers from significant anthropogenic disturbances in the form of activities such as agriculture and clearing. So while today the Piedmont consists of pastures, fields, and second-growth forests, according to the accounts by early explorers, the Piedmont at the time of contact was "an open savanna-like woodlands and grasslands" (Virginia DCR 2009).

As mentioned above, the Blue Ridge province borders the Piedmont to the west and formed through the faulting, uplifting, and deformation of the underlying pre-Cambrian igneous and metamorphic continental bedrock. Specifically, the Northern Blue Ridge, closest to the region which I discuss in later chapters, has "narrow irregularly weathered series of peaks underlain by a core of resistant granites and metabasalts (greenstone)" (Virginia DCR 2009). Generally, these physical provincial boundaries correlate with the cultural boundaries one sees during the Middle and Late Woodland periods discussed in the next section.

Virginian Pre-historic Cultural Periods

Just as geologists separate North America into physiographic categories, archaeologists separate North American pre-history into cultural areas/periods and subareas. Virginia falls in the Eastern Woodland cultural region, but archaeologists split the region into more specific subareas. However, it is also very much a diverse area, sharing characteristics from various tangent regions. As the Virginia borders were only created during historic times, grouping the state under one all encompassing cultural area does not offer the most accurate picture. Virginia falls under the Mid-Atlantic cultural area, as well, but as mentioned under physiography, it is also on the cusp of the Southeastern region. As such, not only does Virginia share vegetation species from both regions, but it similarly shares some aspects of culture (Stewart 1994:73). Despite such diversity, archaeologist Dennis Blanton suggests that the Mid-Atlantic region was, in fact, peripheral to "the most sophisticated" developments of the Middle Woodland and the manifestation of such developments remained "rudimentary" (1992:71). As I focus on Virginia and not the entire Mid-Atlantic region, I further narrow the region to five Virginia physiographic provinces, specifically concentrating on the Piedmont, which generally correlate with the boundaries of regional cultural areas.

Blanton, among others (e.g. McLearen 1992), suggests that Virginia suffers from a lack of sufficient and intensive excavation data in terms of its pre-historic settlements. To support such a claim, Blanton cites a lack of intra-site organization and efficient excavation which prevents archaeologists from developing a full picture of Virginia settlement patterns because they cannot confidently analyze the gathered data from individual sites (1992:66-68). To complicate matters further, the Piedmont continues to be less studied than both the Coastal Plain and southwestern region which it borders (1992:66-68). Blanton demonstrates Virginia research issues in the 1970s which continued at least partially into the 1990s, when Blanton wrote the article. He writes:

> In large part, this was probably due to the lack of detailed site data, a gross chronological placement of certain key ceramic types, lack of both interregional and intraregional comparisons, and an identity problem for the period which viewed all of the local manifestations against classic Hopewell (Blanton 1992:39).

However, he continues to state that through culture resource management (CRM) projects, recent years have seen not only increased the amount of survey and excavation undertaken, but also increased communication between different projects' researchers, though that is not to say that problems do not persist (Blanton 1992:39).

Nonetheless, what is known of the Piedmont demonstrates clear cultural divides between its material culture and that of the Coastal Plain which it borders. For example, according to Blanton, Piedmont sites tend to exhibit less complex material cultures, specifically in terms of factors such as artifact heterogeneity. However, Blanton also recognizes that the apparent disparity in complexity of such goods may actually appear due to the lack of investigation into Piedmont pre-history mentioned above (Blanton 1992:68).

The boundary between the Piedmont and the Blue Ridge province, meanwhile, appears more "fluid" (Blanton 1992:75) as the Blue Ridge was less intensively occupied, acting predominantly as a resource zone rather than a habitation zone. As such, the Blue Ridge contains a mix of Piedmont and Ridge and Valley--the province which borders the Blue Ridge to the west—ceramics (Blanton 1992:75).

Historians and archaeologists call a period "pre-historic" if no written history of the region's occupants exists. Archaeologists assign periods of time to categories such as "Woodland" based on cultural change (Stewart 1992:1). Such change is standardized so as to draw a general picture of the period. Because each culture undergoes its own unique cultural change in its own time, such assignments are estimates, and a certain amount of contention exists in the definition of a period as well as its dates. As such, the time ranges I provide here are tentative and generally recognized as such.

For generations, archaeologists have contended that the North American continent was first populated in about 11,500 BCE, when early people first crossed the Bering Strait, connecting modern day Siberia and Alaska, a time line generally upheld today. Archaeologists classify the Paleoindian people as highly mobile, as they spread throughout the continent, surviving in small egalitarian hunter-gatherer[7] bands, organized through achieved status[8] (Suvorell 2000). Eventually, the Paleoindians migrated south and entered into modern day Central and South America. High rates of exotic lithics[9] and homogeneous tools in the artifact assemblages clearly support this conclusion (Suvorell 2000; Dent 1995). Despite such mobility, the Paleoindian period also experienced high fertility rates, allowing for populations to grow from the original group of colonists (Surovell 2000). Temporary but more sedentary bases also may have existed, specifically in the Coastal Plain, but during most of the year, Paleoindians would have travelled in smaller bands (Dent 1995). Artifact assemblages show that Paleoindians generally made tools from raw material such as chert, quartz, quartzite, quartz crystal, jasper, and slate (Dent:140).

While some disagreement exists over the dates of the Archaic period (separated into Early, Middle, and Late), archaeologists generally place it between 8,000 and 2,000 BCE (Dent 1995:157-159). American Indians lived in larger groups during the Archaic than during the Paleoindian. As a whole, they spread across multiple ecosystems, utilizing the entirety of the landscape while continuing to maintain a hunter-gatherer economy. The Archaic period, as

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[7] Hunter-gatherers, sometimes called hunter-foragers, survive through a combination of hunting and foraging for wild plant goods. Here, we do not see domestication of animals or plants. As hunting was more difficult, forging often served as the dominant subsistence method.

[8] People did not inherit a status through their ancestors and instead had to work for the status they received.

[9] Lithics not made locally.

opposed to the Paleoindian period, saw more heterogeneity between camps and bases (Dent 1995), suggesting the development of regional variability. So while groups continued to be mobile, they limited the overall distance they travelled and cultural areas began to develop. Additionally, American Indians produced more bifacial tools[10], narrow blades, ground, rough stone tools[11], and projectile points. Towards the Late Archaic period, subregional variation occurred in projectile point forms, while chipped stone tools and bone tools became more popular (Dent 1995:159-160).

The Woodland period, including the Early, Middle, and Late subperiods, occurred between approximately 1,000 and 1607 AD. Here, one must be careful in considering the word "Woodlands" as archaeologists refer to the broader region to which Virginia and the Piedmont belong as the Eastern Woodlands. To clarify, I will only call the region by its full name: the Eastern Woodlands. Without the word "Eastern", I am referring to the cultural period.

The introduction of fired clay ceramics and the bow and arrow marked the transition from Late Archaic to Early Woodland, a period which lasted from around 1,000 to 300 BCE (Barber and Barfield 1997:136; Stewart 1992:2). During this period, populations grew as diets improved due to better cooking and storage and increased hunting effectiveness resulting respectively from new ceramics and the bow and arrow (Barber and Barfield 1997:136).

The Middle and Late Woodland period in Virginia mark the last few thousand years of North American pre-history. The Middle Woodland occurred between 300 BCE and AD 1000 (Stewart 1992:2) while the Late Woodland period began at the end of the Middle Woodland (AD 1000) and lasted until European contact. Referred to as the Contact period, contact with

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[10] A two sided stone tool often used as a knife or similar implement.

[11] Often for making other tools.

Europeans and the subsequent emergence of written history mark the end of North American pre-history.

The Middle Woodland period consists of seven key characteristics:

1. Population growth (Blanton 1992:71)
2. High mobility rates (Blanton 1992:71)
3. Increased sedentism (Blanton 1992: 71; McLearen 1992:55; Stewart 1992:12) and, as a result, more clearly defined group territories[12]
4. Hunter-gatherer economy (Stewart 1992:12)
5. "Interregional interaction spheres"[13] (McLearen 1992:55)
6. Evidence of both hierarchical and egalitarian sites[14](McLearen 1992:55)
7. Increased presence of tribes and chiefdoms[15] (Barber and Barfied 1997:136)

While during the Middle Woodland the Piedmont and its bordering provinces demonstrate their own unique material culture, the presence of goods from neighboring provinces also reveal inter-regional trade networks. These "foreign" goods communicate a characteristic trait of the Middle Woodland: increase in long distance trade (Hantman and Klein 1992:143). Thus, the Middle Woodland demonstrates what R. Michael Stewart classifies as focused exchange: "Transactions commonly involving goods from areas outside of the Middle Atlantic region and some sources located within the region" (1994:75).

The Late Woodland period, meanwhile, generally exhibits an intensification of certain trends seen in the Middle Woodland period. Five characteristics most clearly define this period:

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[12] In this case, 'increased sedentism' means that tribes stayed in one place for longer periods of time, perhaps setting up a camp seasonally. However, these camps were not permanent.

[13] Interaction spheres entail both the spread and adaptation of religion and rituals (McLearen 1992:55) and extensive trade networks over large distances (Stewart 1992:12). Adaptation of religion and rituals could also be known as sycnhrocity wherein a group adapts outside traditions and fits these traditions to the group's purpose.

[14] While before the Woodland period, tribal systems operated based on achieved status, some tribes during the Woodland period exhibited inherited status where a parent passes his/her status down to his/her child.

[15] Instead of the dominance of bands as was previously the case

1. Increased sedentism[16] (Hantman and Klein 1992:138)
2. Increased territorial/regional variation in terms of territory and culture[17] (Hantman and Klein 1992:138)
3. The development of horticulture (Hantman and Klein 1992:138)
4. Transition into a more localized economy[18] with a decreased emphasis on long distance trade[19] (Hantman and Klein 1992:143)
5. Emergence of hierarchical societies[20] (Hantman and Klein 1992:143)

As opposed to the Middle Woodland, the Late Woodland exhibits decreased long distance trade and the development of a more localized economy. Archaeologists see the development of discernible regional ceramic styles within the Piedmont and between bordering provinces (Hantman and Klein 1992:143). This localized economy demonstrates broad-based network trade, defined by goods travelling through "weblike relationships" which tend to concentrate goods in an individual region. Stewart explains that, under such trade, the material fall off patterns occurs at 30 to 50 miles from the source, though goods can still be found around 200 to 300 miles from the source (1994:75). So while the Middle Woodland period demonstrates long distance trade thus revealing interregional relationships, the Late Woodland demonstrates a localized economy which stresses the development of regional styles.

Meanwhile, assigning a time stamp to the Contact period remains difficult because of the complexity of contact. While in Virginia contact is established as occurring in 1607 at

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[16] For my interests, sedentism is most important and must be expanded on. In the Woodland period, increased sedentism does not imply a permanent settlement, rather semi-permanent settlements Instead, sedentism during this period suggests a "tendency towards lengthier occupations rather than permanence" (Blanton 1992:71).
More tribes use semi-permanent camps.

[17] Heterogeneity developed in which each region had its own distinctive style and a tribes territory was more stricty defined.

[18] The collection of raw materials, production, and trade becomes centered within the same region one occupies.

[19] Consistent with regional variation

[20] Adoption of inherited status

Jamestown, further west into Virginia American Indians generally did not come into contact with Europeans until later in the following two centuries, though trade did move European goods deeper into the continent. Sticking to the 1607 time stamp suggests that, throughout Virginia, American Indian culture underwent change due to this single point of contact. Because of this, one may not find contact-era sites dating back to 1607 further west into Virginia. While American Indian tribes in the Piedmont may have acquired some quantities of European goods through trade, many did not make contact with these Europeans until the 18th century when Euro-Americans pushed their settlements further west. As James Deetz states: "While such time limits can be imposed on archaeological studies, they are somewhat flexible and blurred at the later end of the scale" (1967:4). Despite such matters, just as the Middle Woodland period has approximate beginning and end times, the Contact period can tentatively be generalized as occurring in the 17th century. However, in discussing Virginia pre-history here, the cultural changes identified between periods remains more important than an exact timeline. As such, these periods must be defined by the cultural changes they exhibit.

Archaeological Site Types and Sizes in Virginia

In the 2009 "Guidelines for Conducting Survey in Virginia" provided by the Virginia Department of Historical Resources (DHR), classifies a site as a bounded area of at least fifty years old presenting evidence of human activity (2009:1). As the definition of site type is a contentious matter, archaeologists assign varying titles to certain site types, through different lines of reasoning. So while archaeologist Barbara Purdy (1996:75) reduces site types into three basic categories, other archaeologists may offer a more extensive list of site classifications. Purdy separates site type into three categories: (1) habitation, (2) special use, and (3) shipwreck, the third of which does not come into play in my analysis.

Another archaeologist, Heather Burke, offers a more extensive list of site types, based not only the function the site once served, but also on the nature of the finds themselves. She separates sites into eleven groups: (1) findspots, (2) lithic scatters, (3) quarries, (4) midden or midden scatters, (5) habitation, (6) stone arrangements, (7) rock art, (8) rockshelters or caves, (9) special religious places, (10) burials, ossuaries, and mounds, (11) post-contact (Burke 2009:227-231).

However, I specifically focus here on the first five, which generally represent sites I will discuss later in this paper. First, findspots contain small finds in relative isolation from and with no connection to other sites or artifacts, though the rest of the area should still be searched in case the findspot indicates the presence of other artifacts nearby (Burke 2009:227). While Burke classifies a findspot as a site, other archaeologists ask whether an isolated find really qualifies as a site. For example, it does not fit into the Virginia DHR site definition as it is not quite a bounded area. On sites, archaeologists search for patterns and one instance of a small find marks a point, not a pattern.

Meanwhile a lithic scatter, the next site type, ranges in size and content but exists in a bounded area. Within a lithic scatter, researchers can find anything from simply a few flakes, cores, and/or tools to high densities of similar finds (Burke 2009:226). Next, quarries once served as a source for stone, clay, ocher, and other raw materials for past peoples. Such sources can include anything from loose river cobbles to large outcrops. At these sites, researchers generally do not find finished tools as groups used other sites for manufacturing (Burke 2009:227). Though Burke does not discuss manufacturing sites any further, my analysis of Virginia will include sites which were identified as manufacturing sites.

A midden is a deposit of trash that built up in the same place for a long period of time, while midden scatters served as a trash pit for a shorter amount of time. While midden scatters may not indicate a camp, but simply people passing through, a midden usually indicates a nearby habitation site, as it is assumed that past peoples dumped their daily living trash near their homes (Burke 2009:227).

Habitation sites usually present near water sources and often include evidence of various activity areas (Hantman and Klein 1992:138). While habitation sites can be permanent[21], semi-permanent[22], or temporary[23], most sites during the Middle and Late Woodland are either semi-permanent or temporary sites. However, with increased sedentism, groups used many of these temporary sites for longer periods of time.

To analyze results of archaeological surveys in Virginia using the Virginia Department of Historical Resource's Data Sharing System in Chapter 6, I create my own list of site types which would fit my purposes. For the purposes of later analysis, I separate site types into (1) sedentary, (2) mobile, (3) industry, and (4) indeterminate. This list is based off of the DSS's site classification system which includes subtypes as well as surplus site types which could be condensed into another site type. For example, I grouped "quarry" and "lithic workshop" under industry, and "camp, base" and "camp, domestic" under mobile. Such assignments fit my later analysis as I partially examine the effectiveness of certain methods in locating sedentary versus mobile sites. As industry sites can belong to either sedentary or mobile peoples, I assigned such sites its own category. Unfortunately, DSS recorders often labeled site type as "indeterminate", making it necessary to retain this DSS classification.

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[21] People settle with the intention of remaining there. Land ownership becomes more prominent.

[22] People reside at a semi-permanent camp for a long period of time, perhaps a full season before moving again.

[23] Sites become more ephemeral, serving more as a camp to be picked up and moved when the group moves on to other resources.

Site types, above all, should help archaeologists examine settlement patterns. Dennis Blanton warns, however, of the danger of merely studying the location of these sites without taking into account other variables. He writes:

> Any discussion of settlement cannot literally address only the distribution of sites across the landscape, as a number of interrelated factors act to influence the character of a given 'settlement pattern' (Blanton 1992:65).

He subsequently reminds the readers of factors such as physiography, ecology, and topography (Blanton 1992:65), which, among others, will continue to emerge in my discussion below.

Blanton then moves on to illustrate certain modes of settlement in pre-historic Virginia. He specifically discusses base camps versus smaller procurement camps and patterns of group movement. During the Middle and Late Woodland, archaeologists find semi-permanent sites such as seasonally rotated base camps ranging in size between moderate and large, an assignment which varies from archaeologist to archaeologist, and temporary camps most likely organized by kin. The intensity or longevity of use can further be narrowed down based on the number of features, midden, and artifact density.

The larger sites presumably formed as a "macro-social unit" (Blanton 1992:71). These settlements would include an aggregate group including tribes or other kin-groups from surrounding territory. Such large sites are predictably located near rich resources (Blanton 1992:69-71). From these base camps, both micro and macro, the larger group splits into smaller parties, usually based on closer nuclear kin relationships, in what Blanton refers to as a "fusion-fission system" (1992:71). The smaller parties create separate camps, generally either procurement or special function sites, both of which are more ephemeral than the larger base camps. Such sites present with less feature finds and decreased artifact or midden density.

Based on artifact analysis, however, archaeologists can decipher the function of the site, such as a hunting camp (Blanton 1992:69).

Though sedentism in Virginia increased by the Middle and Late Woodland Period, especially in the Coastal Plain, archaeologists still find an abundance of procurement sites, as well as multiple base camps, because the Virginia American Indians remained relatively mobile peoples even through the Woodland period, particularly in Western regions including the Piedmont.

Conclusion

From this overview, two points become obvious. First, despite the diverse Virginia physiography, it seems that physiography is the most easily defined and identifiable variable included so far in this discussion. Second, discussion of site period, type, and size leave more room for debate. Archaeologists work with different classification systems for site type leaving site type un-standardized and possibly confusing. Later, in the conclusion of this paper, I discuss resulting difficulties and a possible solution to this confusion. Next, site size expectations are traditionally based on a single model promoted under site/cultural period generalizations. As the DSS operates within this model, I too follow it for the sake of consistency. The DSS classification system applies an evolutionary model, assuming site size will increase over the years as increased sedentism develops. This model assumes gradually increasing rates of sedentism, as if tribes across the region followed the same path in their development. Things are rarely that simple and exceptions to this model do exist.

However, for now, I use the evolutionary model for the convenience of remaining consistent with the DSS source. Unfortunately, a perfect model does not exist. A model after all implies homogeneity despite the heterogeneity of human behavior. So when one considers these site/cultural periods, site type, and site size, one must recognize that these are generalizations with which archaeologists often work provisionally in order to more widely assess and apply their findings and conclusions.

Chapter 2: Survey Methods

Introduction

In the previous chapter, I discussed physiography, site period, site type, and size. Initially one must consider the physiography of an area before surveying the area for sites. According to the Virginia Department of Historical Resources, a site is "the physical remains of any area of human activity greater than fifty years of age for which a boundary can be established" (2009:1). Notice that the establishing of a boundary constitutes as a vital aspect of a site. As such, in the first phases of a project, particularly Phase I, archaeologists generally have two objectives: first to discover sites and, upon discovery, identify the boundaries of the site. An artifact scatter, though included as a possible site type in the previous chapter, serves more as an indicator of site presence rather than a site. Additionally, from the dispersion of the artifact scatter, one can establish site boundaries based on decreasing artifact densities. When densities either reach a pre-determined low or drop to zero, archaeologists can identify the site boundaries. These boundaries are arbitrary and usually based on a pre-determined cut off point for artifact density (Burke et al. 2009:246).

Some site types also complicate establishing site presence and boundaries. For example, low density artifact scatters may or may not qualify as a site, depending on how researchers approach the survey. While some archaeologists classify all artifact scatters as sites, others establish a required site density. Other views on sites and artifact scatters exist as well. For example, the Monticello Archaeology Department considers the entirety of Monticello Mountain as a single site. And though they follow state code and offer site numbers for each excavated area (i.e. 44AB0065), generally they consider these "sites" artifact scatters detected within the Monticello Mountain site (Alison Bell, personal communication, February 14, 2011).

Additionally, in the previous chapter, I listed findspots as a site type, though I also questioned whether one can consider them a site, as a findspot, as a singular find, would not have boundaries and due to insufficient materials lack research potential (Sean Devlin, personal communication, May 2, 2011). Due to surveying's inability to apply boundaries to them, I do not consider findspots sites, but simply as find types.

Looking beyond site detection and boundary establishment, surveying provides data on the cultural landscape, including such factors as land use and settlement patterns (Burke et al. 2009:69; Purdy 1996:75), typically studied through inter-site comparisons. To do this, archaeologists use an array of survey methods, choosing the one(s) most fit for the surrounding environment including such factors as terrain, vegetation, water, climate, soils, slope, elevation, ecology, and ground surface visibility (see Blanton 1992; McLearen 1992; Stewart 1992; Burke et al. 2009; Purdy 1996; Molyneaux 2005).

Archaeologists should guide surveys through research designs, with pre-determined definitions for key research concepts and variables such as 'site' or environmental factors. In creating a research design, an archaeologist must conduct preliminary research through resources such as topographic maps, aerial photographs, historic maps, reports on previous archaeology done in the area, and national geologic reports such as the United States Geologic Survey (USGS) and the United States Department of Agriculture Soil Survey. Additionally, in a research design, archaeologists must specify the intensity[24] to which they want to sample the landscape before going into the field (Molyneaux 2005:106; DHR 2009:3-4). Often natural or self-imposed conditions such as the local environment, number of field workers, available time, and collection intervals are the major factors in setting an intensity level. Overall, the most significant factors contributing to the discovery of sites are, (1) ground surface visibility, (2) available time, (3) size

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[24] Determines the percentage of the study area a survey will cover.

of the survey area, (4) number of workers, and (5) site conditions (Burke et al. 2009:67). The nature of sites includes environmental and/or physiographic conditions, and though such conditions have already been mentioned, the importance of these conditions cannot be stressed enough. For example, ground surface visibility often dictates whether an archaeologist decides to conduct a surface or subsurface survey. Ground surface visibility depends most often on environmental conditions. A study area covered in trees would have lower visibility than a recently plowed field.

The Virginia DHR separates surveying into Phase-I, II, and III surveys. In this chapter, survey descriptions would usually fall under Phase-I survey. Phase-I serves as the "Identification" stage. As such, its goals are to (1) locate and identify all sites within the survey area, (2) establish site size and boundaries, and (3) assess the need for further research. While Phase-I testing functions as the primary stage for locating sites, Phase-II testing is an "Evaluation" stage. Though many goals in Phase-II testing, such as evaluating site eligibility for National Register of Historical Places (NRHP) and making recommendations for future research, are not central to my discussion, Phase-II testing does serve one particularly vital purpose in the development of sites. During Phase-II survey, archaeologists refine the boundaries of the site (DHR 2009:2-3), and as site boundaries are important to the definition of the site, Phase-II surveys work to refine site definitions by establishing more accurate site boundaries.

In this chapter, I discuss the survey methods available to archaeologists for Phase-I and, to a degree, Phase-II survey, as well as in which situations any specific method can be valuable. Survey methods include a range of options. In this chapter I cover three options: (1) surface survey; (2) subsurface survey; (3) and technology-based survey. As I use the Virginia Piedmont as a case study, in this chapter, I will continue to refer to the Virginia DHR survey guidelines.

Archaeologists have put much thought into the effectiveness of each survey method or strategy, and contentions between a few of these archaeologists will be discussed in later chapters. .

Surface Survey

Archaeology is in a unique position. Archaeology in practice is generally destructive, though a few methods exist which either limit or eliminates this destructiveness. Nevertheless, once one disturbs the study area, it cannot be fixed. As a result archaeologists do two things: they avoid destruction whenever possible and they record as much as possible. Archaeologists have an array of survey methods, ranging from semi-intrusive to intrusive, to avoid damaging the study area (otherwise known as the sampling area). As a result, in some ways, researchers prefer surface surveys, as a semi-intrusive method, because they leave the survey area for the most part undisturbed.

While archaeologists can conduct surface surveys in different forms, such as scanning the survey area by vehicle, pedestrian surveys have become the predominant method for surface surveys. Other names for this method include "walk-over" and "field walking" (David 2006:9). As the name suggests, field workers carrying out a pedestrian survey conduct a visual inspection of the landscape on foot, and in a probabilistic surface survey, systematically, in the hopes of discovering either artifact scatters or surface evidence of anthropomorphic features. A large number of workers, time, and small intervals allow for a more effective pedestrian survey (Burke et al. 2009:70). Additionally, an effective surface survey requires good ground visibility, meaning that the ground must be sufficiently exposed. While the amount of exposure required may vary, the Virginia DHR requires at least 50% exposure (2009:6). With such exposure, erosion reveals exposed artifact scatters and surface depressions indicating a possible feature. Most common artifacts found in these scatters are lithic and ceramic materials (David 2006:9).

Erosion represents a natural cause which results in the ground conditions needed for a surface survey, but anthropomorphic activities also create similar conditions. For example, a recently plowed field provides the necessary ground visibility. In Virginia, surveying plowed fields is so common that the DHR lists specific requirements for such a survey, though most of these requirements apply to surface pedestrian surveys in general. The Virginia DHR requires surface collection no deeper than what is already disturbed and two shovel test pits (STPs) to test site depth and further presences of artifacts (2009:6). As STPs are a subsurface survey technique, I discuss the specifics of the technique later.

The DHR also provides guidelines for large survey areas, which are more difficult to cover and require greater labor intensity. More specifically, the DHR discusses the common technique of using predictive models in order to limit labor costs and the actual percentage of the landscape covered. A predictive model guides researchers towards probable areas of site presence based on a number of variables such as distance from water and environmental conditions which would allow for, first of all, past use of the area and, second, survival of cultural remains. While the DHR allows the use of predictive models to guide a survey, it also requires that workers survey at least 10% of low probability areas, determined either not fit for past use or artifact/feature survival (2009:6). Andrew David additionally suggests using sampling strategies, a topic to be covered in the next chapter, when a survey area is large enough that one cannot survey the area with a sufficient intensity (2006:9).

Subsurface Survey

Sometimes conditions require increasingly more intrusive methods. Subsurface testing methods vary in intrusiveness, but no matter the method, a portion of the survey area will be destroyed. Here I will discuss four subsurface testing methods.

In augur testing, researchers use mechanical or manual means to pull out undisturbed columns of the underlying material (David 2006:10). By removing columns of underlying earth, a field worker may discover cultural materials. However, coring and auguring also uncovers other useful information more frequently, especially as it allows for deep testing, which can reach soils as deep as approximately 33 feet (Burke et al. 2009:75). For example, coring pulls out a column of undisturbed soil, making the sample particularly suitable for geoarchaeology, such as examining the natural stratigraphy of soil layers, discovering organic materials, and finding old ground surfaces (David 2006:10; Burke et al. 2009:75). Additionally, the Virginia DHR suggests augur testing when the soil is too difficult to sift, (2009:8) as may occur with other sampling strategies targeted at environments with materials such as thick clays or high sediment densities.

Another survey option is trenching. As opposed to augur testing which provides a deep column of soil, by trenching, archaeologists excavate a long, deep, but narrow expanse of land. Most often, archaeologists excavate these trenches by machine, a strategy identified as mechanical trenching. Mechanical trenching and trenching often refer to the same overall method, differing only in tools. For example, Heather Burke, Clair Smith, and Larry Zimmerman (2009:75) concentrate on mechanical trenching, offering claw-like digging machines called back-hoes as an example of what kind of machines archaeologists use in mechanical trenching, while the DHR guidelines (2009:9) simply outline the general practice of trenching, whether conducted by hand or by machine.

Just as coring can reach deeper soils, trenching can discover deeply buries sites. Some machines can remove centimeters at a time and so examine deep trenches layer by layer. Burke, Smith, and Zimmerman (2009:75-76) estimate that trenches can also reach approximately 33 feet below the surface. The Virginia DHR requires that researchers dig until they reach the cultural horizon[25]. An important advantage of trenching is that it provides a profile for the inspection of stratigraphy. Additionally, a profile can help draw out a history of alluvial[26] or colluvial[27] processes and allow for the convenient testing of geophysical aspect of the environment such as soil type, texture, grain size, and Munsell color[28] (DHR 2009:8).

Shovel test pits (STPs), small units excavated by shovel in order to test for cultural remains, are also a method for subsurface testing. STPs access materials near the surface and can provide an archaeologist with physiography information such as stratigraphy and soil horizons[29] (David 2006:10; Burke et al. 2009:76). More importantly, as a surveying method, researchers excavate STPs locate sites and findspots, as well as to establish site boundaries (DHR 2009:7). The Virginia DHR calls STPs the "most reliable" method for detecting sites with low ground visibility (2009:6). The DHR and Burke, Smith, and Zimmerman promote similar STP sizes, establishing effective STP size, depending on shape as between a 15 inch diameter or an area of 20x20 inches (DHR 2009:6; Burke 2009:76). Due to the small area that a single STP covers, STP methods depend heavily on sampling strategies, the topic of Chapter 3.

Technology-based Survey

Archaeologists can use technology in a variety of ways to either conduct a survey or complement one already applying another method. Such surveys combine methods from different disciplines, offering a relatively interdisciplinary approach. As archaeologists are, of course, most interested in what is in the ground, geology plays a major role in most of these

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[25] Sterile subsoil

[26] Soils and sediments deposited by water.

[27] Soils and sediments deposited down slope.

[28] Standardized color descriptions

[29] Soil horizons often correlate with stratigraphy layers. A-horizons, for example, indicate a ground surface while buried A-horizons show past ground surfaces. A B-horizon includes soil and sediment build up.

methods. Additionally, these methods vary in complexity, both in concept and action. Generally, I separate these methods based on complexity, moving from Geographic Information System (GIS), to aerial photography, to remote sensing, and finally to electrical resistivity.

GIS, while not strictly a survey method, complements other survey strategies. In fact, GIS acts as a mapping system through which, with the proper information, one can combine many variables such as location, elevation, water sources, and even physiography. Using GIS, archaeologists can create a surface which shows the relative probability of an area to contain a site. These probabilities are calculated based on computational variables, many of which I have previously discussed, such as land use, environment, distance from the water, previous sites, etc. As one would expect, these computational variables emerge from previous research conducted during the initial stages of the project.

These computational variables will then be used to create a map portraying areas likely or not likely to contain sites. To do this, one creates a database of existing sites and, then, in a GIS, one sets a background of digital based maps obtained from photographs, remote sensing, or other existing maps such as those provided by state programs. Onto these digital base maps, the program can layer the database of existing sites, converted into a map-friendly form. Using the existing sites and computation variables, GIS creates a probability map from which archaeologists can base their targeted survey areas and can be incorporated into a typical survey research design (Molyneaux 2005:106, 122-123). Additionally, GIS may become useful in later stages of research, specifically for spatial analysis based on information obtained by both large and small scale surveys (Molyneaux 2005:118).

Often, a site unnoticeable on the ground may show in an aerial photograph (Purdy 1996:79). The use of aerial photography in archaeology depends on certain pre-determined markers recognized by archaeologists as signs of site presence. As these markers present on the features, generally, only sites with features are discovered by aerial photography. Crop marks serve as important site indicators. Archaeologists can locate sites based on two contrasting crop marks. First, the crop above a feature grows more rapidly than the area surrounding the feature. These crop marks appear greener and denser than its surrounding area. A feature can also restrict a crop's growth. In this case, an aerial photograph shows stunted or sometimes more yellow crops, which tend to ripen more quickly than the surrounding crops (David 2006:2-3). Aerial photography also reveals sites that "survive as topographic features," which are usually associated with structures or earthworks (David 2006:4).

High altitude photography, meanwhile, maps the earth's surface from space. Such technology originated in the Cold War period, created as spy satellites, and included satellites like CORONA, which was the first to map earth from space. After CORONA, these satellites increased in accuracy over the years. High altitude photography has been used to find such sites in Syria as ancient settlements and Early Bronze aged tracks in northeastern Syria (David 2006:5-6). Though these photographic methods, both aerial and high altitude, offer a relatively non-intrusive survey approach, due to ground visibility issues resulting from its wooded areas, these methods would only be effective in certain Virginia environments like agricultural fields.

Archaeologists also conduct surveys with technology driven geophysical methods such as remote sensing. Purdy offers a working definition of remote sensing as "the imaging of phenomena from a distance" (1996:79). However, this is rather vague for my purposes and I prefer her more in-depth, if more complicated definition. She writes that remote sensing involves either the measuring of the intensity of the magnetic field underlying the survey area or the sending of energy, of varying forms, into the ground to "read" subsurface conditions based on "anomalies encountered by the energy" (Purdy 1996:80). As this definition is rather complicated, it can be more clearly illustrated by the following discussion of different remote sensing methods that archaeologists can choose from.

Remote sensing involves various approaches, including employing equipment such as metal detectors, magnetometers, and ground penetrating radar (DHR 2009:7) Here I will discuss remote imaging (including GPR) and magnetometry more specifically. Archaeologists have different views for how researchers should use remote sensing. For example, some archaeologists promote the application of remote sensing to augment traditional methods. Others prefer remote sensing over subsurface survey and claim that researchers should only use subsurface testing if remote sensing is not viable. Additionally, a number of archaeologists apply remote sensing to a specific task, such as feature detection (DHR 2009:7, Burke et al. 2009:75, Purdy 1996:79). Researchers must always evaluate ground truth when dealing with results emerging from remote sensing further testing, such as excavation, in order to verify the data. Ground truthing--or digging to confirm remote-sensing results--indicates that remote sensing supplied correct data because surface or subsurface testing has supported the results.

David, meanwhile, defines remote imaging as "reflections generated by electromagnetic radiation at wavelengths that are invisible to the naked eye" (2006:4). Optical-electronic sensors operating aerially or from satellite can digitally record these wavelengths (David 2006:4-5). Put simply, a machine sends electromagnetic radiation into the ground and, upon contact with certain materials, rebounds in the form of wavelengths which the machine can then read. The rebounding of these wavelengths, first of all, reveals that some material capable of reflecting electromagnetic radiation lies below the surface of the test area. Additionally, the machine can calculate the distance between the machine and the material based on the wavelength the reflection gives off.

Out of the possible remote-sensing devices, archaeologists most commonly use GPR which can horizontally and vertically map anthropogenic features and artifact scatters. GPR works through a transmitter which sends microwave energy into the ground. When coming into contact with certain material, the energy reflects from electric interfaces up to a surface receiver (David 2006:21). GPR detects disturbances below the surface as the microwave energy encounters them.

Magnetometry, meanwhile, deals in magnetic fields and is commonly used in Virginia (DHR 2009:8) and other regions, detecting inconsistencies in the earth's magnetic field including those caused by subsurface archaeological features. David stresses the importance of magnetometry, stating: "Of the geophysical techniques available to archaeology, the greatest single contribution to site reconnaissance and characterization is probably made by the measurement of variations in soil magnetism or magnetometry" (2006:15). One can measure these variations because natural and archaeological remains cause a change in soil magnetism. These remains often have a higher magnetic susceptibility. Magnetometry is particularly useful in finding remains such as buried hearths, fire places, pottery, kilns, pits and ditches as both iron and burning create magnetic anomalies (David 2006:15-16). When fired to a certain temperature, grains of iron-oxide line up. Because these iron-oxide anomalies are more magnetically susceptible than subsoil, magnetometry readings reveal their presence and location (Purdy 1996:80). While commonly used, magnetometry can only work in certain environments. For example, magnetometry does not produce accurate readings in regions with high densities of iron in the soil, as the iron naturally interferes with magnetic technology.

Conclusion

This chapter provides an introduction to a variety of survey methods, all geared towards site detection, though what qualifies as a site depends on the researcher's own views or the purposes of an individual project. Nevertheless, archaeologists choose between three general survey method categories: surface survey, subsurface survey, and technology-based survey. Each of these general categories has strengths and weaknesses, some of which become important later in this paper. However, my purpose here was to simply establish an understanding of these methods for the sake of later, more complicated analysis. The following chapter, meanwhile, covers sampling strategies applied once a researcher selects a survey method. In a sense, while this chapter shows what each method can do, the next chapter reveals how researchers carry out methods, introducing the strategic choices archaeologists must make before conducting a survey.

Chapter 3: Sampling Strategies

Introduction:

While the previous chapter covered survey methods, site detection is equally dependent on sampling strategies. Archaeologists apply methods through sampling strategies. In other words, one can view survey techniques as the "what" and sampling strategies as the "how" of site discovery. Thus, methods serve as tools and sampling strategies as the specific way one puts the tools to use.

Just as archaeologists have an array of methods from which to choose, they also have a range of possible sampling strategies. In selecting from these sampling strategies, archaeologists must consider the specific variables of their project, such as research goals, targeted site period, environmental conditions, and logistical factors. Some possible environmental conditions to consider include surface visibility, soil type, and identifiable landscape change (i.e. plowing, alluvial and/or colluvial deposits). Logistical factors, meanwhile, include available time, survey area size, size of work force, and budget (Burke 2009; David 2006; Molyneaux 2005; Purdy 1996).

Generally, researchers take similar steps in conducting a survey through different sampling strategies. First, researchers establish a model survey grid which divides the survey area up into different sections. From there they apply a sampling strategy, either collecting or recording finds along the way. In conditions of poor ground visibility, archaeologists then lay out test grids for subsurface testing due to the lack of general artifact exposure. Finally, researchers enter variables such as find location and applied sampling strategy into a computer program which creates a distribution map which archaeologists can use to guide further testing or to analyze preliminary finds (David 2006:9). As mentioned earlier, these are very general steps which apply to most of the following strategies but not all.

There are two general categories of sampling strategies from which archaeologists generally choose from: (1) non-probabilistic and (2) probabilitistic. Archaeologists choose between the two based on how they wish to approach later analysis, though that does not rule out using a combination of the two if it fits a researchers purposes. However, sampling strategies include other choices besides non-probabilistic and probabilistic sampling; one can consider all approaches to sampling a sampling strategy. After all, one can consider a strategy, by its most basic definition, an approach. Thus, a sampling strategy simply means an approach to sampling. Any choice becomes a strategy. For example, though not included in either non-probabilistic or probabilistic sampling, the Virginia DHR suggests the application of mechanical trenching to remove the plow zone before excavating (2009:13). Below, I provide a more specified introduction to individual sampling strategies.

Non-Probabilistic Sampling:

There are three typical non-probabilistic sampling strategies. In the first, researchers simply test at easily accessible locations. Such locations would include areas which have undergone either a natural or anthropogenic disturbance. For example, a site uncovered by a flood or landslide would offer an easily accessible test area. Targeting visible sites also qualifies as a non-probabilistic sampling strategy. Through aerial photography, for example, researchers can select test areas based on crop marks, as discussed in the previous chapter. Additionally, these test areas often involve a standing structure, anything from an earth mound to house remains. However, as one can expect, focusing on obvious sites only reveals information on one aspect of a culture, such as burial or domestic life (Purdy 1996:81). In Virginia, the Hopewell mounds serve as a good example of an obvious site. Focusing on these mounds would only provide insight into burial and spiritual traditions, or possibly the society's elite. Earlier trends in archaeology, in fact, often focused on these elite because their prominent presence in the archaeological or even historical record. Here I think of such examples as the Mayan pyramids in Mexico (Price and Feinman 2006) or even early projects at Monticello focusing on Jefferson's house.

Judgmental sampling serves as another non-probabilistic sampling method, based on researchers' intuition and hypotheses. During such sampling, archaeologists consider what areas are most likely to contain a site, targeting these areas while avoiding seemingly improbable areas. These evaluations are based on past experiences and previous research. An archaeologist, for example, may consider which conditions could have, in the past, attracted people. Often, such conditions include sites near a water or raw material source (Burke 2009:72-73; Purdy 1996:81). Other considerations involve the migration of cultural materials, much like soil and sediments, into alluvial or colluvial deposits.

A judgmental sampling strategy would not necessarily depend on the arbitrary decisions of project leaders. As discussed in the previous chapter, a GIS can create a predictive model based on very similar conditions or characteristics that the consideration under judgmental sampling would. Such conditions or characteristics serve as computational variables to form a relatively reliable projection for site locations (Molyneaux 2005:122-123). When researchesr apply predictive models, they must verify all projections by establishing ground truth, often through subsurface testing such as excavation.

Non-probabilistic sampling has a place in archaeology. Non-probabilistic sampling is generally most viable in three situations: an easily accessible test area caused by anthropogenic or natural disturbances, a clearly visible feature or structure, and/or an area indicated by a predictive model. While not open to statistical analysis like probabilistic sampling, non-probabilistic sampling can still effectively locate sites in some circumstances.

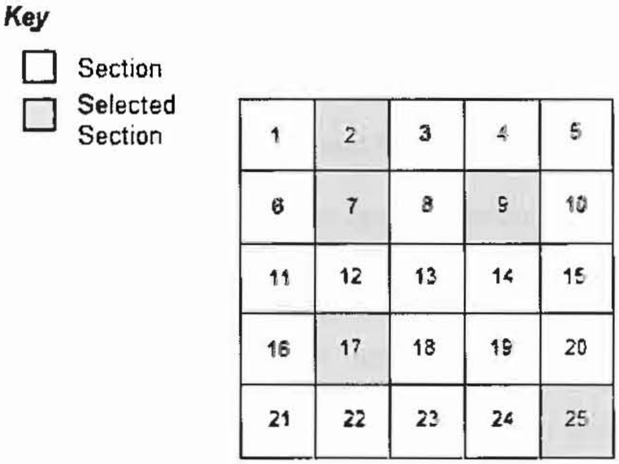
Probabilistic Sampling

Probabilistic sampling offers another option. On the subject, Brian Leigh Molyneaux writes: "...formal sampling strategies, which rely on statistical probability to mitigate the effects of substantially reduced coverage across an area, reduce the effects of bias in the coverage and provide a record of the actual ground surveyed" (2005:121-122). Probabilistic sampling provides the statistical criteria which make it appropriate for quantitative analysis (Purdy 1996:81). Due to the randomization of the data, probabilistic sampling is less biased than non-probabilistic sampling. Of course, this does not totally eliminate biases and archaeologists should record any limitations which affects their choice of strategy (Burke 2009:74).

Here I discuss three probabilistic random sampling methods. Researchers do not, however, have to employ each exclusively and can use the three in various combinations. They are (1) simple random, (2) systematic random, and (3) stratified random (Purdy 1996:81-82; Burke 2009:71-74). Through these strategies, researchers attempt to provide an unbiased representation of the study area. For each of these strategies, researchers establish the desired sample size for the proper representation of the entire survey area. In other words, before choosing the individual test units, archaeologists must first know how many of these units they need. Quite often, archaeologists speculate, based on their best judgment, how many units will offer a large enough sample for a successful analysis. They may speculate based on site density or dispersion in the study area's surrounding region, specifically similar sites belonging to the same time period as their targeted sites. For example, do these sites present with high density artifact presence? Do they have small or large artifact scatters? Do these sites appear at high densities in any particular region (Collins 2003:21)? Based on the sample size selected through such considerations, a grid is then established over a representation of the study area, usually either a diagram or map. Each section of this grid correlates with a specific, potential survey test area on the greater survey landscape. Researchers then assign each section a unique number. Here, for simplicity, I continue to refer to each potential survey test area as a section.

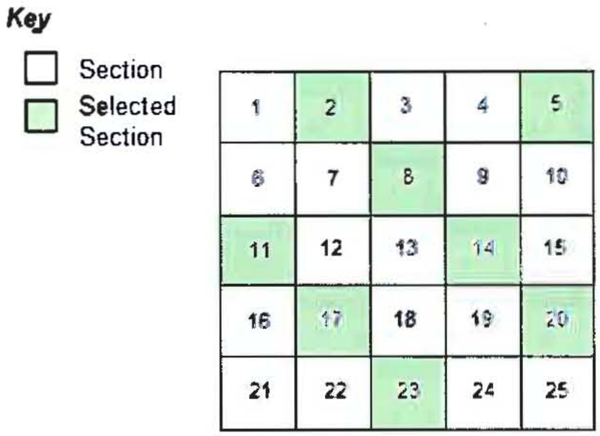
During simple random sampling, researchers use a list of these numbers to select a sample of sections provided in the grid. A researcher can randomly select a pre-determined quantity of these numbers manually, but usually a computer program generates a random list (Purdy 1996:81; Burke 2009:74). For example, from a population of 25 sections, the computer may select sections 2, 7, 9, 17, 25 and (See Figure 1). Researchers then investigate the section correlating with each number to an equal and pre-determined intensity.

Figure 1- Simple Random Sampling



However, as the list of numbers above demonstrates, a completely random selection may miss some areas of the study area. Systematic random sampling intends to eliminate such gaps while still offering a measure of randomization. This method can guarantee a sample which represents each area on the established grid. In systematic random sampling, researchers must apply at least two methods. Working with a similar grid and numbering system, researchers select the first section according to whichever method desired (besides systematic random sampling itself), preferably random in order to reduce sampling bias. For example, a computer program can generate a random number representing the first section. From there, researchers apply systematic random sampling. Archaeologists chose the next sections at pre-determined intervals, starting with the first and following each consecutive selection (Purdy 1996:82; Burke 2009:74). So, if the first method selects section 5 and researchers employ an interval of 3, researchers next test sections 2, 8, 11, 14, 17, 20, and 23 (see Figure 2). This way, the selected samples are representative of the entire gridded area, assuring an even distribution of tested sections.

Figure 2- Systematic Random Sampling



Key

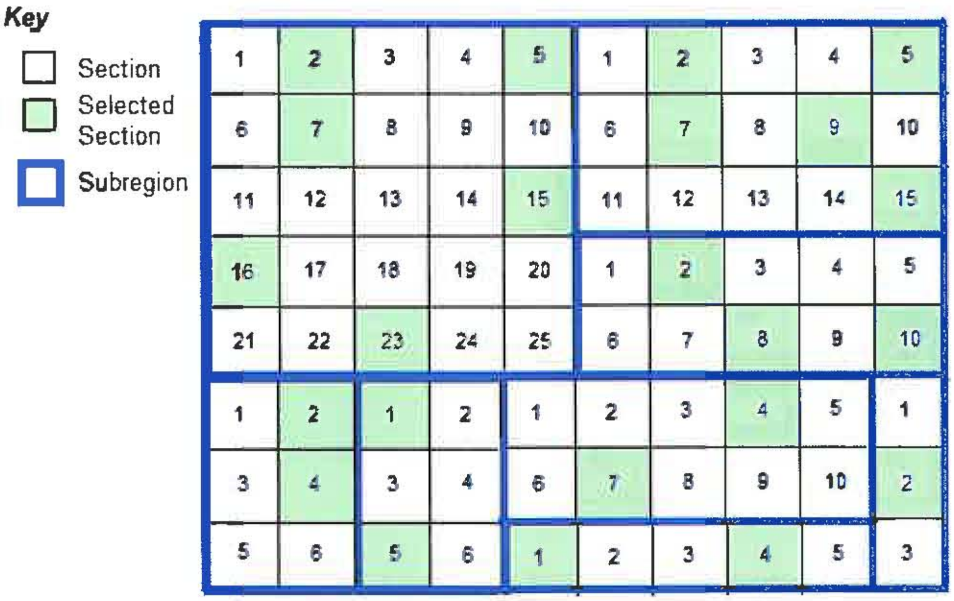
☐ Section

🟩 Selected Section

1	🟩 2	3	4	🟩 5
6	7	🟩 8	9	10
🟩 11	12	13	🟩 14	15
16	🟩 17	18	19	🟩 20
21	22	🟩 23	24	25

While both systematic random sampling and simple random sampling attempt to offer a random and unbiased sample, they do not take into account specific conditions unique to the study area. Stratified random sampling, on the other hand, focus on these conditions in creating its grid. For example, archaeologists may see that different soils cover different areas of the site, or a steep slope cuts through the study area. Additionally, archaeologists may take into consideration conclusions from previous research. Archaeologists can, for instance, stratify the study area inductively, based on the theory that groups tend to settle near water sources. Previous research may also demonstrate conditions under which site dispersion reveal as conducive to past habitation. Considering such conditions, researchers separate the study area into subregions and then further divide these subregions into sections. Though they then select sections randomly from each subregion, they can sample the subregion to different intensities based on conditions such as those provided by previous research (see Figure 3). While not perfectly random, stratified random sampling may offer a more realistic model of the landscape and useful testing results.

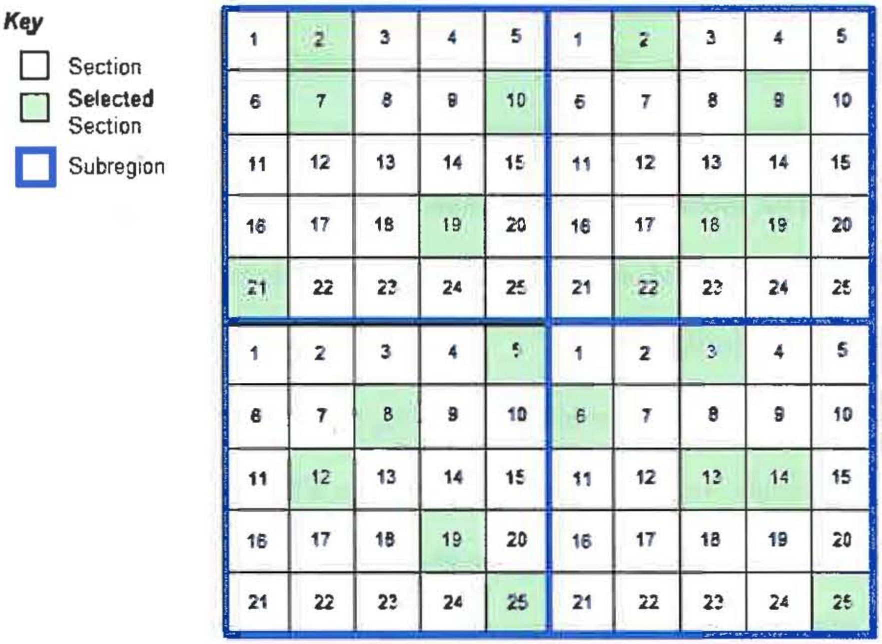
Figure 3- Stratified Random Sampling



On the viability of stratified random sampling, Purdy and Burke offer positive reviews. Purdy classifies stratified sampling as "the most useful method when sample units are not uniform, such as in different environmental settings" (1996:82), while Burke states that human behavior is not random so the chosen method should reflect this in the study of settlement patterns (2009:74). Following this line of reasoning, under stratified random sampling some parts of the landscape undergo more investigation than others (Purdy 1996:82; Burke 2009:74). So while stratified random sampling is not completely random and relies on a certain amount of bias, it does take into account the unique conditions of the test site, and researchers may prefer it in diverse environments.

At Monticello, the Archaeology Department approaches stratified random sampling differently, maintaining a more randomized strategy conducive to statistical analysis. Instead of stratifying the survey area into different sized subregions, Monticello stratifies a survey area into uniform sections of an arbitrarily established size (see Figure 4). In this way, Monticello ensures that each survey area subregion is sampled to an equal intensity. While through the stratified random sampling strategy illustrated by Purdy and Burke, archaeologists can target specific areas, the strategy at Monticello allows for a representation of the entirety of the survey area.

Figure 4- Stratified Random Sampling (at Monticello)



1	🟩 2	3	4	5	1	🟩 2	3	4	5
6	🟩 7	8	9	🟩 10	6	7	8	🟩 9	10
11	12	13	14	15	11	12	13	14	15
16	17	18	🟩 19	20	16	17	🟩 18	🟩 19	20
🟩 21	22	23	24	25	21	🟩 22	23	24	25
1	2	3	4	🟩 5	1	2	🟩 3	4	5
6	7	🟩 8	9	10	🟩 6	7	8	9	10
11	🟩 12	13	14	15	11	12	🟩 13	🟩 14	15
16	17	18	🟩 19	20	16	17	18	19	20
21	22	23	24	🟩 25	21	22	23	24	🟩 25

Probabilistic sampling gains it name because, through statistical operations, the survey can not only detect sites but also create a representation of the landscape which can aid future research in the region. Statistical operations depend on random distributions. Probabilistic sampling offers a random selection of the actual areas which archaeologists survey, allowing researchers to apply statistical measures to their research. In choosing between non-probabilistic and probabilistic sampling, researchers decide how to manage labor costs and whether a statistical model would facilitate more relevant analysis.

Other Choices in Strategy:

While the above are the strategies traditionally associated with the term "sampling strategy", any choice during a survey or excavation qualifies as a sampling strategy. For example, what size interval should be used for collection or testing in surface and subsurface surveys? A popular choice in testing, in both surface and subsurface, is to conduct a transect survey. Researchers most often use transects in probabilistic surveys and establish coverage along lines or contours at pre-determined intervals (Molyneaux 2005:122). Archaeologists hold no consensus on the optimal interval size. While archaeologists consider the conditions specific to the study area when establishing the project's interval size, much of what is considered in terms of intervals comes from the literature, which I discuss next chapter. While I mention specific interval sizes here, they are based on Virginia DHR guidelines and not necessarily the optimal interval, just one required by the DHR.

The DHR offers a useful representation of such sampling strategies in regards to pedestrian surveys in plowed fields. In environments with less than 50% ground visibility, researchers conducting a pedestrian survey must additionally employ subsurface testing. Otherwise, when at least half of the study area is clear of obstructions such as wooded areas, researchers can rely on visual inspection without subsurface testing. Next, researchers establish a grid over a representation of the survey area. Based on this grid, field workers collect samples at a maximum interval of 50 feet. During this process, surface collection can go no deeper than the already existing disturbance. In other words, field workers should not create new surfaces. Doing so would then qualify as subsurface testing. However, throughout this process, field-walkers look for cultural materials along their entire transects, not only in intervals. Once researchers complete a pedestrian survey and discover a site, the DHR suggests following up the survey with at least two STPs. These STPs would do two things: (1) establish site depth and (2) discover the presence of material culture (DHR 2009:6).

Because subsurface surveys are more labor intensive in labor, cost, and time, researchers often limit their intensity. In order to limit intensity while still conducting an efficient subsurface survey, researchers must form a research design with a detailed approach to sampling strategies. Because of this, unless certain conditions make it impossible, researchers should conduct subsurface surveys using probabilistic methods which allow archaeologists to make estimates for artifact presence in untested areas between collection points. James M. Collins and Brian Leigh Molyneaux put it this way:

> Any subsurface sampling strategy is most effective when done systematically. You must determine intervals and transect spacing appropriate to the sometimes conflicting consideration of site discovery probability, scheduling, requirements, and budget (2003:64).

To demonstrate sampling during subsurface surveys, I will examine STP sampling strategies, specifically those provided in the DHR survey guidelines.

The DHR highly recommends STPs when less than 50% of the ground is visible. Burke recommends a square test pit measuring approximately 20 x 20 inches for optimal precision as, not only does it detect the presence of cultural materials, it also offers a clearer vertical profile

(2009:76). The DHR, however, advises circular STPs with a diameter of 15 inches. Field workers should dig until they hit sterile subsoil[30]. Again, the most controversial aspect of STP sampling lies in interval size. While I cover this controversy later, here I outline the interval strategies that DHR specifically requires for state projects.

According to DHR guidelines, during Phase-I testing, researchers must systematically excavate STPs at a maximum interval of 50 feet. Though promoting systematic sampling[31], the DHR also recognizes the need for judgmental sampling. For example, under certain soil or topography conditions, researchers can justify creating a wider interval. Conversely, for high probability, map projected, and/or visible site areas (such as those indicated by crop marks) researchers should apply shorter intervals. Additionally, when archaeologists expect sites of smaller size or artifact density, the starting interval should tighten accordingly, based on archaeologists' best judgment (DHR 2009:6). In some cases, however, researchers do not anticipate smaller or less dense sites and the 50 foot intervals may miss these sites entirely. To avoid a misinterpretation of the study area's site density, when a survey discovers one positive STP in isolation[32], results should be confirmed by tightening the interval (DHR 6-7, 13).

Subsurface testing can also include the use of technology-based methods such as magnetometer surveys, which will here serve as my example. Like subsurface strategies (and, to an extent, surface strategies), field workers carry out magnetometer surveys in transects with a pre-determined sampling interval. These intervals can vary (David 2006:17). Magnetometer surveys offer some more favorable strategic opportunities. As the use of magnetic technology requires less time and effort than subsurface testing such as STPs, researchers can use smaller intervals and test the study area more intensively. For example, during the 1992-1996 project in

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[30] Underlying soil area without cultural materials.

[31] Systematic sampling lacks the random selection of test areas provided under systematic random sampling.

[32] A positive STP is in isolation if its surround STPs are negative.

Jamestown, a magnetometer took a reading every meter (Horning 2000:4). Additionally, magnetometer surveys differ from methods such as STPs because it is relatively non-intrusive and the integrity of the survey area can remain intact.

Sampling strategies can also included the application of several survey methods under one project, for instance, involving diverse environmental conditions within a single site. One can effectively conduct an STP survey at constant intervals on a homogeneous study area, but field workers may come across more heterogeneous environmental conditions. For example, a survey area may contain colluvial or alluvial deposits which make locating a buried site more difficult (DHR 2009:8). While one can use STPs, STPs are usually ineffective at depths greater than one-foot. Researchers, then, must consider supplemental methods to investigate deep deposits which the original STP survey could not reach. With a large enough budget, most mechanical methods are more time efficient and capable of reaching the required depths. The DHR also suggests, instead of STPs, three-foot-square test units (DHR 2009:8-9), which physically allows one to dig deeper than STPs, as researchers can brace the unit walls in the case that they reach depths which can cause the walls to collapse.

Conclusion

As the above chapter has shown, while the term "sampling strategy" usually refers to strict models such as "simple random" or "stratified random" sampling, any decision researchers make in the course of their project qualifies as sampling strategy. This includes choices made both when forming a research design and in the field. By recording each employed sampling strategy, archaeologists are better informed when it comes to statistical analysis in the case of primarily probabilistic samples or future research. More importantly for my analysis, however, researchers also contribute to the constant search for the most effective and efficient survey plan, in general and under specific conditions. The following chapters illustrate this search by providing scholarly debates and case studies on the subject of method and strategy. Though these articles do not establish the perfect survey, they guide the decisions archaeologists must make during their own projects.

Chapter 4: Literature Review Part I

Introduction:

The scholarly works I discuss below emerge, for the most part, from the 1980s when the debate over survey methods was at its peak. Reading over the pieces, one sees that these archaeologists drew from each other, building on or criticizing each other's work. They examine the history of survey methods, weighing in on which methods or strategies allow for efficient surveys, particularly in the Eastern Woodlands. Additionally, H. Martin Wobst, whom I discuss below, offers his own literature review of developments in the 1970s and early-1980s. Despite their early publication dates, these works remain prominent in the field. While some debate and criticism continue, for the most part, the works of the 1990s and 2000s either refer to or re-iterate these conclusions (e.g. Burke 2009; David 2006; Molyneaux 2005; Collins and Molyneaux 2003; Purdy 1996; Hoffman 1993). Furthermore, professors still assign these readings in graduate and other archaeological method courses.[33]

In the previous chapters, I provided an introduction to many of the concepts which appear in this literature review as these scholarly works examine methods and strategy in depth. While I could perhaps leave one with only the introductory concepts before turning to my own analysis, one would find forming a research design based on only textbook descriptions of these methods and strategies difficult. One must see actual surveys in action, so to speak. Through the case studies from which these scholars draw conclusions, these archaeologists reveal the intricacies involved in planning a survey project. While one strategy may work in a certain environment, in others the survey would fail to provide sufficient results. Through a review of these works,

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[33] e.g. Anthropology 229B-Archaeological Research Strategy at University of California, Berkeley. Course packet provided by Professor James Flexner. Includes Lightfoot 1986, Shott 1989, and Lightfoot 1989.

researchers can build upon others' experimentation instead of allocating funds and time to discovering optimal survey methods and strategies themselves.

Though archaeologists published numerous case studies and recommendations, I provide a review of only a select few which I believe offer a representative overview, revealing the general methods and strategies promoted or designed during the debate's peak. Following the discussion of the selected articles, I offer a brief analysis of these pieces, demonstrating my position in the debate which, ultimately, reveals itself repeatedly in following chapters. Finally, even with the condensed literature review, the review is still extensive. Therefore, in this chapter I will discuss surface and subsurface analyses, while in the next I will review works focusing on sophisticated geophysical methods.

In looking at the survey versus subsurface debate, these archaeologists often refer to each other's work. As I focus most strongly on Kent Lightfoot's 1986 piece, I discuss his use of these earlier works and, to avoid repetition, do not examine the issues in their original articles (e.g. Wobst 1983; Nance 1980). Similarly, Wobst offers his own literature review of past work, many of which I do not specifically discuss here (e.g. Chartkoff 1978). Additionally, while, as I acknowledged in Chapter 1, American Indians across North America moved towards greater sedentism in later periods, the following archaeologists and others still mark the American Southwest as having a greater degree of sedentism.

Wobst 1983[34]

In, "We Can't See the Forest for the Trees: Sampling and the Shapes of Archaeological Distributions" H. Martin Wobst defines a site as an artifact scatter surrounded by sterile space[35].

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[34] More recent pieces which refer to Wobst's work include Banning 2002, Bloemker and Oakley 1999, Hey 2002, Stafford 2002.

However, not all archaeologists agree with using sites as the unit of study. Wobst and others (e.g. Shott 1989) point out that humans used the entirety of their landscape and archaeological remains in fact reflect this past use. Wobst writes: "...low-intensity tails of this distribution are infinite rather than neatly bounded and peaks are not separated from each other by a vacuum, but by a continuum of behavioral space" (1983:39). Nevertheless, while archaeologists should keep this opinion in mind, site analysis remains the most convenient approach logistically and analytically.

The title "We Can't See the Forest for the Trees" immediately informs the reader of the topic of analysis, surveying in heavily wooded areas. Wobst stresses the degree of low visibility, attributing zero visibility to survey areas in the Eastern Woodlands, caused by both its heavily wooded areas and agricultural fields. He writes that much agricultural land remains unplowed. The plowed land, meanwhile, is confined to valley bottoms, where alluvial deposits have buried cultural remains deeply beneath the surface. Such conditions make subsurface testing necessary, but through the 1970s and early 1980s, archaeologists conducted these surveys to varying levels of efficiency. Wobst attributes the level of efficiency to the survey methods and strategies. As such, he offers a review of past surveys conducted in the Eastern Woodlands over the years.

William A. Lovis (1976) first used variables such as soil types, relief, and stream dissection to subdivide the larger study area. In this way, Lovis's crew covered 20% of the overall area, excavating STPs every 100 yards on pre-determined transects (otherwise known as stratified random sampling). This strategy left merely one percent of the area tested. D. Birk and D. George (1976), meanwhile, applied similar methods, but increased the intensity of the

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[35] Sterile space refers areas in which the survey discovered no or isolated cultural remains.

survey. To do this they (1) dug to sterile soil, (2) used trowels, and (3) excavated STPs in 5 m[36] intervals (Wobst 1983).

Later in the decade, Joseph L. Chartkoff (1978) approached his survey in a different manner. His crew dug STPs at regular intervals just as Lovis, Birk and George had before him. However, he dug additional STPs radiating from positive STPS, which he classified as known findspots. Through this strategy, Chartkoff identified and defined site location, size, as well site type. He made these choices not by artifact density, but instead by establishing the sterile space between and around artifact scatters (Wobst 1983).

Next, Wobst considers Jack D. Nance's more complicated approach (1980). Nance subdivided the study area three times, first into three horizontal strata, then into 200x200 m[37] grids, and finally into sample units (again what I have identified as stratified sampling, only in multiple stages of stratification). During the third subdivision, Nance stratified the units into an eastern half, a northwest quarter, and a southwest quarter. From these subdivisions, Nance randomly selected units for testing (making this method not only stratified but also stratified random). His crew conducted a pedestrian survey in the eastern half, no matter the degree of visibility. In the southwest quarter, the crew excavated 16 randomly selected one-by-one meter[38] STPs, digging to a depth of 10 cm[39]. In the northwest quarter, the researchers similarly excavated 16 STPs to a depth of 10 cm, but instead of selecting the STPs randomly, they excavated in 25 m[40] intervals (Wobst 1983).

Though Wobst originally focuses on alternative survey methods, specifically subsurface methods, targeted at low visibility sites found in the Eastern Woodlands, another regional

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[36] Approximately 16.4 ft
[37] Approximately 650.2x160.2 ft
[38] Approximately 3.3x3.3 ft
[39] Approximately 3.9 in
[40] Approximately 82 ft

difference between the American Southwest and the Eastern Woodlands exists. Though the American Indians of the Woodland period moved towards sedentary lifestyles, even in the Woodland period, tribes remained mostly mobile, with some exceptions. Meanwhile, archaeologists attribute more sedentary lifestyles to the American Southwest.[41]

Sedentary and mobile groups leave behind disparate cultural remains and the sites associated with each one also reflects this difference. Sedentary sites present with large and dense artifact clusters, as well as more structures and features. Remains in the Eastern Woodlands contain sites with smaller clusters and fewer structures. Consequently, one cannot "transpose" (Wobst 1983:67) Southwest survey methods to the Eastern Woodlands. Summarizing this difference, Wobst states: "Sedentism is bound to cluster behavioral and archaeological distributions significantly more strongly than the more ephemeral settlement pattern of northeastern populations" (1983:68).

Finally, Wobst provides details from his own research which heavily involved statistical analysis. However, I discuss Wobst's statistical approach later on, as this example plays into Lightfoot's article. Wobst researched 220 subsurface surveys conducted in Massachusetts during the 1970s. Taking the aggregated data, Wobst calculated the proportion of the survey area researchers actually tested, based on the average STP size, interval size, and the percent of site actually probed. He discovered that the surveys generally only tested between .001 and .00001 of the site (Wobst 1983). Lightfoot later extends Wobst's results further, remarking that such a fraction is similar across most of the Eastern Woodlands (Lightfoot 1986:488). Due to the minimal volume area traditionally tested, projects suffer from issues resulting from site size bias, density estimates, and labor intensity.

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[41] Though Wobst follows this theory, it must be recognized that such a pattern may be too generalized or universal.

Wobst further shows that subsurface testing often fails to detect sites, specifically those made by highly mobile people. Wobst offers an example of a survey with 50x50 cm[42] units at 24 m[43] intervals. He illustrates how such a survey method performs for three different site types: large features, small clusters/features, and fireplaces. For large features, this strategy intercepts features greater than 900 square meters[44] with certainty, while still failing to locate more than 29% of cases. Wobst uses the Algonquian wigwam as an example of a small cluster/feature. He estimates the circular wigwams usually have a radius of approximately three meters[45]. Using the above strategies, researchers would only locate these wigwams less than five percent of the time. Finally, Wobst discusses his smallest find. He writes that archaeologists would miss the fireplace, estimated to have a diameter of about 50 cm[46], 99% of the time (Wobst 1983). So, while Wobst promotes subsurface testing, he recognizes the need to strategize using statistical measures based on previous projects in the area before surveying begins.

Lightfoot 1986[47]

In "Regional Surveys in the Eastern United States: The strengths and Weaknesses of Implementing Subsurface Testing Programs," Lightfoot evaluates the usefulness of shovel testing in low visibility environments by reviewing works by Wobst (1983), Nance and Ball (1986), and Krakker et al. (1983) and reporting on two case studies from his own projects, one in northeast Arizona and the other in Long Island, New York. He writes that in areas of high visibility like the American Southwest, pedestrian survey offers an effective discovery method. However, as a low visibility environment, the Eastern Woodlands require a different, just as

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[42] Approximately 19.6x19.6 in.
[43] Approximately 78.7 ft.
[44] Approximately 0.5 square miles
[45] Approximately 9.8 ft.
[46] Approximately 19.7 in.
[47] More recent pieces which refer to Lightfoot (1986) work include Banning 2002, Stafford 1995, Bloemker 1999.

efficient method as the American Southwest (Lightfoot 1986: 485-486). While recognizing that shovel testing indeed has its limitations, Lightfoot proposes that shovel testing is still the most effective alternative to pedestrian surveys in the Eastern Woodlands.

Lightfoot's project in northeast Arizona serves as his case study evaluating pedestrian surveys in the more arid American Southwest. This case study serves, in a sense, as his control, as he uses it as the baseline to evaluate the relative effectiveness of STPs during his Long Island project. As Lightfoot intended to discover the location of sites in this region, he first outlined his definition of site: "We defined sites as all loci containing cultural material of sufficient quantity and quality to provide a good potential for interpreting the range of activities that once occurred there" (1986:485-486). Sufficient quantity is indicated by a cluster of one or more finds per square meter[48] and/or feature (Lightfoot 1986:485-486). During this project, field workers surveyed one hundred percent of a 41-square kilometers[49] area divided into smaller units. A three to four member crew walked in transects set at an interval of ten meters[50]. The crew covered about 60-80 m[51] along each transect. By the end of this survey, the field workers detected 152 sites: 143 pre-historic and nine historic (Lightfoot 1986:485-486).

As mentioned, the Eastern Woodlands require a different set of survey methods due to their low levels of visibility. While often transposing some of the methods involved in pedestrian survey (such as subdividing the survey area and creating transects), shovel testing involves greater planning in the initial stages and makes for a more extensive and intensive research design. Shovel testing, due to its nature, is more labor intensive as it requires not simply collection on intervals, but actual digging to reach these samples. However, researchers

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[48] Approximately 3.3 square feet

[49] Approximately 25.4 square miles

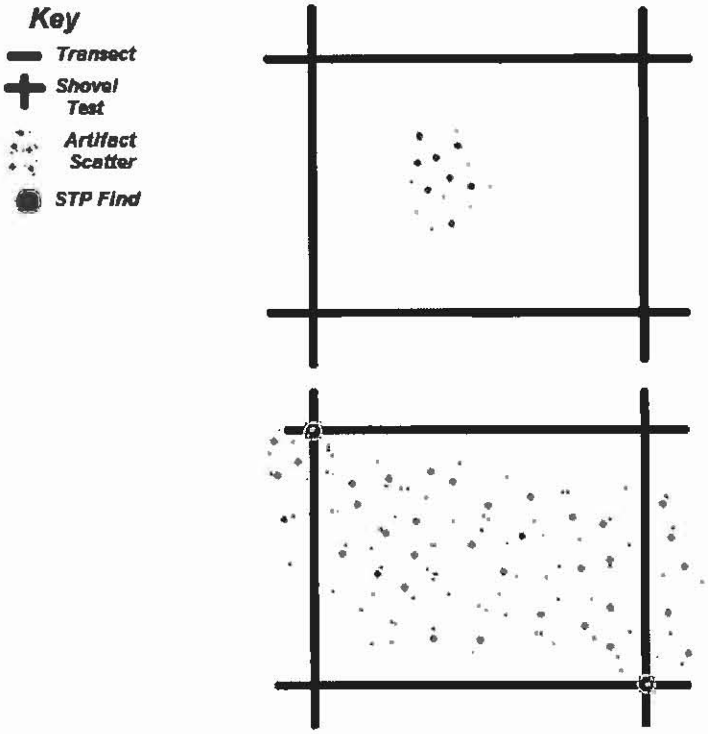
[50] Approximately 32.8 feet

[51] Approximately 196.9-262.5 ft

greatly reduce costs associate with intensive labor through a strict, pre-determined sampling strategy. Additionally, because of the restrictions created by available time and labor costs, shovel testing provides less detail than a surface survey. As a result, shovel testing relies heavily on probabilistic methods made possible by adhering to this pre-determined sampling strategy. Most commonly, this sampling strategy involves 30x30 cm[52] to one-by-one meter[53] test pits, placed along a transect or square grid, at an interval anywhere between five meters and 100 m[54] (1986:488).

Site size bias, perhaps, qualifies as the most problematic issue surrounding shovel testing. To begin with, subsurface testing has an inherent bias towards the discovery of large artifact scatters as, logically, a shovel test is most likely to hit within the site (see Figure 5).

Figure 5- Discovery of a Small vs. Large Sites



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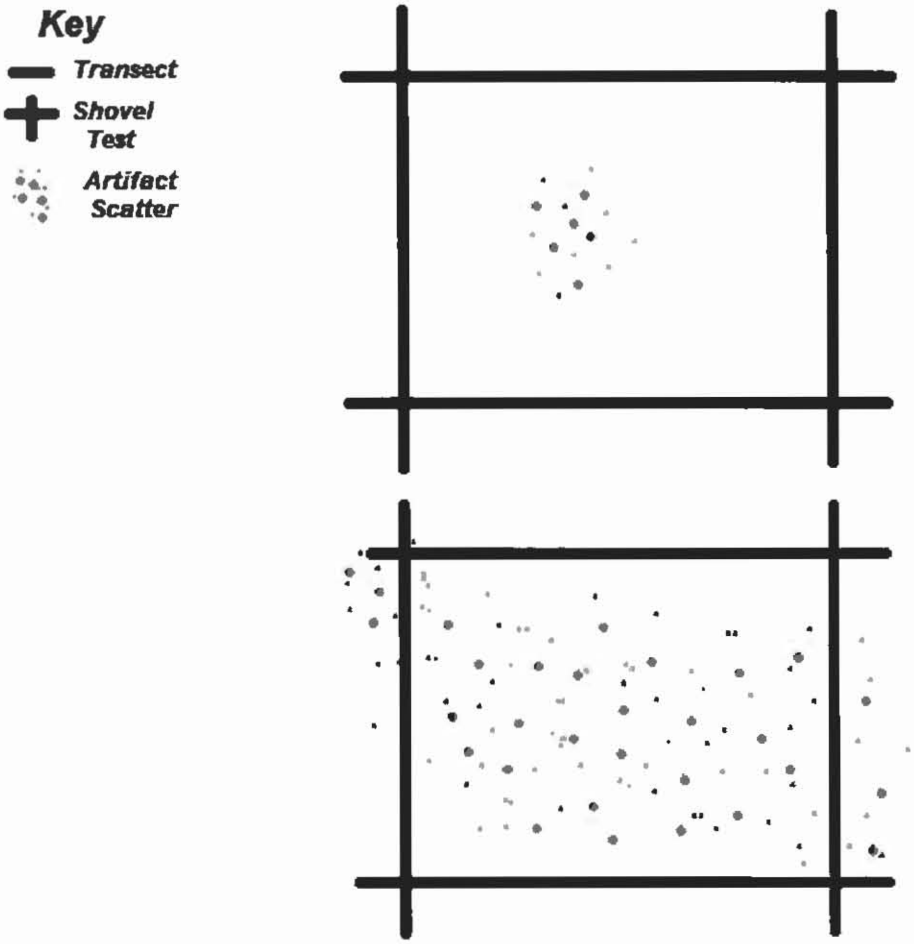
[52] Approximately 11.8x11.8 in.
[53] Approximately 3.3x3.3 ft.
[54] Approximately between 16.4 ft and 328 ft.

As a general pattern, through later periods of of pre-history sedentary groups were more common in the American Southwest than in the Eastern Woodlands. Lightfoot (1986), as a result, associates the Eastern Woodland landscape with smaller sites than the American Southwest, and site size bias becomes particularly problematic as many sites remain undiscovered. Further problems develop when a transect may run through a site, but STPs reveal no artifacts (see Figure 6).

Figure 6- Failure of STPs to Locate Sites



Lightfoot writes: "Recent evaluation of shovel probes indicate that, on average, 23-40% of the test units[55] placed over known sites may not produce any artifactual material" (1986:489). Density estimates also suffer as researchers cannot properly approximate site frequency and spatial distributions because, as mentioned above, STPs often miss sites. As a result, researchers cannot accurately study settlement patterns, which researchers usually evaluate based on site frequency and spatial distribution.

Finally, labor intensity offers additional issues. While archaeologists can reduce biases produced by low discovery rates by conducting a more extensive survey, cost often makes this unrealistic. For example, if researchers increased shovel test sizes and decreased intervals, discovery probability becomes more favorable, but, as mentioned, cost also goes up. Subsurface surveys are always more expensive than surface surveys due to the need for more workers and equipment costs. As Lightfoot states: "...the amount of work involved in surveying a unit of land increases astronomically—to the point where the costs become prohibitive for most archaeological projects" (1986:488).

However, shovel testing again becomes a viable option when researchers take measures to reduce such costs. Here, Lightfoot borrows from the work of Krakker et al. (1983), Nance and Ball (1986), and McManamon (1981) who illustrate that shovel testing is more practical if one uses statistical methods to adjust for the frequencies and distribution of sites in a sample unit rather than increasing the number of STPs per sample (Lightfoot 1986:488). Lightfoot clarifies that by using statistical calculations (based on equations discussed later) researchers can refine site frequency and distribution projections by considering previous research in similar areas (Lightfoot 1986:492). Such a hypothesis assumes that a survey area sharing characteristics and/or in the same region will produce similar results. Archaeologists basically work backwards,

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[55] STPs

calculating what survey strategies would have been most effective during previous surveys, and then projecting this strategy onto a current project. From there, researchers can calculate sampling intervals based on site discovery probabilities established as described above.

Lightfoot goes on to specify the process, step by step. First, researchers must do two things: (1) determine what kinds of cultural material they are targeting, and (2) define what qualifies as a site for the purposes of the project. For example, archaeologists can determine which finds qualify as a site based on size, artifact density, or artifact distribution. Next, researchers specify the extent of labor intensity to which they have access. As site size and interval sizes greatly affects site detection, researchers should survey as intensively as they can afford. Due to cost constraints, archaeologists may have to predetermine whether they target all sites or only a certain number of a specified minimum size.

Based on such factors, researchers calculate the probability of finding a site. Again, for the statistical portion of his discussion, Lightfoot cites Krakker et al. (1983) as the provider of this specific statistical approach. Lightfoot establishes that finding a site of a certain size and with a certain artifact density depends on shovel test intervals and STP size. Interval size especially plays a key role in the following equation. According to this equation, one can calculate the radius of the largest circular site (and as a result the site size) that cannot escape detection using (Krakker et al. 1983; Lightfoot 1986:492):

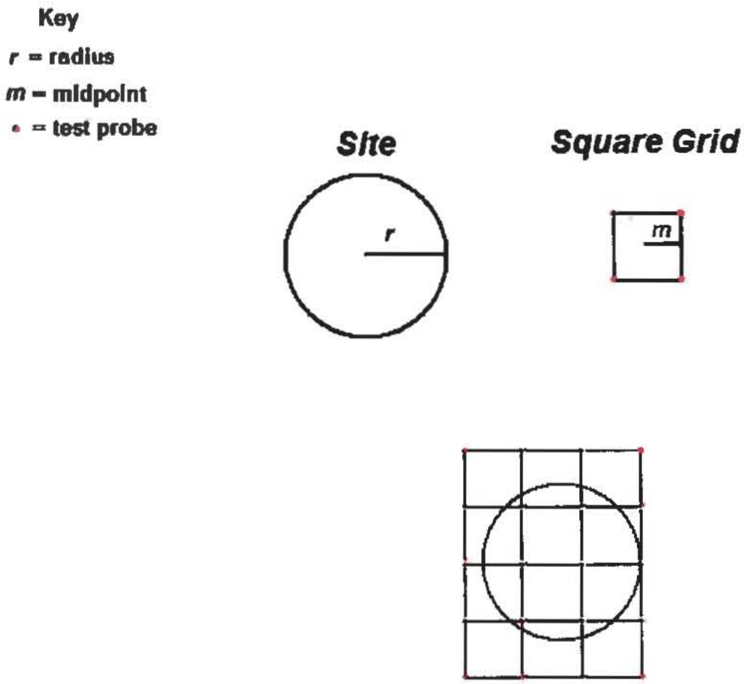
Key

i = interval size
r = site radius

$$r = \frac{i}{\sqrt{2}}$$

According to this equation, Lightfoot theorizes that if the radius of a circular site is greater than half way between the transects along which four shovel tests create a square grid, a STP will locate the site, no matter how the site and square grid is spaced in relation to each other (see Figure 7) (Lightfoot 1986:491-492).[56]

Figure 7- Clarifying Lightfoot's Statistics



From there, assuming a random distribution of sites and using both the radius of the site and interval size, researchers can calculate the probability of finding a site of a specified size, based on this equation:

Key
i = interval size
r = site radius
P = probability of finding site with r radius

$$P = \frac{\pi r^2}{i^2}$$

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[56] See Appendix C for graphical representations.

Lightfoot used statistical methods based on these two equations and previous archaeology to correct for bias in his project at Shelter Island in Long Island, New York.

Lightfoot claims that making these statistical corrections during the initial stages of the project resulted in as much detailed findings as surface surveys conducted in the American Southwest. Here, I briefly re-iterate his findings, which he reports in comparison to the American Southwest surveys. According to his calculations, Lightfoot's project at Shelter Island was 16 times more intensive than any project in the Southwest (1986:500). He found that shovel testing effectively discovered site boundaries and size. More importantly, he claims that shovel testing is particularly useful for the discovery of remains left by mobile groups. However, even with statistical calculations prior to actual surveying, labor remained significantly costlier than labor costs for surface surveys.

Moreover, Lightfoot states that surface survey in the American Southwest is not as effective as it is advertised to be. First, it assumes that most remains will have surface exposure, missing cultural remains below the ground surface. As a result, archaeologists retain biased perspectives of American Indian sites and settlement patterns. Because of this, Lightfoot writes that surface survey in the American Southwest remains reliable for the discovery of remains left by sedentary groups but surface surveys prove less effective in discovering mobile groups, even in the American Southwest. Lightfoot suggests that employing STPs in the region would result in the discovery of more sites associated with mobile people (1986:499).

In summary of his position on the subsurface survey versus surface survey debate, Lightfoot writes:

> The main point I wish to make is that intensive subsurface testing programs, especially when designed around discovery probability limits, may provide just as solid a foundation for making parameter estimates as most surface surveys conducted in arid areas of sparse vegetation (1986:501).

In other words, shovel testing not only effectively discovers sites, but it also allows for the formation of a solid database for the analysis of settlement patterns.

Shott 1989[57]

In his article "Shovel-Test Sampling in Archaeological Survey: Comments on Nance and Ball, and Lightfoot," Shott immediately makes his stance on shovel testing known, writing: "Shovel-test sampling is a survey method whose time, hopefully, has come and gone" (1989:396). He makes this statement in connection with two issues he sees in relation with the current use of shovel testing. First, contrary to the opinions of archaeologists such as Lightfoot, Nance, and Ball to whom he specifically responds, he believes that shovel testing, even with statistical corrections, fails to match the effectiveness of surface surveys in the American Southwest. The problem, he states, is that researchers use STPs as a site detection technique instead of a sampling technique for already detected sites, which Shott believes is the more suitable task for the method.

Shott soon moves on to his primary purpose of the article, offering a critique of Lightfoot, and through his addressing of Lightfoot's article, of Nance and Ball. Shott seems to disagree with Lightfoot's approach at its most basic levels. According to Shott, Lightfoot's discussion suffers from two major assumptions. First, Lightfoot assumes that all STPs within a site's boundaries will contain artifacts and, secondly, that the space between STPs is sterile. Shott declares even Lightfoot's approach to designating sites inaccurate. He writes that Lightfoot's definition of "site" assigns the landscape a greater number of sites than really exists. By separating artifact distributions that could conceivably make-up one site into multiple ones,

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[57] More recent pieces which refer to Shott (1989) work include Stafford 1995, Bloemker 1999, Verhagen 2005, and Wells 2010.

Lightfoot actually offers a misrepresentation of site size, suggesting a large number of smaller sites (Shott 1989:399-400).

As shown above, Lightfoot argues that subsurface survey actually, at the very least, matches the intensity of surface survey. In Lightfoot's opinion, subsurface survey is three dimensional, covering both surface and subsurface. Furthermore, Lightfoot claims that subsurface surveys can match the effectiveness of surface surveys conducted in the American Southwest. However, Shott disagrees, stating that surface survey remains both more "effective and efficient" (Shott 1989:401).

To further prove his point, Shott shows how even Lightfoot, Nance and Ball recognize the pitfalls of shovel testing. He writes that even Nance and Ball designate shovel testing to a supplemental role as they see that shovel testing cannot alone effectively discover sites. Even Lightfoot, whom Shott seems to view as the main supporter of shovel testing, admits that, despite the intensity he assigns to shovel testing, his crew probably missed some sites. Shott firmly agrees, only suggesting that shovel testing did not miss some sites; it missed many (1989:401-402).

Based on these arguments, Shott writes that Lightfoot, Nance and Ball failed to prove the effectiveness of shovel testing, proving its inefficiency instead. He writes: "But as long as shovel-test sampling is used, we continue to sanction the omission and unwitting destruction of many archaeological sites" (1989:401) However, he offers no alternatives to shovel testing, writing that, in the short-term archaeologists must depend on STPs as a site discovery technique, though he hopes that the then new experiments with geophysical methods would offer an alternative in the near future.

Lightfoot 1989

Shortly after the publishing of Shott's article, Lightfoot offered his own response to Shott's critique. He approaches this by first offering an overall summary of Shott's critiques, followed by a point-by-point response, and finally a case study supporting his position on shovel testing.

Lightfoot agrees that, as Shott stated, shovel testing does have its limitations and researchers need to develop more efficient and effective survey techniques. However, if one's preliminary work shows a high probability of buried remains in the study area, STPs should not be merely an option, but the primary one. He stresses that currently STPs are the most effective approach to surveys in the Eastern Woodlands, specifically on a regional level (Lightfoot 1989).

From there, Lightfoot refutes Shott point by point, three of which I will re-iterate here. First, while Shott stresses that shovel testing cannot identify all sites, Lightfoot points out that no method could realistically do that, especially for buried sites as one finds in the Eastern Woodlands. Next, as survey techniques would vary according to statistically driven sampling strategy, Shott sees shovel testing, even corrected for bias, as disadvantageous for comparing sites on a regional level because subsurface surveys cannot properly detect sites in the area, resulting in incorrect data. Lightfoot responds that results from different survey methods can indeed be compared for the sake of inter-site analysis because results emerging from systematic subsurface surveys can offer a representation of the landscape with predictive models (Lightfoot 1989:414)

Finally, Lightfoot comes to the crux of this debate: the accuracy of shovel testing juxtaposed with surface surveying. Despite Lightfoot's work at Shelter Island and the statistical corrections, Shott believes that surface surveys remain more accurate and intensive than shovel testing. Lightfoot agrees but only for remains on modern surfaces with high visibility (such as the American Southwest). However, he points out that archaeological remains exist in three dimensions, with some sites not presenting with surface finds, even in the American Southwest (Lightfoot 1989:413-414).

Lightfoot provides a case study to illustrate the effectiveness he connects to shovel testing. He compares two steps of his project under the Division of Environmental Protection in Brookhaven Township. Step one was a surface survey over a large area of road cuts and fields which discovered few remains, despite the relative visibility of the ground surface. During step two, his crew excavated 1,815 STPs in 10 m intervals across 16 survey sample units over the study area. He reports the discovery of a broad range of both historic and pre-historic sites. Subsurface survey yielded more finds than surface survey because most remains were buried within the 30 cm plow zone. This case study, Lightfoot claims, refutes many of Shott's criticisms while further proving the possible efficiency of shovel testing (Lightfoot 1989:415-416).

Plog and Hegmon 1993[58]

Instead of focusing on the effects of strategies on inter-site study, Stephen Plog and Michelle Hegmon (1993) offer a different view, examining and/or controlling for sample size and its effect on sample richness (measured according to artifact diversity[59] and density). Plog and Hegmon first suggest that archaeologists depend on sample richness levels to interpret "the range of activities conducted at different locales" (Plog and Hegmon 1993:489). The probability of detecting high sample richness levels correlates with increasing sample sizes. As such, they

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[58] More recent pieces which refer to Plog and Hegmon's work include: Leonard 1997

[59] Artifact diversity implies finds revealing the inconsistent nature of human behavior and/or the presence of rare artifacts or features.

suggest that researchers control for varying sample sizes in order to remove their effect from the data. By removing sample size effects, researchers can more easily compare the heterogeneity in human behavior illustrated from one site to another (Plog and Hegmon 1993:489-490).

Keeping this in mind, Plog and Hegmon hypothesize that archaeologists can successfully remove the sample size variable through statistical corrections. However, to properly control for differences in sample size, Plog and Hegmon stress the necessity of first examining the project's research questions and whether correcting sample size effects can effectively answer these questions (1993:490). As sample size can also be caused by diverse human behaviors, Plog and Hegmon state that archaeologists must first discover why sample sizes vary between sites. Some possible causes include differences in frequency and/or length of occupation as well as differences in population. Their argument, then, in its most basic form stresses the need to examine and correct the effects of sample size and sample richness. After all, if one has a greater number of artifacts to study, one will most likely see more artifact forms. Removing sample size from the equation, then, allows for archaeologists to study human behavior through inter-site analysis instead of the individual site focus of intra-site studies (Plog and Hegmon 1993).

Analysis

In Chapter 1, I illustrated different cultural manifestations in the Virginia regions and pre-historic site periods. However, the archaeologists in this literature review collapsed these specific variables into the overarching pre-historic Eastern Woodlands, working through generalizations on the degree of sedentism in the American Southwest versus the Eastern Woodlands. I find it useful to first consider the general trends and recommendations provided here to establish a starting point before looking at specific Virginia site periods and types later in my final chapters, working from the general to the specific. After acquiring the pertinent information on available survey methods and sampling strategies, in this chapter I narrowed my focus to pre-history in the Eastern Woodlands. In later chapters, I further narrow my focus to the Virginia Piedmont and different site types and periods and, then, eventually to a single project in the Virginia Piedmont.

Much of the above literature has considered subsurface versus surface survey, focusing on the effectiveness of one over the other, based on an array of variables. Others focus primarily on subsurface surveys (usually STPs) and how to improve their efficiency and effectiveness.

Surface survey was once the traditional model strategy for locating North American sites, based on its apparent success. Most of this success emerged from projects in the American Southwest where certain conditions facilitate surface surveys. First, the arid landscape offers high visibility so that, if an artifact lies on the ground surface, a crew member will most likely spot it. Second, a significant amount of cultural remains do lay on the modern ground surface, free from alluvial and colluvial deposits. Finally, some pre-historic peoples in the American Southwest lived relatively sedentary life-styles, creating larger sites with a greater number of structures/features, many of which researchers can still find on the surface. Archaeologists survey to find sites and, the three factors above offer enough evidence of site presence.

However, the Eastern Woodlands do not meet these three conditions. Vegetation, as the region's name suggests, covers much of the landscape, greatly reducing ground visibility. An artifact lying amidst the grass can very likely go unnoticed during a surface survey. Additionally, and more problematically, most indicators of site presence do not appear on the modern ground surface. Hundreds or thousands of years of erosion and deposition not only moved artifacts out of place; they also buried them. As Lightfoot would point out, this factor creates the need for a strategy targeted towards a three-dimensional site. Finally, while some pre-historic peoples in the American Southwest lived more sedentary lifestyles, the more mobile Eastern tribes left behind ephemeral sites, though in later periods tribes became less mobile in both regions, as explained in Chapter 1. As such, artifact scatters are often smaller and less dense and archaeologists locate limited structural finds. These conditions make surface survey impractical in Eastern Woodland conditions. As Wobst says, you cannot transpose methods from the American Southwest to the Eastern Woodlands.

This leaves subsurface methods. While I will cover what Wobst calls "fancier" (1983:54) or geophysical methods, which include technological and scientific subsurface methods, here I consider the more destructive processes. Such processes include the use of corers, augers, backhoes, and mechanical trenching. The works review here generally focuses on the effectiveness of subsurface testing. They show that while STPs and subsurface testing have their faults, with the proper statistical corrections, researchers can compensate for many of these results.

Above, I focused on Lightfoot's 1986 article most extensively. I chose to do this first because Lightfoot incorporated the work of other archaeologists who considered the case of shovel testing (e.g. Wobst 1983; Nance and Ball 1986), putting in one place the key points in their article as well as his own conclusions. He so successfully does this that I left out Nance and Ball from this review and used Wobst's work most specifically for his outline of previous approaches to subsurface surveys. Secondly, the debate between Lightfoot and Shott, and their commentary on other archaeologists' works such as Wobst or Nance and Ball, remains an important debate even in the most recent decade, representing the strengths and weaknesses of subsurface versus surface methods (e.g. Bloemker 1999, Stafford 2002, Banning 2002). As is often the case in debates, I took a side, generally agreeing with Lightfoot.

As I said above, conducting a surface survey in the Eastern Woodlands, unless in a recently plowed or disturbed area which offers increased visibility, is impractical. However, surface survey results remain the bar to reach in terms of efficiency, and shovel testing often fails to meet this bar unless certain approaches are made before hand. Enacting a standardized sampling strategy would not evaluate the intricacies of each individual study area and, as such, becomes ineffective. I consider STP interval size an exception, one that I will discuss in depth in later chapters.

Researchers can reduce inaccurate survey results by increasing the number of STPs and reducing interval size. Generally, researchers can standardize STP intervals, specifically when targeting a certain site size, and when it comes to intervals, smaller is better, as it increases the percentage of the survey area actually tested. But, while surface surveys require relatively low labor intensity, to match the intensity of surface surveys, researchers must hire more workers and/or spend more time out in the field. Money and time constraints usually make this unrealistic. However, Lightfoot, Nance and Ball, and Wobst offer a way to increase STP efficiency by correcting site size bias and density estimates through carefully thought out research designs using statistical models discussed earlier. Through the course of two articles, Lightfoot cites the apparent success of two of his own projects as proof. I find the second project, in Brookhaven Township, particularly convincing as it compares the results of both surface and subsurface survey in the same area, with the subsurface survey showing more success.

The downfall of shovel testing is that, while surface testing on areas of high visibility provides very tangible evidence of site distribution and size, results emerging from STPs rely heavily on statistics, offering only predictive models. Researchers also base these models on assumptions which can very easily prove untrue. Shott has a valid point when he suggests that Lightfoot's model assumes that all STPs dug within a site will find remains (Shott 1989:399). Additionally, STPs may succeed in locating sites, but they may in reality offer a misconception on site size and frequency. Shovel testing can separate a large site into several based on negative STPs found within the site. So, while mobile groups may indeed leave behind a greater number of smaller sites, STPs may over exaggerate site density estimates.

However, no strategy or method is perfect, and archaeologists must carefully consider which method will best serve their research goals. Even surface survey in the American Southwest has its pitfalls. For example, archaeologists may have missed a large number of sites or the site borders or any other number of factors because the only remains present were below the ground surface. Additionally, surface surveys are biased towards obvious sites (discussed earlier in this paper), large sites, and sedentary sites. This last factor not only leaves multiple other sites undiscovered, but it also may offer a misconception of pre-history in the American Southwest as a whole, over estimating the degree of sedentism in the region at various points in time. Even proponents of shovel testing like Lightfoot recognize that the method is not ideal (1989:413). However, it was the best method which researchers could use across the Eastern Woodlands then and probably still today, despite "fancier" developments, which themselves need certain conditions to effectively produce results.

Wobst, Lightfoot, and others address different strategies that researchers can employ while shovel testing, based on pre-determined STP size, frequency, interval, and even location. So what is the ideal? Obviously, researchers would consider large STPs dug at small intervals across the entirety of the landscape ideal. However, as discussed, restraints in terms of labor intensity and cost prevent this. This aside, then, I would say no ideal exists as the effectiveness of any method depends on the conditions under which researchers employ it and the nature of the study area. So as Lightfoot, Wobst, Nance and Ball suggest, researchers should make calculations before hand to decipher what is ideal for any specific project. For such calculations, archaeologists must do their research and consider previous archaeology in the region or targeted at the same site type or period.

In general, though, researchers should excavate as many STPs at as small of an interval as possible within project parameters. With less time and money, stratified or judgmental sampling can target areas which would represent the entirety of the landscape or those most likely to contain sites. Though discussed minimally in this literature, I would suggest one requirement. Just as Chartkoff did in the 1980s, upon the discovery of a positive STP, researchers should decrease the interval size around the positive STPs so as the better evaluate the density and size of the site or even the nature of the find, discovering whether it is an artifact scatter/cluster or simply a single find. Beyond that, researchers must target the STP strategies (and really any other method employed) based on their specific project, taking into account not only the study region, but also the project/survey budget and goals.

Chapter 5: Literature Review Part II

Introduction

"Fancier" (Wobst 1983:54) or geophysical methods refer to the use of technological and scientific processes to aid in the location of sites. Some processes I explore here include magnetometers, electric resistivity, ground penetrating radar (GPR), Geographic Information System (GIS), and probability models, among others. I introduced these methods, at least conceptually, in previous chapters. This literature review chapter offers a more in-depth look into the benefits of these geophysical approaches, but as they do not play a key role in following chapters, I do not concentrate on these approaches to the same extent as I did shovel testing.

While in the following case studies, researchers generally illustrate these methods' success, in many environments, such as those found on Morven Farm and its surrounding region, results are limited. In Chapter 6, I address the use of geophysical methods in Morven's region. Just as the pieces in the last chapter emerged mostly from one decade, the 1980s, these pieces emerge from the 1990s and while technology has certainly improved over the years, the information from these sources are reflected in introductory works and/or other researchers cited the pieces even years later. Furthermore, professors still assign these readings to survey methodology courses.[60] In Chapter 6, however, I will cover a few applications of these methods in more recent years.

Kvamme 1992[61]

In "Geographic Information Systems and Archaeology" K.L. Kvamme focuses on how archaeologists can use GIS[62] as a discovery and analysis technique. GIS's primary use is in

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[60] e.g. Anthropology 229B-Archaeological Research Strategy at University of California, Berkeley. Course packet provided by Professor James Flexner. Includes: Kvamme 1992; Frederick and Abbot 1992; Arnold et al.. 1997.

[61] More recent articles which refer to Kvamme's work: Richards 1998; Lang 2000; Murray 2001.

special database management, integrating regional data and allowing archaeologists to concentrate all previous research or post-survey data in one place. During the initial stages of a project, researchers can include such variables as previous site locations and features in the region, as well as environmental conditions, distance to water, and topography. Using a database of these variables, GIS provides a representation of the study region in map form. With a visual aid, archaeologists can more clearly identify spatial patterns and relationships. From there, archaeologists can analyze a number of variables, including likely site locations, forming a predictive model (Kvamme 1992:80-81).

Before the development of GIS, researchers in need of a predictive model collected and aggregated the data manually, taking constant frequency measurements and making calculations repeatedly for accuracy. But GIS changed that and the same task that could take days or more researchers can now complete within a few hours. Kvamme writes: "The same analysis in a GIS setting can be a nearly trivial exercise" (1992:78). Kvamme provides an illustration of this, showing how an examination of Iron Age coin finds and their correlation with Roman roads, with GIS, took a grand total one and a half hours (1992:79). Of course, Kvamme does not suggest that GIS is a standalone tool, whether for surveying or analysis, merely a supplement to other methods.

Frederick and Abbot 1992[63]

Frederick and Abbot discuss protonmagnetic (PM) prospecting in their piece "Magnetic Prospection of Prehistoric Sites in an Alluvial Environment: Examples from NW and West-

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[62] Introduced in Chapter 2

[63] More recent articles which refer to Frederick and Abbot's work: Moffat et al.. 2008

central Texas." They first establish when researchers can benefit from PM[64], which detects magnetic susceptible anomalies such as fired or iron artifacts or features. While archaeologists primarily use PM for detecting features at known sites, Frederick and Abbot state that PM can also effectively locate subsurface sites. Additionally, PM can examine the formation processes involved in "complex thermally-altered pre-historic sites" (1992:139), thus both detecting the artifact or feature and analyzing how the artifact or feature formed.

Frederick and Abbot then provide potential purposes and processes behind PM through a case study from their project in northwest and west Texas. They first recognize that researchers cannot use PM in all environments. They write that, before using PM, researchers should evaluate the geologic and cultural conditions of their study region and whether these conditions would allow for this type of work. For example, regions with iron-rich soils disrupt magnetic readings. Their study region in northwest and west Texas, however, did not have prohibiting conditions such as iron-rich soils. Using portable proton magnetometers, their crew located fired features, ceramic clusters, and historic metal objects. The portable PM especially facilitated findings in the shallowly-buried alluvial sites in their study area. However, they found that the equipment did not always pick up the presence of cultural remains.

Following their discussion on the project's success, Frederick and Abbot illustrate their strategies. During this project, they examined sites created by highly mobile people using two portable proton processor magnetometers, formed of a field sensor and a base station which reported instances of variation in the magnetic field, a task for which this equipment was designed. The crew worked in two person teams with each person handling different parts of the equipment. First, they created one meter grids. Holding the field sensor 75 cm[65] above the

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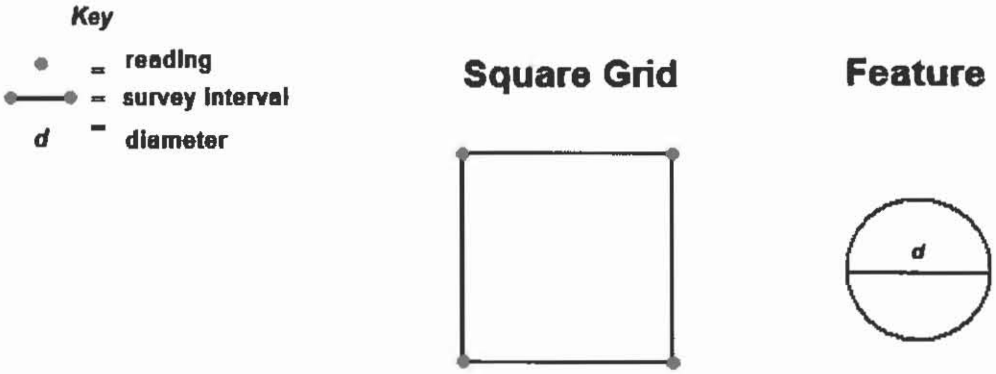
[64] Discussed in Chapter 2

[65] Approximately 2.5 ft

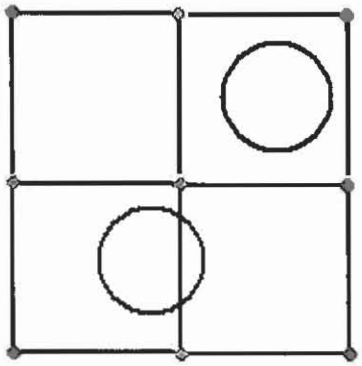
ground, the team followed a fiber glass line leading to opposite sides of the transects and took a reading at ten second intervals (Frederick and Abbot 1992:140-141).

Researchers input the data resulting from this process into a computer system which combined and read such variables as anomalies, contours, transects, and surface models. Using these variables, the computer program created intensity maps indicating concentrations of anomalies. Researchers then identified specific anomalies and excavated the area either manually or mechanically, depending on the depth readings reported by their equipment.

Figure 8-Effectiveness of Magnetometry According to Feature Diameter



However, they found that magnetometry **often missed "thermally-altered" (Frederick and Abbot** 1991:151**) pre-historic features, especially when the feature's relative diameter is smaller than the survey interval.**



Using their results from both the initial survey and later excavation, Frederick and Abbot evaluated magnetometry as a discovery tool, either of sites or artifacts/features on known sites. First, in terms of its performance in detecting certain types of remains, pre-historic findings actually read as strongly as the historic metals also found. In the actual location process, they report that magnetometry worked most effectively on fine-grained alluvial deposits and performed well in locating remains of a certain size. However, they found that magnetometry often missed "thermally-altered" (Frederick and Abbot 1992:151) pre-historic features, especially when the feature's relative diameter is smaller than the survey interval (see Figure 8). Overall then, Frederick and Abbot recommend PM as a supplement to other methods, not the predominant survey strategy.

Arnold, Ambos, and Larson 1997[66]

In "Geophysical Surveys of Stratigraphically Complex Island California Sites: New Implications for Household Archaeology," Arnold, Ambos and Larson advocate the use of geophysical techniques such as GPR and caesium vapour magnetometer (CVM). While especially useful for locating structural deposits, the authors list three major reasons why archaeologists should use geophysical strategies in general surveys. They write that these techniques are generally non-intrusive and less labor intensive, in terms of both cost and personnel, though some geophysical methods are actually costlier. Most importantly, however, Arnold, Ambos and Larson find these methods particularly effective. They make a strong statement on the matter of effectiveness, writing: "...geophysical techniques obviate the need for large scale exploratory excavations and permit highly informed and focused sub-surface studies" (1997:157).

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[66] More recent articles referring to Arnold et al.: Hargrave et al.. 2002; Rick et al. 2005

To support their point, they offer a case study from California, the Morse Point site. During this project, they used both GPR and CVM. As I have not discussed CVM previously, I will outline the basic concept according to Arnold, Ambos, and Larson. CVM locates anomalies using caesium atoms which when surrounded by a magnetic field undergo a predictable change in their electron shell configuration. The machine can generate measures of this configuration change at least every .1 to .2 m[67]. While more efficient than proton procession magnetometers, to which CVM can be compared, it is also expensive, though fortunately researchers could afford to employ CVM at Morse Point (Arnold et al.. 1997:160-161).

For the sake of both GPR and CVM, the researchers applied two 20 x 20 m[68] grids over an already existing site grid and collected materials every 20 m[69] along the transects of each grid. They took GPR measurements every 1 m[70] and CVM measurements every 0.5 m[71]. Here, the authors promote CVM, informing that CVM offered "detailed spatial coverage" (Arnold et al.. 1997:160), covering a 20 x 20 m[72] grid in only an hour. For this project, the researchers used GPR and CVM to locate remains in an already identified site, but believe these methods could also prove effective as a survey method as well.

Hey and Lacey 2001[73]

Hey and Lacey's piece "Evaluation of Archaeological Decision-making Processes and Sampling Strategies" reports findings from an experiment with Iron Age and Roman Sites in England meant to evaluate the effectiveness of different techniques. This book provided side by

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[67] Approximately .33 to .66 ft
[68] Approximately 66 x 66 ft
[69] Approximately 66 ft
[70] Approximately 3.3 ft
[71] Approximately 1.65 ft
[72] Approximately 66 x 66 ft
[73] More recent works referring to Hey and Lacey's work: Passmore et al.. 2006; Jordan 2009

side comparisons of the performance of several techniques in certain study areas. These techniques include pedestrian survey, test pits, mechanical trenching, desk-based assessment, and geophysical methods.

Researchers conducted pedestrian surveys, which they call "field-walking," during either low crop or no crop seasons. In England, these seasons fall between October and May. Hey and Lacey also recognize that three specific conditions must be met for pedestrian surveys to get successful results. Researchers need: (1) arable land, (2) appropriate land conditions during the survey (no crops, snow), and (3) a cultural horizon on the modern ground surface. As, for the most part, the study area environment did not meet these conditions, pedestrian surveys showed what they rated as poor to moderate results. However, they also report that pedestrian survey did do better than desk-based assessment, which builds on previous research and predictive models, which was only reliable in areas with previous archaeological work and obvious indicators of sites, such as crop marks. Hey and Lacey write that desk-based assessment could only, at the most, indicate a site, but failed to identify a precise location, artifact intensity, site character, or site conditions.

Only four projects from the array Hey and Lacey evaluated involved test pitting. In three sites, researchers used boreholes without screening or sorting through the unearthed soils, while in one site, researchers manually dug 1 x 1 m[74] test pits and screened/sorted the unearthed materials. While none of these projects used test pitting during survey, Hey and Lacey created a simulation, based on the finds from test pitting at known sites, which suggested the method would serve poorly in site detection. Machine trenching, meanwhile, which reaches greater depths than test pitting, performed moderate to good for Iron Age to Medieval cultural horizons. However, for all others, Hey and Lacey rated machine trenching as generally poor. Researchers

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[74] Approximately 3.3 x 3.3 ft

employed this method most often and appeared most effective at detecting sites above all other tasks.

Finally, Hey and Lacey evaluate geophysical methods, specifically the use of magnetometers and fluxgate gradiometers. Fluxgate gradiometers work through similar means as proton magnetometers, but instead of protons, this machine uses highly permeable magnetic alloy cores (Alldred 1964:1). Interestingly, they found that the cultural period, not environmental conditions, affected results from geophysical testing the most, though they note that these methods performed most poorly in colluvial environments. Additionally, with the exception of adverse conditions such as flooding, researchers could employ geophysical methods in a large variety of weather and ground discussions. As such, projects employed geophysical methods throughout most of the year, between the months February and November. Hey and Lacey go on to discuss one specific method, fluxgate gradiometer survey, which they reported as producing moderate to good results. This method performed most effectively in locating sites with substantial features and enhanced soils. While good at indicating site presence, its results offered less information on the precise location, feature density, and site age.

Results from this analysis show that project size did not significantly affect the performance of different techniques. However, after evaluation, they saw that desk-based assessment and pedestrian surveys produced the best results on large sites. Geophysical methods, meanwhile, showed the best results on smaller sites. According to their rating system, mechanical trenching was good for large sites and moderate for small sites.

Hey and Lacey also evaluate which methods proved most effective for which tasks. In judging the character of remains, mechanical trenching and desk-based assessments did well. For detecting site presence, trenching was most effective though field-walking and geophysical methods offered sufficient data. Geophysical methods, however, most precisely located sites, while pedestrian surveys produced the most false positives. Additionally, geophysical methods offered a clearer picture of the cultural landscape. Through this study, then, Hey and Lacey offer at least a general picture of different methods' effectiveness in Iron Age to Medieval England.

Analysis

Generally, researchers, such as those reviewed above, recommend these geophysical methods as a supplement to other methods. Even those who would promote one of these methods, whether GPR or CVM as Arnold, Ambos, and Larson discuss, cannot ignore the need for verification or what archaeologists call ground truth. Similarly, I also view these geophysical methods as a supplemental to other methods. Researchers must evaluate the viability of and/or degree to which one can employ these geophysical methods in the specific project's environment.

Before researchers consider the effects of variables such as expected site size or targeted site periods, they must first evaluate whether they can employ the specific technology in their region's environment. Some technology needs certain conditions to operate effectively. Compared to other researchers reviewed here, Frederick and Abbot discuss this point in most depth. While the environment in Northwest and West Texas was conducive for the use of protonmagnetometers, environments rich with iron deposits, for example, would not offer the needed results when researchers apply any variety of magnetic fields. In Chapter 6, I will illustrate this further as I look at Virginian archaeology, specifically in and surrounding Albemarle County.

As mentioned earlier in this thesis, methods such as mechanical trenching or STPs are intrusive and, as a result, archaeologists destroy as they dig. The methods discussed above, specifically magnetometers and imaging devices such as GPR and CVM, therefore, offer a particularly desirable benefit: they are non-intrusive. Wherever the environment and funding permit, archaeologists should find ways to reduce the intrusiveness of their strategies and employ equipment such as magnetometers or imaging devices, especially on certain site types. On most sites, a sampling strategy allows archaeologists to generally preserve site integrity, even with intrusive subsurface techniques. However, researchers cannot do the same for site types such as earth mounds like those in Hopewell. Destroying earth mounds not only compromises the site, but it also dramatically changes the landscape on which that mound stood for hundreds or thousands of years. With GPR, CVM, or deep reaching magnetometers, archaeologists can locate anomalies within the mound, from which archaeologists can choose to excavate or evaluate in different manners.

Geophysical methods also offer benefits in terms of labor intensity. As shown by the frequent readings of Frederick and Abbot's protonmagnetometer or Arnold, Ambos, and Larson's GPR and CVM, geophysical methods can take readings significantly more often than methods such as STPs. In the former, the protonmagnetometer took readings every ten seconds. In the latter, the GPR took readings every one meter[75] and the CVM every half meter. Both methods offer a detailed representation of subsurface conditions and anomalies. Additionally, the use of such technology generally is more cost effective than traditional subsurface surveys. However, this is most likely contingent on the availability of such equipment.

Beyond field technology, as previous chapters have suggested, probabilistic models created by computer programs such as GIS also serve as supplemental surveying techniques. Stratified (random) and judgmental sampling particularly benefits from such models. While archaeologists sometimes stratify study regions relatively arbitrarily, they also stratify these

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[75] Approximately 3.3 ft

regions based on other factors traditionally inputted as variables in GIS programs. As discussed, a GIS aggregates a number of variables, such as topography, site locations, and water source locations, onto a single map. Archaeologists choosing not to take a randomized approach can use these generated probabilistic models to select areas to survey based on where they believe sites to exist, for example, within a cluster of other sites or within a certain radius extending from water sources such as period. During the pre-survey planning period, GIS can simplify tasks which originally took extensive period of time and designate more time for other tasks. I believe GIS serves as an important tool for either the initial stages of survey planning and post-survey or excavation analysis.

While I evaluate the use of these geophysical methods as they pertain to previous research in Virginia in Chapter 6, in general, I recognize that all methods can simplify the survey process and perhaps offer additional details which researchers would otherwise miss with traditional subsurface methods. However, in specific situations (such as the ones we see in the next chapter) these methods, especially magnetometers, are impractical. Of these geophysical methods, I promote the use of GPR and GIS as the most widely applicable methods.

Chapter 6: Archaeology in the Virginia Piedmont

Introduction

The following analysis examines sites in Albemarle County and three counties adjacent to it, Buckingham, Fluvanna, and Orange County. As surface surveys are generally ineffective in the Eastern Woodlands due to low visibility, I focus on two remaining viable choices, geophysical and subsurface testing, specifically STPs. Ideally, I would base this analysis on a single source. However, because my primary source, the Virginia Department of Historical Resources Data Sharing System (DSS), does not include information on geophysical testing, I consider three case studies in order to evaluate the viability of geophysical testing in Virginia. The previous archaeology reported in these three case studies and the aggregated DSS sites, in turn guide my establishment of optimal survey methods and/or sampling strategies for different site types and periods for Virginia and, eventually, for the Morven project.

In this chapter, I first consider three geophysical projects, two at Monticello Park Cemetery in Albemarle County and the other at Montpelier's Madison Family Cemetery in Orange County, which experimented with GPR, resistivity, and magnetometry, all discussed in Chapter 2 and Chapter 5. In considering these projects, I focus most strongly on the researchers' evaluations on the effectiveness of each method in order to judge under what conditions and for what purposes geophysical testing is most useful. The DSS, meanwhile, is instrumental for subsurface testing analysis because it provides a single source encompassing the vast majority of Virginia sites. With a sample of Albemarle, Buckingham, and Fluvanna County sites, I can apply the statistical measures promoted by Lightfoot (1986), as discussed in Chapter 4 in order to establish optimal STP intervals in the Virginia Piedmont.

The "Fancier" Methods in Action

Generally, because of the unsuitable local geology in the central Virginia Piedmont, characterized by fairly magnetic greenstone bedrock, thick clay soils, and high soil moisture, archaeologists often find survey projects conducted through geophysical technology ineffective (Bon-Harper, et al. 2003:18-19). Nevertheless, I asked Sara Bon-Harper, Archaeological Research Manager at Monticello, for source suggestions, specifically in regards to geophysical testing. Her response reaffirmed my expectations, stating that local geophysical testing often does not produce definitive results (personal communication, January 28, 2011) though in a recent project at Monticello resistivity testing performed better than it did in the previous decade (personal communication, April 18, 2011).

However, Bon-Harper offered four suggestions for Virginia studies in which archaeologists had attempted to use geophysical methods: (1) Monticello Park Cemetery (Albemarle County), (2) Monticello's Kitchen Road, (3) the Madison Family Cemetery at Montpelier (Orange County), and (4) older projects at Jamestown (James City County). The first three belong to the Virginia Piedmont and share similar geology. Jamestown, however, sits in the Coastal Plain and would not properly represent or correlate with Morven's local environment. And though, due to insufficient information or reporting, my DSS data do not include Orange County sites, I use the Madison Family Cemetery project to represent local geophysical testing as it is also located in the central Piedmont and adjacent to Albemarle County. Finally research at Monticello Park Cemetery and the Kitchen Road offer a look at the development of geophysical testing at Monticello over a period of approximately 20 years.

Geophysical Testing at Monticello, 1990-2010

The Monticello Department of Archaeology published its findings at Park Cemetery in an August 2003 report (http://www.monticello.org/sites/default/files/inline-pdfs/parkcemetery.pdf). In the report, the archaeologists evaluated remote sensing and geophysical testing as originally undertaken in 1990 to locate burials in the site, and then in their more recent 2000-2001 research. Later, they then examined the future (post-2002) of geophysical testing at Monticello and, in a wider context, in the local geology.

In 1990, Monticello conducted a magnetometry survey on a 70 x 60 foot area using a two foot interval. Initially, researchers believed they received positive results; as Sara Bon-Harper, Fraser Neiman, and Derek Wheeler (2003:11) write: "It was concluded at the time that these areas might contain burials, because the patterns identified by magnetometry were like those that would be expected from anthropogenic disturbances the size and shape of burials" However, later research suggested that many of these anomalies resulted from Monticello geology. "Research in 2002 by Somers suggested that magnetometry in Monticello's soil conditions more likely detects greenstone cobbles than burial shafts, as the magnetic signal of greenstone is far greater than that of anthropogenic features the size of human burials" (Bon-Harper et al. 2003:11; see Somers 2002). As such, the 1990 research team may have marked as possible burials readings which, in reality, represented greenstone cobbles.

In March 2000, Monticello researchers again experimented with geophysical testing at the cemetery, this time using resistivity, ground penetrating radar (GPR), and magnetometry. Out of the three, magnetometry proved most effective, locating possible burial anomalies which researches verified through excavation. GPR survey, however, proved unreliable due to the sheer number of anomalies it detected. Nearly a third of anomalies detected at a depth greater than one foot indicated pipes, not burials. While some of the remaining anomalies proved in later excavation to indicate burials, researchers could not, realistically, verify each of the 284 GPR readings (Bon-Harper et al. 2003:12) through excavation. Resistivity, meanwhile offered the least constructive results due to the clay soils. However, the report suggests that the method itself did not entirely cause this poor performance. Instead, the sampling strategy employed only provided scanning to a depth of half a meter[76]. Such a shallow reading would not run up against a burial (Bon-Harper et al. 2003:12).

Evaluating all three methods' performance, researchers noticed that detected anomalies did not bear the traditional characteristics of burial readings. Although the geophysical methods used here did detect anomalies worthy of further investigation, they failed to identify characteristic anomaly readings corresponding to burials (Bon-Harper et al. 2003:12-13). Again, the local Monticello geology generally caused the poor performance of magnetometry and resistivity testing (Bon-Harper et al. 2003; see Watters 2000). Meanwhile, GPR's performance suggests that, while they found that GPR effectively detects features, researchers cannot reliably distinguish modern, natural, or historical features from each other through readings alone. Further complicating the issue, researchers cannot conceivably verify their interpretations through subsurface testing due to the sheer number of disturbances beneath the surface, such as modern pipes or natural tree roots.

In the winter of 2002, Monticello researchers again conducted geophysical testing at the cemetery, this time to evaluate geophysical methodology (see Somers 2002). In the final evaluation of the project's geophysical testing, the report stresses the detrimental effects of "magnetic 'clutter'" (Bon-Harper et al. 2003:18) on magnetic surveying, which previous researchers evaluated as inefficient and costly in such an environment. Both GPR and resistivity

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[76] Approximately 1.65 ft.

testing showed potential for locating anomalies such as burials, but both still suffered from false positives and negatives. While Somers (2002) writes that these geophysical methods could mark the general location of a cemetery site in the Monticello environment, they could not offer specifics like site size and precise location. Previous researchers stated that without the development of a more efficient geophysical survey method, researchers should continue using STPs and excavation for such tasks (Bon-Harper et al. 2003:18-19; see Somers 2002).

Evaluating the geophysical testing conducted between 1990 and 2002, Bon-Harper, Neiman and Wheeler (2003:19) write: "These points reveal the particularly challenging conditions of geophysical survey at Monticello. The combination of clay soils, highly magnetic basalt rock, and differential soil moisture and compaction due to planting and irrigation contribute to failures or only marginal successes in all the established geophysical survey methods in detailed work such as site definition and mapping." While not an effective survey method, researchers could use geophysical testing on located sites or as a supplement to other methods.

In 2010, the Monticello Archaeology Department implemented electrical resistivity (ER) testing on the East Lawn, specifically to locate and study the Kitchen Road, which travelled between the kitchen and Mulberry Row (Monaghan et al. 2011). This project produced better results than those at Monticello Park Cemetery nearly a decade before. Along with coring, researchers used ER to create a three-dimensional subsurface representation of the East Lawn's historical fill. By using coring and ER, they reduced the intrusiveness of the project, particularly through ER, a non-intrusive method. Researchers classified low ER zones as clay-rich areas with highly weathered rock. However, high ER zones identified several anomalies including the privy vent and a possible road or path. Though researchers failed to locate a path and/or fence indicated by historical documents, they succeeded in mapping out the lawn's underlying geology (Monaghan et al. 2011). Though the 2010 testing revealed advancement through ER, the Monticello geology continues to make geophysical testing difficult.

Madison Family Cemetery at Montpelier

Interestingly, both Monticello and Montpelier researchers conducted geophysical testing at cemeteries, perhaps suggesting that cemeteries are more suitable for geophysical testing and/or researchers viewed the detection of human remains important enough to experiment (Alison Bell, personal communication, March 28, 2011) with other, non-intrusive methods. However, unlike the project at Monticello, researchers at Montpelier, home to the former President James Madison, employed only one geophysical testing method on their survey of the Madison Family Cemetery. Researchers used GPR to survey a known site for the location of undocumented grave sites (Hanna and Petrone 2008:1; http://www.montpelier.org/library/index.php# archaeology). Montpelier shares a similar environment with Monticello, with some exceptions. While both rest on a partially greenstone bedrock and have silty-clay loam soil, Montpelier's soil is less clay-rich than Monticello which makes GPR surveying at Montpelier more practical. Hanna and Petrone (2008:1) explain that clay hinders the radar's ability to penetrate the soils. Montpelier's less clay-rich soil, then, allows for clearer readings as the radar can more successfully penetrate the soil.

During the survey, researchers placed measurement tapes parallel to each other, creating three foot "alleys" (Hanna and Petrone 2008:7). Within these alleys, researchers ran two GPR lines[77] at an interval of 18 inches. Researchers evaluated resulting signal levels, grouping signals consistent with graves into three categories: "possible graves" marked by weak signals

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[77] Which the GPR measures along

"suggestive of graves" (Hanna and Petrone 2008: 8), "probable graves" marked by strong signals "convincingly indicative of graves" (Hanna and Petrone 2008:8), and "definite graves" marked by "exceptionally strong" (Hanna and Petrone 2008:8) signals. Despite the use of the word "definite", the report acknowledges that only complete excavation of the indicated grave site could confirm grave presence. Researchers excavated test units in order to verify anomaly readings. In selecting anomalies to verify through excavation, researchers considered historical maps, surface features, and past excavations (Hanna and Petrone 2008: 6-7). Due to the successful verification of readings through excavation, researchers concluded that GPR efficiently located most of the graves (Hanna and Petrone 2008: 12).

Virginia Piedmont Sites and Optimal STP Intervals

While the above offers case studies of geophysical testing in the central Virginia Piedmont, with DSS I could create a larger sample of sites for analysis. Unfortunately, due to the lack of information on geophysical testing in the DSS, I could not consider Virginia Piedmont archaeology through a single source. However, through the compilation of data from these case studies and the DSS database, I generally evaluate the effectiveness and results of past Virginia research, incorporating what I view as the most viable methods and strategies in the Virginia Piedmont: geophysical and subsurface testing.

Through the DSS I hoped to create a sample of sites for analysis of STP interval size while also acquiring a clearer picture of Virginia sites and surveys. I was confronted, however, by a number of problems. First, while DSS includes the vast majority of archaeological surveys conducted in Virginia, the DSS does not encompass every survey and, as such, does not offer complete picture of Virginia archaeology. Second, the recorders do not follow a standardized approach to the form entries[78]. Instead measurements jump from meters to feet and vice versa not only from entry to entry but also within a single entry. While the form requires recorders to provide individual site sizes in feet, the same standardization does not exist for other measurements such as sampling interval size, measured in meters or feet depending on the entry.

Next, many recorders fail to completely fill out the form, and I had to select my sample based on form completeness. Many forms do not provide a sampling method and, if one does, often it does not provide an interval size. Other entries lack any description of nature of the site, for example, not offering information on the artifact assemblage or even the site location. Because of this, I could not develop a clearer picture of Virginia sites or surveys as I had planned and had to settle for only collecting the basic data: site type, period, and size.

I encountered additional problems based on site period. First many sites contain artifacts from multiple time periods and, as such, recorders apply several site periods to a single site. On the other hand, while some recorders provide specific time periods such as Middle Woodland or Late Archaic, others only apply the general site period, such as Woodland or Archaic. Broader still, other entries do not even supply site periods, instead labeling a site as Pre-historic, unknown or Historic, unknown. Though I originally intended to look at Contact period site as well, I chose not to enter this site period into my final search parameters as DSS produced too few or unreliable entries.

I selected this sample from entries in three bordering counties: Albemarle, Buckingham, and Fluvanna. These counties were chosen based on a few factors. First, as this analysis leads to my consideration of the Piedmont and Morven Farm, I wanted to focus on Morven's surrounding area as my study region. Morven Farm lies in Albemarle County which is bordered by Buckingham County to the south and Fluvanna to the east. All three belong to the Piedmont

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[78] See Appendix D for a sample form

region. Second, as DSS proved problematic in many cases, I chose counties based on the reliability of its entries, which I mostly evaluated based on form completeness.

I focus most of this section on 14 tables[79] (see Figures 9-21) created based on site type and site period. In these tables, I provide the information acquired from DSS for each chosen site, including site ID[80], site period, site type, and site size (L x W). In terms of site type, I used a different classification system than DSS. The DSS divides its classification system into such specific categories that site types often overlap. For the sake of analysis, I needed broader categories. Also, as the detection of mobile versus sedentary people is my focus here, I narrowed down DSS site types, such as camp, hamlet, domestic, temporary, and lithic workshop, into four general classifications more suitable for my analysis: (1) Mobile; (2) Sedentary; (3) Industry; and (4) Indeterminate.

For site period, I continued with the DSS classifications: (1) Historic; (2) Late Woodland; (3) Middle Woodland; (4) Woodland; (5) Late Archaic; (6) Middle Archaic; (7) Archaic; and (8) Pre-historic, unknown. I provided "Archaic" and "Historic" tables only when a site also belonged to the Woodland period. As such, the minimum or optimal intervals assigned to these tables do not properly apply to those site periods. Because DSS often applies several site types or periods to a single site, a single site will often appear in more than one site type or period table.

After establishing site type and site period categories, I calculated the optimal STP interval for each based on individual site sizes. However, while DSS provides size measurement for a square site, the necessary calculations assume a circular shape. Because of this, I had to work with the numbers so as to attain the site radius (*r*) measurement needed for the calculations.

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[79] See Appendix E for original table including all sites.

[80] E.g 44AB0228, which provides the Virginia ID number, county abbreviation, on site number.

Remember, *r* stands for the site radius of the largest site that can escape detection based on the sampling interval, which one calculates using this equation:

Key

l = interval size
r = site radius

$$r = \frac{l}{\sqrt{2}}$$

Using the site length and width measurements provided by DSS, I calculated site area. Then, for the sake of analysis, I provided an *r* for a circular site of the same area. For all intents and purposes, this *r* represents the original site size as it assumes equal areas. Next, I plugged the acquired *r* into the above equation and calculated the maximum interval still able to reliably locate the circular site. However, recognizing that the rectangular and circular sites of the same area do not cover the same space, I took one additional step. As *r* stands for the distance between the center of the circle and any one point on the arch, I attempted to establish a measurement which would closest match the radius concept in a rectangular site. As the radius indicates that traveling from the site's edge, one has reached the middle of the site, I considered the original site's length and width which both communicate traveling the distance between one end of the site to another. As my goal is to establish the maximum interval size which still detects a site of a given size, I re-calculated *r*, this time based on the shortest side of the rectangular site's midpoint.

While both calculations fail to emulate the specific site distribution provided in DSS, by using both *r* measurements, I believe I sufficiently corrected for resulting biases from which I can I calculate the maximum interval for each site, organized based on site type and site period. Based on the DSS data and my own calculations, through these tables I establish an average site size for each site type and period, as well as provide an optimum sampling interval. The following discussion depends wholly on the tables provided in the next few pages. To begin, I establish site size and maximum STP interval (i) first based on site type and then based on site period, providing tables with average site size and maximum interval by site type and site period.

Figure 9- Site Type: Sedentary

Site	Length	Width	Area	r	Maximum i (Based on area)	Maximum i (based on smallest side)
44AB0039	984	656	645504	453.29	641.05	695.79
44AB0291	197	2297	452509	379.52	536.73	139.30
44BK0314	340	480	163200	227.92	322.33	240.42
44BK0327	230	350	80500	160.07	226.38	162.63
44FV0134	2645	656	1735120	743.17	1051.01	463.86
Average	879	888	780554	498.46	704.92	627.77

Figure 10- Site Type: Industry

Site	Length	Width	Area	r	Maximum i (Based on area)	Maximum i (based on smallest side)
44AB0464	40	165	6600	45.83	64.82	28.28
44AB0548	125	200	25000	89.21	126.16	88.39
44BK00154	164	197	32308	101.41	143.42	115.97
44BK0314	340	480	163200	227.92	322.33	240.42
44BK0327	230	350	80500	160.07	226.38	162.63
44BK0334	200	425	85000	164.49	232.62	141.42
Average	183	303	55469	132.88	187.92	129.52

Figure 11- Site Type: Mobile

Site	Length	Width	Area	r	Maximum i (Based on area)	Maximum i (based on smallest side)
44AB0019	1	1	1	0.56	0.80	0.71
44AB0020	100	100	10000	56.42	79.79	70.71
44AB0033	250	250	62500	141.05	199.47	176.78
44AB0294	180	72	12960	64.23	90.83	50.91
44B0300	820	98	80360	159.94	226.18	69.30
44AB0327	36	108	3888	35.18	49.75	25.46
44AB0343	289	131	37859	109.78	155.25	92.63
44BK0154	164	197	32308	101.41	143.42	115.97
44BK0330	450	100	45000	119.68	169.26	70.71
44BK0331	250	520	130000	203.42	287.68	176.78
44BK0334	200	425	85000	164.49	232.62	141.42
44FV0164	213	410	87330	166.73	235.79	150.61
44FV0166	262	656	171872	233.90	330.78	185.26
44FV0168	1132	361	408652	360.66	510.05	255.27
44FV0179	131	164	21484	82.70	116.95	92.63
44FV0239	295	164	48380	124.10	175.50	115.97
Average	298	235	70048	149.32	211.17	111.94

Figure 12- Site Type: Indeterminate

Site	Length	Width	Area	r	Maximum i (Based on area)	Maximum i (based on smallest side)
44AB0038	1640	492	806880	506.79	716.71	347.90
44AB0045	328	115	37720	109.57	154.96	81.32
44AB0273	82	377	30914	99.20	140.29	57.98
44AB0286	1476	180	265680	290.81	411.26	127.28
44AB0416	591	755	446205	376.87	532.98	417.90
44BK0038	246	410	100860	179.18	253.40	173.95
44BK0221	115	1312	150880	219.15	309.92	81.32
44BK0222	98	656	64288	143.05	202.30	69.30
44BK0223	722	820	592040	434.11	613.93	510.53
44BK0229	330	1815	598950	436.64	617.50	233.35
44BK0263	164	1312	215168	261.71	370.11	115.97
44FV0152	66	312	20592	80.96	114.50	46.67
44FV0177	246	1148	282408	299.82	424.01	173.95
44FV0181	148	2116	313168	315.73	446.51	104.65
44FV0182	656	656	430336	370.11	523.41	463.86
44FV0192	246	2297	565062	424.10	599.77	173.95
44FV0201	295	1903	561385	422.72	597.82	208.60
44FV0206	262	525	137550	209.25	295.92	185.26
44FV0216	246	410	100860	179.18	253.40	173.95
Average	419	927	388174	351.51	497.11	296.13

Figure 13- Site Period: Late Woodland:

Site	Length	Width	Area	r	Maximum i (based on area)	Maximum i (based on shortest side)
44AB0033	250	250	62500	141.05	199.47	176.78
44BK0229	330	1815	598950	436.64	617.50	233.35
44FV0134	2645	656	1735120	743.17	1051.01	463.86
44FV0152	66	312	20592	80.96	114.50	46.67
44FV0192	246	2297	565062	424.10	599.77	173.95
Average	707	1066	754088	489.93	692.87	500.21

Figure 14- Site Period: Middle Woodland

Site	Length	Width	Area	r	Maximum i (based on area)	Maximum i (based on shortest side)
44AB0020	100	100	10000	56.42	79.79	70.71
44AB0033	250	250	62500	141.05	199.47	176.78
44AB0327	36	108	3888	35.18	49.75	25.46
44BK0229	330	1815	598950	436.64	617.50	233.35
44FV0152	66	312	20592	80.96	114.50	46.67
44FV0164	213	410	87330	166.73	235.79	150.61
44FV0166	262	656	171872	233.90	330.78	185.26
44FV0179	131	164	21484	82.70	116.95	92.63
44FV0192	246	2297	565062	424.10	599.77	173.95
44FV0201	295	1903	561385	422.72	597.82	208.60
44FV0216	246	410	100860	179.18	253.40	173.95
44FV0239	295	164	48380	124.10	175.50	115.97
Average	206	716	147325	216.55	306.25	137.83

Figure 15- Site Period: Woodland

Site	Length	Width	Area	r	Maximum i (based on area)	Maximimum i (based on shortest side)
44AB0019	1	1	1	0.56	0.80	0.71
44AB0038	1640	492	806880	506.79	716.71	347.90
44AB0039	984	656	645504	453.29	641.05	695.79
44AB0045	328	115	37720	109.57	154.96	81.32
44AB0273	82	377	30914	99.20	140.29	57.98
44AB0286	1476	180	265680	290.81	411.26	127.28
44AB0291	197	2297	452509	379.52	536.73	139.30
44B0300	820	98	80360	159.94	226.18	69.30
44AB0343	289	131	37859	109.78	155.25	92.63
44AB0464	40	165	6600	45.83	64.82	28.28
44BK0038	246	410	100860	179.18	253.40	173.95
44BK00154	164	197	32308	101.41	143.42	115.97
44BK0221	115	1312	150880	219.15	309.92	81.32
44BK0222	98	656	64288	143.05	202.30	69.30
44BK0223	722	820	592040	434.11	613.93	510.53
44BK0263	164	1312	215168	261.71	370.11	115.97
44BK0330	450	100	45000	119.68	169.26	70.71
44BK0331	250	520	130000	203.42	287.68	176.78
44BK0334	200	425	85000	164.49	232.62	141.42
44FV0168	1132	361	408652	360.66	510.05	255.27
44FV0177	246	1148	282408	299.82	424.01	173.95
44FV0181	148	2116	313168	315.73	446.51	104.65
Average	445	631	280994	299.07	422.95	314.73

Figure 16- Site Period: Late Archaic

Site	Length	Width	Area	r	Maximum i (based on area)	Maximum i (based on shortest side)
44AB0039	984	656	645504	453.29	641.05	695.79
44FV0134	2645	656	1735120	743.17	1051.01	463.86
Average	1815	656	1190312	598.23	846.03	579.83

Figure 17- Site Period: Middle Archaic

Site	Length	Width	Area	r	Maximum i (based on area)	Maximum i (based on shortest side)
44AB0416	591	755	446205	376.87	532.98	417.90
44FV0164	213	410	87330	166.73	235.79	150.61
44FV0206	262	525	137550	209.25	295.92	185.26
Average	355	563	200171	252.42	356.98	251.26

Figure 18- Site Period: Archaic

Site	Length	Width	Area	r	Maximum i (based on area)	Maximum i (based on shortest side)
44BK0221	115	1312	150880	219.15	309.92	927.72
44BK0222	98	656	64288	143.05	202.30	463.86
44BK0223	722	820	592040	434.11	613.93	579.83
44FV0168	1132	361	408652	360.66	510.05	255.27
Average	517	787	406811	359.85	508.90	556.67

Figure 19- Site Period: Pre-historic, unknown

Site	Length	Width	Area	r	Maximum i (based on area)	Maximum i (based on shortest side)
44AB0294	180	72	12960	64.23	90.83	50.91
44AB0548	125	200	25000	89.21	126.16	88.39
44BK0314	340	480	163200	227.92	322.33	240.42
44BK0327	230	350	80500	160.07	226.38	162.63
44FV0182	656	656	430336	370.11	523.41	463.86
Average	306	352	142399	212.90	301.09	201.24

Figure 20- Site Type

Site Type	Average Site Size	Maximum *i*	Corrected Average Site Size[81]	Corrected Maximum *i*[82]
Sedentary	879 x 888	139		
Industry	183 x 303	28		
Mobile	298 x 235	1	318 x 250[83]	25[84]
Indeterminate	419 x 927	46		

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[81] Corrected for potentially misleading outliers.

[82] Corrected for potentially misleading outliers.

[83] Corrected for potentially misleading outliers.

[84] Corrected for potentially misleading outliers.

Figure 21- Site Period

Site Period	Average Site Size	Maximum *i*	Corrected Average Site Size[85]	Corrected Maximum *i*[86]
Late Woodland	707 x 1066	46		
Middle Woodland	206 x 716	25		
Woodland	445 x 651	28	466 x 661[87]	28[88]
Pre-historic, unknown	306 x 352	50		

Average Site Size

Based on the evolutionary model assumed here, average sites size should, ideally, increase from earlier time periods to later ones, so Late Woodland sites would be larger than Middle Woodland sites. This increase would generally indicate higher rates of sedentism for three reasons. First, remaining in one place for extended periods of time would facilitate larger group sizes. Mobile groups tend to have lower numbers to allow for ease of travel, but once ease of travel lost priority, a group may accumulate greater members as more and more people settle within the site over time, presuming trade and/or land resources are sufficient to support larger groups. In this case, site size, group numbers, and sedentism would have positive correlation (Hantman and Klein 1992; Stewart 1994). Next, the longer a group remains at a site, the more goods group members eventually discard. Similarly, while mobile groups needed to travel

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[85] Corrected for potentially misleading outliers.

[86] Corrected for potentially misleading outliers.

[87] While recorders labeled 44AB0019 a site, the 1x1m site size suggests that it is only a findspot. This site size was calculated without 44AB0019.

[88] The corrected maximum interval size if one disregards 44AB0019 as a site

lightly, again for ease of travel, sedentary peoples could accumulate more goods. If each individual in a mobile group of 30 owned five possible goods which he or she could discard at one site, the greatest number of goods that can be left behind is 150. However, if each individual in that same group obtained five more goods which he or she previously could not afford to carry, the greatest number of goods that can be left behind rises to 300. So, artifact density at sedentary sites increases. Artifact build-up would eventually push site boundaries further from the center of the site, thus increasing site size.

Based on average site size, the DSS sites generally support this hypothesis (see Figure 21). The average Middle Woodland site size is smaller than the average Late Woodland site, averaging 206' x 716' and 707' x 1,066', respectively. Sites assigned the general Woodland title fall between Middle and Late Woodland, averaging 466' x 661'. If one assumes that the Woodland classification includes sites from its Early stages as well as its Middle and Late stages, general Woodland site size should fall closer to Middle Woodland site size, and this is exactly what the DSS site sizes show. By the same line of logic, Pre-historic unknown sites, recorded as such because the researcher could not specify the time period any further, would include sites dating back to at least the Archaic period, possibly the Paleo-Indian period. Average site size would then reflect this range between site periods and size. If average site size for the Woodland period is close to that for the Middle Woodland, then Pre-historic unknown site size would be smaller than that of the Middle Woodland, because it presumable includes groups from not on the Early Woodland but earlier periods as well. Again this line of logic proves correct.

Next, I looked at site size in DSS based on site type (see Figure 20). As hypothesized, Sedentary sites proved larger than Mobile sites, by a significant degree. Industry sites, meanwhile, on average had the smallest site size. Typically, the title 'Industry' marks a site as a material source or workshop area. Discarded goods would include scrap material or expendable tools. As a non-domestic site with little artifact variety, I would expect minimal artifact densities and distributions. Finally, DSS also classified a number of sites as of an Indeterminate site type. Just as I reasoned with Woodland and Pre-historic unknown sites, in terms of average site size I would expect Indeterminate sites to fall somewhere in the range between the smallest sites (Industry) and the largest sites (Sedentary). Again the results from DSS confirm this hypothesis. However, the inconsistent sample sizes should be noted here. While these results seem to confirm an already expected pattern, they may not properly represent the site type or period. For example, as I ruled out Historic sites because of unreliable data, the Sedentary sample size is excessively small. Because of this, when I later consider the detection of Historic sites at Morven, I will refer to the results from previous Morven surveys, which I will discuss in the next chapter.

In general, however, Virginia site sizes reflect the evolutionary model in terms of degree of sendentism; site size increases from earlier site periods to later site periods and Sedentary sites, by far, averaged the greatest site size. This reflection does not necessarily suggest that all groups displayed similar trends, nor would I promote the evolutionary model as an authoritative representation of North American pre-history. However, based on these results, archaeologists can use the model as a general guideline when targeting specific site types or site periods during surveys.

Optimal STP Interval Size

As I explained earlier, using the equations provided in Lightfoot's 1986 article, I established the largest STP interval by which an individual site will still be discovered. Essentially, I worked backwards, starting with a discovered site and then using site measurements provided or derived from DSS to consider how large of an STP interval would ensure the discovery of that site or a site of the same size. For every site type and site period, I provided two maximum STP interval sizes for each site, one based on area and a derived *r* value and the other based on the size of the site's shortest side. For each site type or site period, I selected the lowest STP interval present (e.g. Refer to Figure 15 and 21. The maximum i for the Woodland Period in Figure 21 is 28 feet, the same as the lowest STP interval present in Figure 15-Site Period: Woodland).

By establishing an optimal STP interval size, I intend to ensure the site's discovery, not simply facilitate it. In other words, ideally, my optimal STP interval should guarantee that an STP will intersect every site. The lowest STP interval for each site type or period represents the maximum STP interval which ensures the detection of the smallest site in the sample (e.g. refer to Figure 11. An interval of 25 feet would still discover the smallest site—44AB0327). For each site type or period I selected the lowest STP interval in the parent table as the maximum STP interval for the site type or period as a whole. However, the maximum interval provided for each site type or period is not necessarily the optimal one. For example, I provide a 139 foot interval for the detection of Sedentary sites. That does not mean that researchers should employ such an excessive interval. As discussed earlier, such results are a function of a very small sample.

To establish an optimal STP interval for any survey, I compared all maximum STP intervals from the two site type and site period tables (Figure 20 and 21). Though these intervals are provided in Figure 20 and 21, I will repeat them here. According to the DSS data, the preferable sampling intervals based on site period are:

1. Late Woodland: 46 feet
2. Middle Woodland: 25 feet

3. Woodland: 28 feet
4. Pre-historic, unknown: 50 feet

The preferable sampling intervals based on site type are:

1. Sedentary: 139 feet
2. Industry: 28 feet
3. Mobile: 25 feet
4. Indeterminate: 25 feet

While these intervals sizes prove not only adequate but also preferable, again they emerge directly from the DSS data and may reflect the small sample size from which I selected them. In fact, one can find several inconsistencies in these numbers. For example, while average Industry site sizes are smaller than average Mobile or Indeterminate sites, the preferable interval is greater. Similarly, while the Pre-historic unknown sites are on average the smallest sites, the preferable sampling interval is the largest. Such results occur because the site type with the smallest average site size may not have the smallest site, the variable on which I based the preferable sampling interval.

Additionally, no interval reached lower than 25 feet. I believe that, instead of suggesting that 25 foot intervals find all sites of a certain size, period, or type, this interval size reflects the sampling strategies employed in the original surveys which located the DSS sites. In the discovering of each DSS site, surveyors used 25 feet as the absolute lowest sampling interval, most likely due to labor costs. However, another point of view would suggest that though 25 foot intervals would still miss clusters, these clusters do not necessarily equate to sites. Again the question of site definitions becomes important. For some projects, all clusters smaller than a pre-determined minimum site size does not qualify as a site. As such, a smaller interval would prove extraneous for site detection. However, before making such a claim, researchers must first either define a site for the purposes of their project or apply a standardized definition. While I cannot, based on this information, assign minimum site dimensions, I do believe that researchers can and should establish such measurements before determining a sampling interval.

From the DSS results and these considerations, I selected an optimal interval size. As six preferable interval sizes were either 25 or 28 feet, I believe that the optimal sampling interval is 25 feet, but logistics may make this unrealistic. In such cases, researchers should use the smallest interval possible after 25 feet. However, I do establish 40 feet as the maximum interval. According to my sample, using an interval of 40 feet, a survey would possibly miss 4.5% of the sites. Increasing the interval to 50 feet, one would miss 15.9%.

It is useful to at least mention briefly here the interval size suggested by the Monticello Department of Archaeology as the initial Morven surveys followed this guideline and they calculate their interval based on the same equation I used. However, while I calculated intervals for each site in my 43 site sample, Monticello established their STP interval based on their work on the Elizabeth Hemings site. Monticello suggests 40 foot intervals, the same interval I established as the maximum. While I would like to promote a calculation such as mine because of the larger sample size, I worked from limited information provided by a problematic program.

Monticello researchers, meanwhile, have completed their Elizabeth Hemings project and, while a sample size of one, they do have a more complete picture of their site and the surrounding landscape than I do for any one site in my database (Neiman et al. 2000). That is not to say that my suggested intervals differ too greatly from Monticello's. As, upon the discovery of a positive STP, the Monticello strategy is to cut the STP interval to 20 feet, I think we would agree that while 40 foot intervals are sufficient, 25 foot intervals would be more efficient and desirable. However, again, researchers must take other variables into account, not all of which reflect optimal strategy but instead reflect such practical concerns such as cost and labor.

Conclusion

In this chapter, I have established three important factors which may help in subsequent analysis of and recommendations for the Morven project. First, while not completely ineffective, geophysical testing such as GPR, magnetomtry, and resistivity do not perform well in local conditions due to moist, iron-rich clays. Next, through DSS, I compared average site size in each site type and site period. Such results suggest that sites do generally increase in size as the site period approaches historic. During survey, then, researchers searching for Early Woodland sites should expect and adjust strategies such as STP interval size for smaller sites.

Finally, while I consider 25 foot STP intervals optimal, constraints on labor cost and available time would often prevent such intensity. While researchers should opt for the smallest interval they can afford, archaeologists should not employ intervals larger than 40 feet. No interval is guaranteed to detect all sites, no matter the number of calculations. As Shott (1989:399) points out, intersection does not always result in detection. In a perfect world, surveys using a 50 foot interval would fail to detect, at the most, 15.9% of the DSS sites, but in a not so perfect world, that percentage further increases as STPs located within a site's boundaries produce negative results.

Conclusion: Finding Sites at Morven Farm

In the previous chapters, I covered a range of topics in hopes of drawing out a better understanding of the methodology, and by default the sheer amount of work, required in only the first stage of archaeological research: detection. Not only have I covered the question of how archaeologists know where to dig, but I have hopefully also provided enough information to evaluate the effectiveness of different strategies. This last section, then, serves to pull together the loosely connected topics on which each chapter has focused in order to evaluate, or possibly critique, current methodology and offer a strategy targeted at a specific project, to be discussed below, Morven Farm.

In Chapter 1, I gave a brief regional overview of Virginia, covering a few select topics valuable to archaeologists as they begin planning a project. These topics include a regional introduction to Middle and Late Woodland period, and typical archaeological site types and sizes. Chapter 2 and 3 provided a basic introduction of survey techniques and sampling strategies. While for organizational purposes I separated the two into different chapters, survey techniques rely on sampling strategies and, throughout a project, a researcher would consider the two in tandem.

Chapter 4 and 5 stepped away from the survey fundamentals as I offered a literature review of scholarly works which consider survey in practice through a number of case studies. The repetitive focus illustrates the debates and controversies surrounding methodology. While Chapter 4 covered more traditional survey methods, in Chapter 5 I discussed what Wobst referred to as "fancier" methods, or geophysical methods.

After five chapters of introduction and theory, I reached my own analytical work in Chapter 6. There, I considered previous archaeological work performed in the central Virginia

Piedmont using both two case studies of sophisticated methods such as GPR, resistivity, and magnetometry, and the Virginia DHR DSS. Because, generally, the more sophisticated methods are not as effective in the area of my analysis, I dedicated more time to my DSS site database which I used to evaluate average site size for different site periods and types as well as to establish optimal interval sizes between shovel test pits.

Finally, below, I offer a more complete introduction to the Morven project, including a historical context and past archaeological work in the specifics only possible after covering a broad introduction to the span of factors contributing to surveying, in general and in Virginia. In short, chapters one through five provided diverse necessary background information through which to view the data in Chapter 6, all of which allows me ultimately to make recommendations for methods of surveying Morven Farm in cost effective and productive ways.

Morven Farm

MAST Phase- I Survey

In 2009-2010, MAST and RAS conducted a survey of the 250-acre study area (MAST 2009:1). By the end of July 2009, MAST had completed survey of sixty percent of this area, approximately 250 acres, as well as an informant survey, discussing findings from both in a 2009 Status Report. During the informant survey, researchers went on a site tour with a long-term employee at Morven who had worked there for two different owners. The informant pointed researchers to a site where he recalled that a barn construction project in the early 20th century had exposed headstones and graveshafts most likely associated with a large slave cemetery. He also identified two probable 19th- century sites (MAST 2009:10).

In terms of the 250 acre survey, MAST records the execution of "systematic shovel testing" (MAST 2009:1), without going into further details on STP intervals or other strategies. A progress report provided by RAS, however, fills in the blanks. RAS excavated STPs in 80 foot intervals, tightening intervals to 40 feet or, more rarely, 20 feet around positive STPs. As of July 30, 2009, out of the 1,241 STPs RAS completed, eighty percent were dug with 80 foot sampling intervals. In June 2009, University of Virginia, Washington and Lee, and Monticello Archaeology participated in a joint field school, also excavating STPs at Morven, covering 13.3-acres. This field school used 40 foot intervals and tightened to 20 foot intervals upon the discovery of a positive STP (RAS 2009). This survey located five sites: three pre-historic American Indian sites (Site A, B, and C), and two historic sites, one (D) associated with the early 19th century and the other (E) dating to the 19th century into the early 20th century (MAST 2009:89).

All three pre-historic sites are located along Indian Camp Creek[90]. The survey at Site A recovered pre-historic lithic artifacts and pre-historic or contact-era pottery fragments broadly of the Woodland Period. Along the site's west side, a layer of dark, organic rich sediments located two feet below the surface may indicate a buried pre-historic surface. MAST writes that the historic era soil covering this stratum resulted from soil erosion and redeposition caused by anthropogenic disturbances such as Euro-American forest clearing and agriculture, hypothesizing that these soil deposits can help track historic landscape transformations (MAST 2009:8). Site B and C offered only limited pre-historic lithic finds, with one diagnostic[91] projectile point, indicate site occupation in at least the Middle-Late Archaic period. On site conditions, MAST

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[89] See Appendix H for site locations

[90] See Appendix I for pre-historic site locations

[91] Can indicate chronology for the site.

reports that, while deep soils comprise Site B, researchers found artifacts within one foot from the surface and Site C has shallow soils with finds appearing in the plow zone (MAST 2009:10).

Located next to a spring Jefferson had indicated in one of his maps of Morven (RAS 2009) Site D provided low artifact density including ceramics, glass, and nails. Based off these material finds and documentary evidence, researchers believe this to be a domestic site from the early 19th century, associated with a lease held by George Haden. Finally, the low density scatter of ceramics and glass at Site E indicates the location of Overton, a site of a post office, store and school by the first decade of the 20th century and as early as 1875 (MAST 2009:10).

On their goal to identify American Indian Contact period settlements, MAST reports that they recovered "no conclusive evidence" (MAST 2009:11). However, they write that discoveries along the "relatively narrow valley of Indian Camp Creek indicate the stream held a long-standing attraction to the region's prehistoric inhabitants" (MAST 2009:11). The presence of late prehistoric pottery also suggests that occupation may have continued into the contact period.

MAST 2009 Recommendations

Following the report of their 2009 results, MAST made recommendations for continuing research, some of which have already been carried out. Still, I find it useful to discuss what researchers recommended for further testing after the completion of the first stages of their survey. In general, MAST suggested further testing at both Site A and Site D in order to evaluate the possibilities for extended research. At Site A, they recommend one to two large "opportunistically" (MAST 2009:10) placed units. Additionally, MAST advised extending Phase-I STPs to a wider study area for a more accurate model of past settlement, specifically north and northeast of the already surveyed study area. This move would place STPs in land associated with leaseholds in the documentary record, offering more data concentrated on tenant farmers. It would also encompass additional streams which researchers can test for the extent and nature of pre-historic settlements which have so far seemed to congregate at Morven along stream shores (MAST 2009:10-11). Due to the deep soil deposits along these streams, MAST advises introducing geoarchaeology. MAST expects that, through coring and the examination of stratigraphy, researchers can develop a site chronology, specifically in terms of changes in the landscape through the historical period.

Logistically, MAST offered additional recommendations such as rescheduling the future field schools to May-June and returning to wooded areas in the winter in order to avoid interfering with agricultural projects. As available field schools were already committed to other study areas, MAST hired RAS to continue with the first stages of the project (MAST 2009:11). RAS's methodology and findings follow.

RAS Phase-I Survey

While the MAST report discusses results as of the completion of the first sixty percent of the 250-acre study area in July, in a later report RAS offers results from the final forty percent of the area, covered in the Fall and Winter 2009. This provides not only additional findings but also more detailed information on the actual survey strategy (RAS 2010). RAS excavated STPs at what they refer to as a "relatively coarse" (RAS 2010:1) sampling interval of 80 feet, well over the 50 feet suggested by the Virginia DHR and the 40 feet promoted by Monticello. They defend such a large interval, stating that this STP interval will provide "first order" information over a "broad area" (RAS 2010:1).

As researchers contracted RAS for 2000 STPs and the 80 foot interval covered the study area in 1770 STPs, RAS excavated additional STPs in two "opportunistically chosen areas"

(RAS 2010:1), basically applying a judgmental sampling strategy over the initial systematic sampling. These opportunistic areas included, 15 acres located along an already established 18th-19th century road and associated with a documented leasehold and 23.5 acres along the Indian Camp borders which also overlapped additional leaseholds. By the completion of the first stage of Phase-I survey in January 2010, RAS covered a total of 288.5 acres (RAS 2010:1).

While MAST reports the discovery of five sites plus three possible sites indicated by informants, RAS identifies two additional sites detected in the last forty percent of the study area. Based on the finds of the survey, RAS considers site density at Morven low for the Piedmont region, specifically as compared to site density findings at Monticello and the 1985 Albemarle County survey (RAS:1). They report that this low site density may have resulted from the wide 80 foot STP interval. Additionally, they found deep sediment deposits of approximately two feet "along even the smallest streams within the Morven study area" (RAS 2010:1). Such a depth makes site discovery along these streams via STPs difficult, though not impossible, as STPs do not traditionally reach such depths (RAS 2010:1). In fact, though Site A was discovered in such an environment, this resulted from a planned approach by Derek Wheeler, an archaeologist at Monticello, which called for extended STPs in the alluvial environment to a greater depth of three feet (Cannon 2010).

RAS reports further testing initiated in March 2010 at Site A and D. This testing focused on the nature and dates of site occupation, site size, and site preservation. Researchers at Site A excavated by hand a 3x7 foot trench. At Site D, they excavated 14 "systematically spaced" (RAS 2010:2) 2.5 x 2.5 foot units. At site A, they discovered a buried A-horizon located 2.5 feet below relatively recent alluvium/colluvium, as well as charcoal consistent throughout the stratigraphy and a large Late Woodland ceramic sherd, consistent with Site A's identification during surveying. Two geoarchaeologists visiting the site, Dan Hayes and Bill Monighan, agreed that the Site A study area "presents a rare research opportunity to investigate Late Woodland Period Native American settlement in an upland (i.e. non-riverine) setting in the central Piedmont at a site with a high potential for preserved organics, cultigens, and cultural features" (RAS 2010:2). Further testing at Site D, meanwhile, identified low density artifacts indicating a late 18th century to early 19th century domestic occupation, concentrating to a 100x100 feet area. Besides nails, researchers did not find architectural remains (RAS 2010:2).

RAS Recommendations March 2010

RAS offered three recommendations for subsequent research at Morven. First, RAS suggested site mapping and Phase II testing at the 19th-century plantation house site pointed out during the informant survey. In doing this, researchers would systematically excavate 2.5x2.5 foot units at pre-determined equal intervals in the site center in order to evaluate site size, artifact presence, site preservation, occupation dates, and feature types (RAS 2010:3).

Next, they called for the extension of Phase- I survey into areas adjacent to the original 250 acres. In discussing this, they re-iterated a few suggestions from the earlier MAST status report such as concentrating on the area north and northeast of the 2009 study area (a 110- acre area) and scheduling an earlier field school. While RAS also stated that focus should remain on locating additional tenant leasehold and American Indian sites, they also suggested directing research focus towards African American sites on the property. In terms of methodology, RAS offered two recommendations. First, researchers should concentrate a fraction of future survey efforts on existing roads and buildings. Second, they advised reducing the STP interval from 80 to 50 feet (RAS 2010:3).

Finally, in March 2010 RAS suggested that researchers should conduct a Phase-II survey at Site A using a combination of methods, including: mechanical trenching, geoarchaeological soil analysis, and excavate/screen soil columns at pre-determined locations. By conducting such research, archaeologists can identify horizontal and vertical site boundaries, as well as test soil samples and discover sites. Researchers, as a result, could then create a well-informed research design for future, more extended projects at the site. On these future projects, RAS wrote that the site has the "potential to integrate studies" (RAS 2010:3) by offering a single locale for the possible evaluation of late pre-historic and Contact period American Indian settlement patterns and track landscape changes resulting from early Euro-American occupation and activities (RAS 2010:3).

October Lecture from Don Gaylord and Steve Thompson

In an October 2010 lecture, two researchers – Steve Thompson, the RAS archaeologist who penned the reports summarized above, and Don Gaylord, archaeological analyst at Monticello – discussed their findings and work at Site A with a group of Washington and Lee and UVA students (Gaylord and Thompson, personal communication, October 2, 2010). They first discussed original discovery of Site A during the first stage of Phase-I surveying in Summer 2009, before moving on to geophysical and soil chemistry testing enacted at Site A as recommended by RAS in March 2010. However, this latter testing falls under Phase-II work and I will not discuss it here.

In the summer of 2009, as mentioned earlier, University of Virginia, Washington and Lee, and Monticello archaeology combined field school excavated STPs at an interval of 40 feet with a row of STPs intersecting the site. Thompson and Gaylord emphasized that despite having identified Site A, the survey suggested that site was almost culturally sterile with some pieces of

Late Woodland quartz unearthed in the STPs and a large diagnostic ceramic vessel[92] discovered through the stream, potentially dating to the Late Woodland, or as late as the Contact period.

My Recommendations for Future Work

As one could ascertain from the above, the project at Morven has passed the first stage of Phase-I survey[93]. Since October, researchers have done additional work, mostly Phase-II work and some further limited Phase-I testing on a 40-acre tract of land sharing near the southwest border of Indian Camp. They applied a 50 foot interval, excavating 650 STPs. However, I formed the following recommendations prior to this additional work and, nevertheless, additional Phase-I work would greatly benefit the project. Initial Phase-I survey revealed the study areas low site density, inconsistent with the higher general site density within the local region. However, as the STP interval started at 80 feet and worked its way down to 40 feet, it is not unrealistic to think that a number of smaller sites exist on this landscape but were not found.

As I illustrated in Chapter 6, to locate the smaller sites associated with pre-historic Virginia, particularly further back in time, and/or created by mobile groups, researchers should use a 25 foot interval for the greatest reliability. Furthermore, due to the deep deposits along the study area's streams, initial STP surveys failed to reach beyond the alluvial deposits. Though Rivanna enacted additional survey research since the initial stages, they mostly concentrated this work along already detected sites rather than continuing site discovery attempts. And, in dealing with the deep sediment deposits, they opted for mechanical trenching, an intrusive and labor-intensive method.

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[92] See Appendix J for ceramic image

[93] See Appendix K for Morven STP Map

While both MAST and RAS proposals suggest broadening the survey area past the original 250 acres, I believe that further survey work must still be done within the area. Most simply, on the entirety of the 250 acre survey area, I would recommend further decreasing the STP intervals. While I have established 25 foot intervals as optimal, because subsequent research will build on previous archaeology, which used 80 and 40 foot intervals, I advise that researchers excavate STPs in radials of 20 foot STP intervals. In order to do this, researchers would first place STPs 20 feet from each previously excavated STP. Areas in which researchers tightened STP intervals to 40 feet would not need additional STPs excavated after this first step. However, in possible areas still only sampled in 80 foot intervals, researchers need to then excavate radials from each new STP until one encounters a test pit from the 80 foot interval survey.

By comparing the cost for a survey using 80 foot intervals to the potential cost of one using 20 foot intervals, I confirmed that conducting such an intense survey in a single field season, or even year, is unrealistic. Using 80 foot intervals, it took 1,770 STPs to cover the 250 acre survey area. RAS charges approximately $20 per STP and UVA paid for 2,000 STPs (Bell personal communication, March 7, 2011) which totaled $40,000, funded by the University of Virginia. Before RAS targeted specific areas to complete the quota, the STP survey covering the entirety of the property cost $35,400. Originally excavating STPs on 20 foot intervals would have cost, most likely, over $500,000, an exorbitant amount for a project conducted mostly through university work. And cost is simply one factor; other constraints such as time would have made 20 foot intervals increasingly unrealistic.

Researchers can now work off of previous STPs, inserting three additional STPs along transects where researchers did not reduce the 80 foot interval and inserting one additional STP between transects which received further testing at 40 foot intervals. However, labor costs are still prohibitive, with costs either way well over $100,000. Due to labor costs, then, researchers could only conduct such detailed surveys with a large budget and/or a large amount of time. Additionally in viable areas, instead of excavating STPs, researchers could employ less costly geophysical testing, a task I discuss further into this analysis.

Nevertheless, I still recommend a 20 foot interval, though due to cost more strategizing is necessary. One possibility is to spread the project over multiple field seasons. Paying a high price over a number of years at least makes the cost manageable and, by devoting more time to surveying, a more detailed picture can develop. For example, between 1997 and the summer of 2010, Monticello excavated approximately 18,000 STPs on 40 foot intervals across 500 acres (LS, FDN 2010 http://www.monticello.org/site/research-and-collections/uncovering-monticello-plantation). If researchers continued to pay RAS for Phase-I work through the next few years, university field schools can still conduct Phase-II excavation at already located sites such as Site A or D concurrently with RAS's work towards detecting additional sites. Though the project at Morven Farm does not have the permanence of Monticello Archaeology, it also does not need 18,000 STPs. Including STPs already excavated and without considering further possible sampling strategies, to cover the entire 250 acre study area researchers would need to excavate just over 7,000 STPs. As I do not know the project's available (or negotiable) budget, I cannot offer even a tentative time line. Nevertheless, if project leaders measured their budget against their time limit, a workable research design could be created to incorporate 20 foot intervals.

If, however, neither the time nor money for such an endeavor can be obtained and organized, researchers should consider further sampling strategies. I offer here two possibilities: stratified-random sampling or judgmental sampling, one a probabilistic method and the other non-probabilistic. As discussed in Chapter 3, researchers can utilize stratified sampling organized based on either arbitrary or non-arbitrary boundaries. Here, I advocate arbitrarily assigned strata. In this way, one can save money by randomly selecting portions of the landscape for surveying while also offering relatively constant coverage across the entirety of the study area. And though researchers would then only excavate STPs in superimposed grids of equivalent size across the study area, random sampling allows for probabilistic models in later analysis which would, ideally, be representative of the entire 250 acre study area.

Finally, judgmental sampling serves as another possibility. While researchers could not create a predictive model from the resulting data, this sampling allows for the targeting of areas archaeologists view as probable sites, based on historical map projections, informants, and/or visible features. Researchers should preferably use judgmental sampling for detecting historical period sites, especially due to the thick documentary record surrounding "Indian Camp." Using maps, researchers could direct STP excavations towards areas shown on maps as belonging to a specific tenant farmer. For example, tenant farmer George Haden's falls almost completely in the study area as does as small portion of Joseph Price's[94].

If researchers wish to further narrow down this area, they could test in certain proximity to the water, based on excavations at previous sites in the region which perhaps establish similar sites' average distance from the water. Archaeologists can also target areas by investigating the effect of certain gradients on the depth of colluvial build up at the bottom of the slope. Depending on the depth of the colluvial deposit, researchers should consider either employing machine trenching or geophysical methods such as GPR. This may reveal whether researchers should excavate the slope or focus on colluvial deposits and tracts on top of the slope. In all,

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[94] See Appendix F

focusing survey efforts on these areas would save money as well as very plausibly locate a number of additional sites.

For pre-historic sites, MAST and RAS's analyses suggest a long history of occupation along the streams and, as such, researchers should make efforts to locate as many of these sites as possible. Due to soil and sediment conditions along the study area's streams, researchers should avoid excavating STPs in those areas (another decision under judgmental sampling), for the sake of a more effective strategy. Regardless of which method applied to the rest of the landscape, I advise specialized testing along these streams.

While RAS opted for machine trenching, I believe they should also employ Ground Penetrating Radar (GPR) as it offers a larger sample of data and requires both less time and money to operate, assuming the availability of the technology. GPR could pass the deep alluvial deposits and reach cultural strata to detect possible remains. This would be partially experimental as generally, these more sophisticated methods do not often produce satisfactory results in the region. Because these deposits are located along streams, this may further complicate the matter as GPR does not work as well for particularly moist soils as the radar cannot travel through the clay clasts as easily. Nevertheless, GPR may produce enough results so as to guide further machine trenching.

In summary then, my recommendations are:

1. Continue focusing on the 250-acre study area.
2. Reduce STP intervals to 20 feet, in order to remain consistent with previous 80 foot and 40 foot intervals.
3. To balance out labor costs in both time and money take one of three approaches.
    a. Spread Phase-I survey across several field seasons.

   b. Select areas for STP testing through stratified-random sampling.
   c. Select areas for STP testing through judgmental sampling.
4. Employ GPR along streams before further machine trenching.

The Problem of 'Site'

Here, I would like to take the opportunity to address a certain issue that repeatedly came up through this piece. While this paper focuses on site discovery, the concept of site as the unit of analysis in fact proved the most problematic. As I considered a variety of views and projects conducted by an array of researchers, I kept my working definition of site simplistic. To me, a site was the location of concentrated archaeological excavation. This view allowed me to incorporate data from a number of sources using different conceptions of site. As shown in the literature review, archaeologists like Wobst (1983), Dunnell and Dancey (1983), and Shott (1989) have also discussed the drawbacks of such an approach. However, in my research I did not come across a reasonable alternative and, as Wobst (1983) and Shott (1989) acknowledge, the studying by site remains the most logistically convenient.

Nevertheless, I believe I must address my own qualms with the site concept. I found its implications on both analysis and methodology inapt. In analysis, Wobst and Shott write that viewing the study area as a series of sites offers an inaccurate view of the past landscape, pointing out that a vacuum does not exist between two sites. Humans used the entirety of the landscape and did not limit themselves to the clearly bounded areas that sites represent (Wobst 1983, Dunnell and Dancey 1983, Shott 1989). I believe researchers can partially correct these inaccuracies by deeper inter-site analysis and additional testing between known sites. Such an approach may better reveal spatial patterns as well as offer an improved representation of the space between sites. However, to do this, researchers would also need inter-project cooperation and a more accurate data sharing system than what the Virginia DHR currently offers, a task which may or may not ultimately prove unrealistic.

The site concept also causes issues for methodology. Surveys suffer from a lack of standardization not only in strategy but also in definitions. As mentioned above, researchers define sites differently according to the project. While their site definition aids their individual project, it also complicates inter-site analysis. In Chapter 1, I provided a list of site types promoted by Burke (2009). These eleven site types include (1) findspots, (2) lithic scatters, (3) quarries, (4) midden or midden scatters, (5) habitation, (6) stone arrangements, (7) rock art, (8) rockshelters or caves, (9) special religious places, (10) burials, ossuaries, and mounds, (11) post-contact (Burke 227-231).

However, I would argue that Burke does not specifically label site types but instead find types, particularly findspots and lithic scatters which can represent isolated finds or activities. The other nine may qualify as site types in the sense that they attribute a specific purpose to the find and, indeed, such labels are potentially useful. Nevertheless, Burke's remaining site types often overlap and create redundancies. For example, a rockshelter or cave would serve another purpose, such as habitation or special use. Additionally, despite the specific nature of this list, Burke leaves out production sites. Of course, Burke's list is only one of many, but I believe it presents the possible issues resulting from a lack of site type definitions. Offering an extensive list such as Burke's leaves too much room for overlap and, conversely, omission.

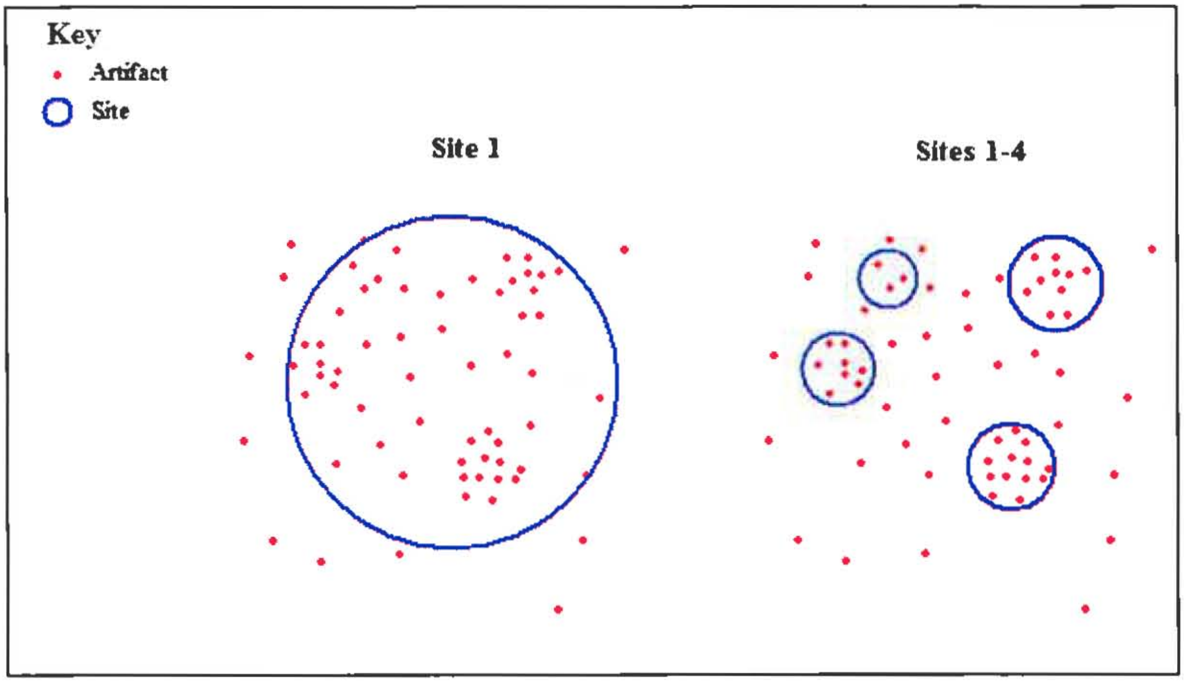
Also in Chapter 1, I provided a site type list from Purdy's work, which includes only three classifications: (1) habitation, (2) special use, and (3) shipwreck (1996:75). As opposed to Burke's, this list is too general and, while one can certain divide all sites into the habitation and special use categories (with shipwreck as an outlier), site use gets lost. In both Burke's and Purdy's site typology, researchers unfamiliar with their classification system, or even the other site types on their list, may elicit a faulty interpretation or picture of the site. In an article examining how to approach the classification and analysis of early colonial Chesapeake tobacco pipes, Anna Agbe-Davies offers a few thoughts that are applicable here in site type classifications as well (2006:116-117). She writes that classification systems reflect one of two possible organizational approaches; archaeologists either create classification groups which, as closely as possible, "replicate systems of past societies" (Agbe-Davies 2006:117) or allow for more manageable analysis. While Agbe-Davies suggestion that the classification strategy should fit "the problem at hand" (2006:117), rather than follow a previously standardized system promotes a particularized analysis for an individual project, unique classification strategies makes inter-site and inter-project analysis difficult.

I believe archaeologists can simplify inter-site and inter-project analysis, which in turn allows for greater understanding of the cultural landscape, by creating a standardized system for site type and minimum size classifications so as to make inter-site analysis more accessible. Standardized site types better facilitates the identification of similar sites during reviews of previous archaeology which can help researchers formulate a more specific survey plan. For example, when I analyzed the DSS sites by site type, I had to create my own categories as those in the DSS system varied greatly and overlapped. With a standardized system, I would have been able to more easily calculate average site size and optimal STP interval for individual site types. Again, I recognize that this is easier said than done, but even a generally accepted standardization can simplify matters.

What would this site classification system look like? Does a happy medium between overly specific and overly general exist? I believe a list closer to Purdy's to be more suitable, admittedly a bit more extensive. While in Chapter 6 I partially based my classifications on those provided by the DSS, I believe it serves as a mostly credible list. My site types included (1) Sedentary; (2) Mobile; (3) Industry; and (4) Indeterminate, a clearer of definition of which I provided in the chapter. These four types covered the DSS site types included in my database. However, this list also requires additions. A more complete list would include two more categories, burial and special use, the first of which is self-explanatory and the latter would most frequently include spiritual space. Of course, such a list will often miss the intricacies of an individual site or project. In this case, researchers should apply subcategories, whether created for the individual project or standardized. For example, researchers may identify either a midden scatter or a camp which belongs to the Mobile site type. Additionally, researchers would not necessarily apply these standardizations in intra-site analysis, a more detailed analysis of a single group instead of regional generalizations.

Site definitions further suffer from the lack of standardization in additional areas, for example, site size and density. In Chapter 6, I established an average site size by site type and site period based on the DSS and then used site size to calculate an optimal sampling interval. From this analysis, I realized that smallest find size and density attributed to the site definition varied greatly across projects. For one, researchers may misidentify a large site as several small sites or several small sites as a large site (see Figure 22), according to two non-standardized variables: the survey detail (particularly sampling interval) and the researchers' judgment. But if one standardized the survey detail and minimum site size, researchers may more effectively avoid misidentifications.

Figure 22- The Variability of Site Classification on the Same Scatter



As suggested, site definitions suffer from the lack of a standardized minimum site size. For example, in Chapter 6, one site (44AB0019) measured only 1x1 foot, most likely the dimensions of a single excavation unit. Such a small size would suggest a findspot or a small artifact scatter. Yet researchers categorized it as a site. I would argue such a find does not qualify as a site as it represents an isolated find in an area approximately the size of an STP. If this 1x1 foot findspot qualifies as a site, then researchers could potentially argue all positive STPs represent a site. Because of this, I offered corrected calculations of average site size and maximum interval without 44AB0019.

Though not a site, 44AB0019 illustrates Wobst's (1983), Dunnell and Dancey's (1983) and Shott's (1989) point that a vacuum does not exist between sites and past humans dispersed cultural remains across the landscape. But while I do not consider one-by-one foot find a site, the question becomes: how small can a site be? Such a question has greater implications when it comes to establishing an optimal interval size. Though a survey would ideally locate the greatest location of cultural remains as possible, researchers generally stress site discovery during a survey. If one established a standardized minimum site size, one could also offer a more concrete optimal interval size targeted at the discovery of all sites in the study area. For example, as mentioned in Chapter 6, my suggested 25 foot interval would locate with certainty sites with a radius of at least 17.6 feet, or a square area with 31.2 foot sides. If the minimum site size approximates this measure, then a 25 foot interval would indeed be optimal.

This raises another issue in terms of site definitions: shape. While these measurements and any calculation based off of Lightfoot's equations assume a regular site shape such as a circle or a square, sites do not usually exist in regular shapes. If one were to trace an outline around the positive units of a site, an irregular shape would nearly always form[95]. Though I believe imposing a pre-determined shape onto the site does not offer an accurate picture, as of now, just as researchers must currently work in sites, they must also deal in regularly shaped sites in mathematical models for a lack of a better alternative.

Concluding Remarks

Overall, then, currently survey methodology lacks the standardization of certain variables needed to properly conduct inter-site and inter-project analysis. While I focused here on the problem of site definitions in terms of type, size, density, and shape, the DSS revealed further standardization issues. Depending on the entry, recorders provided STP intervals in either feet or meters and I was forced to convert meter measurements to feet which may have led to less accurate data. Conversely, it was less difficult to evaluate site size as the DSS specified the use

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[95] See Appendix G

of feet in site size measurements. The ease with which I was then able to compare site sizes from different projects only proves the need for standardization.

While the lack of standardization in interval size does not necessarily prevent inter-project analysis, it causes a misinterpretation of the cultural landscape and many available cultural remains to continue to go undiscovered. I refer here to those projects with inordinately sized STP intervals. Though this problem persists mostly in CRM work in which projects must traditionally cover larger areas, other projects also suffer, as shown through the initial 80 foot interval used at Morven. *That initial interval, after all, suggested an anomalous site density for the region.* Morven appears to contain on its property less sites than one would hypothesize based on previous surveys in the region. Researchers then should first of all standardize STP intervals by establishing a maximum site size, taking into account that, for efficient surveys, smaller is better though concessions must be made for projects which can only afford a certain level of labor intensity.

However, standardization of other strategies would decrease the effectiveness of a given survey. Throughout these chapters I provided a large quantity of information on assorted survey methodologies, some of which one must choose between and other which serve as an indispensible part of a greater research strategy. In choosing from this potentially overwhelming supply of strategies, researchers must design a survey particular for the project at hand. Would the project benefit more from probabilistic or non-probabilistic sampling? Should one use machine trenching? STPs? Magnetometry? Each and every one of the methods I have discussed is valid and efficient but not necessarily for the same project. One cannot conduct the same survey in both the Eastern Woodlands and the American Southwest and expect the same effectiveness, just as one cannot excavate STPs along a large alluvial or colluvial deposit and expect to detect sites. Surveying, then, must be the product of a well thought out, detailed research design carefully balancing methodology standardization and individualization for any given project.

Appendix A- The Mid-Atlantic Region in Relation to the United States

Image Source: U.S. Environmental Protection Agency, www.epa.org Accessed on 4/11/11

Appendix B- Virginia Provinces

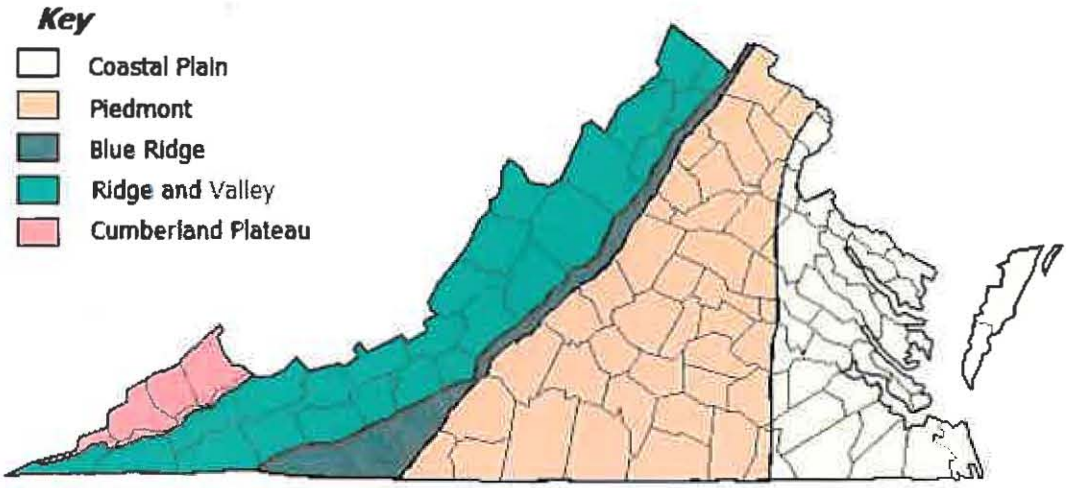
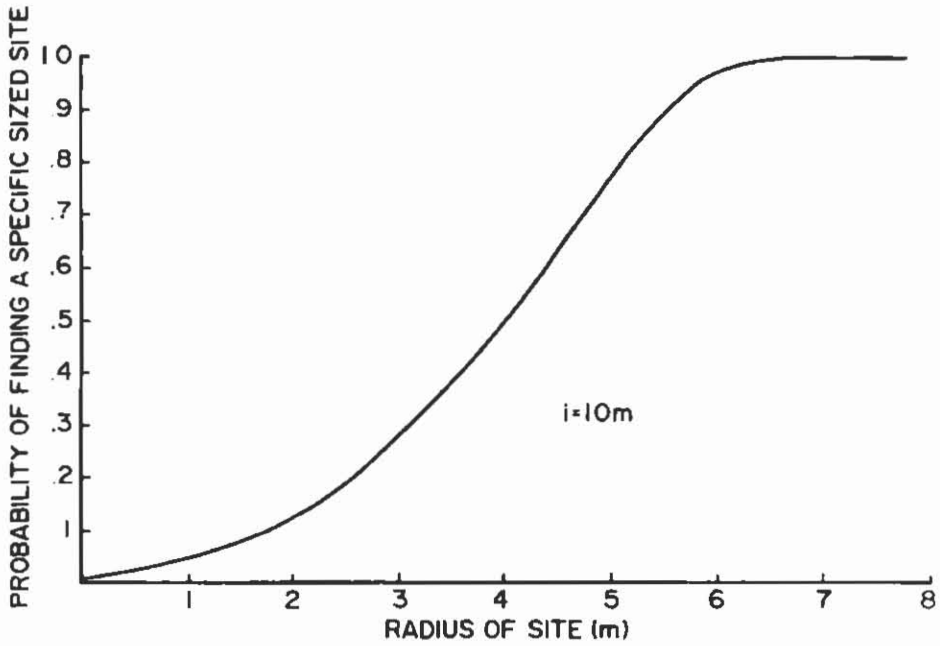
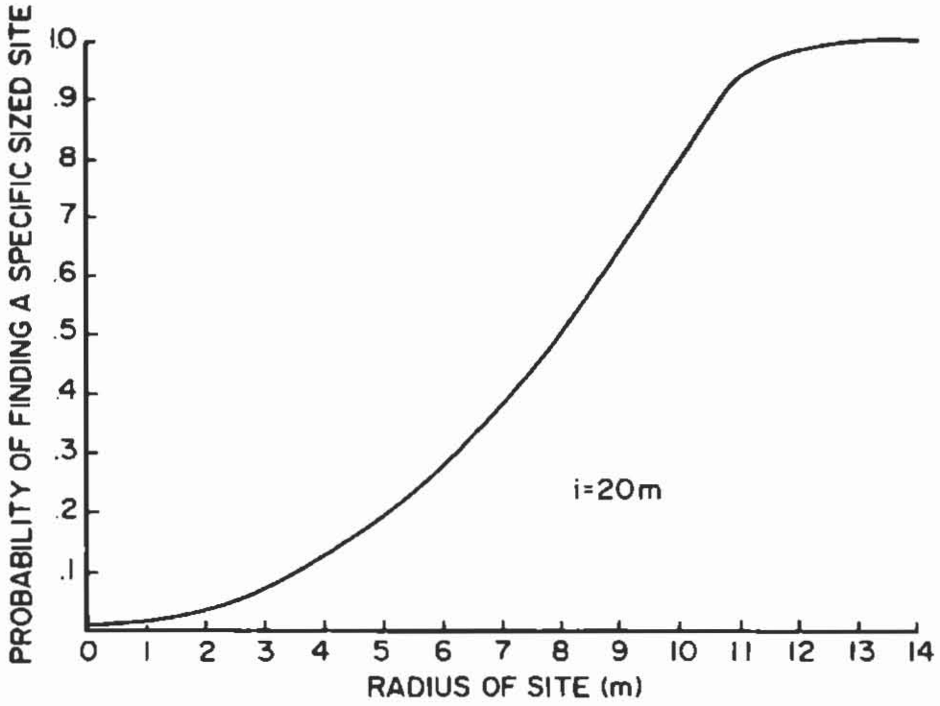


Image Source: Radford University, Skip Watts, www.radford.org Accessed on 4/11/11

Appendix C- Probability of Finding Sites

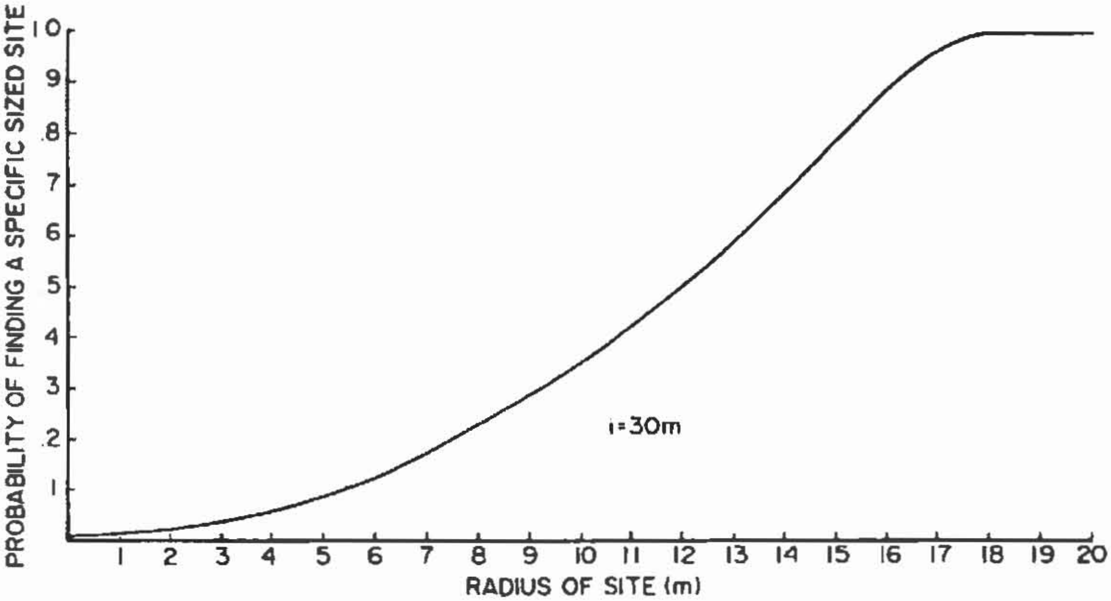


Probability of Finding Site with Interval = 10 m
Image Source: Lightfoot 1986: 493



Probability of Finding Site with Interval = 20 m

Image Source: Lightfoot 1986:494



Probability of Finding Site with Interval = 30 m
Image Source: Lightfoot 1986:496

Appendix D- Virginia Department of Historical Resources Archaeological Site Inventory Sample Form

VIRGINIA DEPARTMENT OF HISTORIC RESOURCES

ARCHAEOLOGICAL SITE INVENTORY FORM

GENERAL PROPERTY INFORMATION

City/County:

Site Class: ___ Terrestrial, Open Air ___ Terrestrial, Cave/ Rockshelter ___Submerged

Temporary Designation:

Specialized Contexts:

Resource Name:

Open to public: Y N Is there a CRM report: Y N

Ownership Status: ___ Private

___ Public/Local Gov. Modifier:

___ Public/State

___ Public/Federal

Temporal Affiliation:

Cultural Affiliation: ___ African-American ___ Native American

___ Euro-American ___ Other ___ Indeterminate

Thematic Contexts:

Context Example Comments

LOCATION INFORMATION

UTM Center:

UTM Coords:

Zone North East

Loran:

Restricted UTM Data? : Yes No

VDHR Site Number:

Other VDHR Number:

Physiographic Province: Elevation:________ ft

Aspect:

Site Soils:

Drainage:

Adjacent Soils:

Direction: Distance: ___________ ft

Landform:

Nearest Water Source:

Site Dimensions: ______ x ______ ft Acreage:

Slope: _____________ percent

Survey Description:

Site Condition(s):

25-49% of Site Destroyed

50-74% of Site Destroyed

75-99% of Site Destroyed

Destruction of Surface and Subsurface Deposits

Intact Cultural Level

Intact Stratified Cultural Levels

Less than 25% of Site Destroyed

No Surface Deposits but With Subsurface Integrity

Site deliberately buried

Site Totally Destroyed

Surface Deposits Present And With Subsurface Integrity

Surface Deposits Present But Subsurface Not Tested

Surface Deposits Present But With No Subsurface Integrity

Unknown Portion of Site Destroyed

Subsurface Integrity

Surface Features

Surface Deposits

Site Condition Unknown

Survey Strategy: ___ Historic Map Projection ___ Informant __ Observation

___ Surface Testing ___ Subsurface Testing

USGS Quadrangle:

Current Land Use:

Date of Use: ____________________ Example: ________________________

Land Uses: ____

Comments:

SPECIMENS AND FIELD NOTES INFORMATION

Specimens Obtained: __ Yes __ No Depository:

Assemblage Description:

Field Notes: ____ Yes _____ No Depository:

BIBLIOGRAPHIC INFORMATION

Reference Numbers: __________ Report(s): _____ Yes _____ No Depository:

Reference for Report:

Additional Comments:

Source: Virginia Department of Historical Resources Data Sharing System
http://www.hrdss.state.va.us/DSS/jsp/Field_Survey_Form.htm

Appendix E- DSS Site Database

Site	County	Year of Survey	Survey Method	Site Type	Site Period	Site Dimensions (in ft.)
44AB0019	Albemarle	1942, 2007	Surface (1942), Subsurface (2007)	Mobile	Woodland	1 x 1
44AB0020	Albemarle	1942, 2007, 2008	Surface (1942), Subsurface (2007)	Mobile	Middle Woodland	100 x 100
44AB0033	Albemarle	1979, 2007, 2008	Surface (1979), Subsurface (2007)	Mobile	Middle and Late Woodland	250 x 250
44AB0038	Albemarle	1961, 1985, 1986	Surface	Indeterminate	Woodland	1,640 x 492
44AB0039	Albemarle	1961, 1985, 1986	Surface	Sedentary	Late Archaic and Woodland	984 x 656
44AB0045	Albemarle	1966, 1976	USGS Topographic Map, Surface	Indeterminate	Woodland	328 x 115
44AB0273	Albemarle	1985	Subsurface	Indeterminate	Woodland	82 x 377
44AB0286	Albemarle	1986	Surface-Pedestrian	Indeterminate	Woodland	1,476 x 180
44AB0291	Albemarle	1986	Surface-Pedestrian	Sedentary	Woodland	197 x 2,297
44AB0294	Albemarle	1988	Subsurface	Mobile	Pre-historic and Historic	180 x 72
44B0300	Albemarle	1980	Surface	Mobile	Woodland	820 x 98
44AB0327	Albemarle	1988	Subsurface	Mobile	Middle Woodland	36 x 108
44AB0343	Albemarle	1988	Subsurface	Mobile	Woodland	289 X 131
44AB0416	Albemarle	1991	Subsurface	Indeterminate	Middle Archaic, Woodland	591 x 755
44AB0464	Albemarle	1999	Subsurface	Industry	Woodland	40 x 165
44AB0548	Albemarle	2008	Surface, Subsurface	Industry	Pre-historic, Historic	125 x 200
44BK0038	Buckingham		Subsurface	Indeterminate	Woodland	246 x 410
44BK00154	Buckingham	1984	Subsurface	Mobile and Industry	Woodland	164 x 197
44BK0221	Buckingham	1986	Surface	Indeterminate	Archaic, Woodland, Historic	115 X 1,312

44BK0222	Buckingham	1986	Surface	Indeterminate	Archaic, Woodland, and Historic	98 x 656
44BK0223	Buckingham	1986	Surface	Indeterminate	Archaic, Woodland	722 x 820
44BK0229	Buckingham	1986	Surface	Indeterminate	Middle and Late Woodland	330 x 1,815
44BK0263	Buckingham	1986	Subsurface	Indeterminate	Woodland	164 x 1,312
44BK0314	Buckingham	1997, 2007	Subsurface	Sedentary and Industry	Pre-historic, Historic	340 x 480
44BK0327	Buckingham	1998	Surface	Sedentary and Industry	Pre-historic, Historic	230 x 350
44BK0330	Buckingham	2001	Subsurface	Mobile	Woodland	450 x 100
44BK0331	Buckingham	2001, 2007	Subsurface	Mobile	Woodland	250 x 520
44BK0334	Buckingham	2001	Subsurface	Mobile and Industry	Woodland	200 x 425
44FV0134	Fluvanna	1985	Surface, Subsurface	Sedentary	Late Archaic, Late Woodland	2,645 x 656
44FV0152	Fluvanna	1987	Subsurface	Indeterminate	Middle and Late Woodland	66 x 312
44FV0164	Fluvanna	1987	Surface-Pedestrian	Mobile	Middle Archaic, Middle Woodland	213 x 410
44FV0166	Fluvanna	1987	Subsurface	Mobile	Middle Woodland	262 x 656
44FV0168	Fluvanna	1987	Surface	Mobile	Early and Late Archaic, Woodland	1,132 x 361
44FV0177	Fluvanna	1988	Subsurface	Indeterminate	Woodland	246 x 1,148
44FV0179	Fluvanna	1988	Subsurface	Mobile	Middle Woodland	131 x 164
44FV0181	Fluvanna	1988	Subsurface	Indeterminate	Woodland	148 x 2,116
44FV0182	Fluvanna	1988	Subsurface	Indeterminate	Pre-historic, Historic	656 x 656
44FV0192	Fluvanna	1988	Surface	Indeterminate	Middle and Late Woodland, Historic	246 x 2,297
44FV0201	Fluvanna	1988	Surface	Indeterminate	Middle Woodland	295 X 1,903
44FV0206	Fluvanna	1988	Subsurface	Indeterminate	Middle Archaic, Historic	262 x 525

44FV0216	Fluvanna	1988	Subsurface	Indeterminate	Middle Woodland	246 x 410
44FV0239	Fluvanna	1995	Surface, Subsurface	Mobile	Middle Woodland	295 x 164

Appendix F

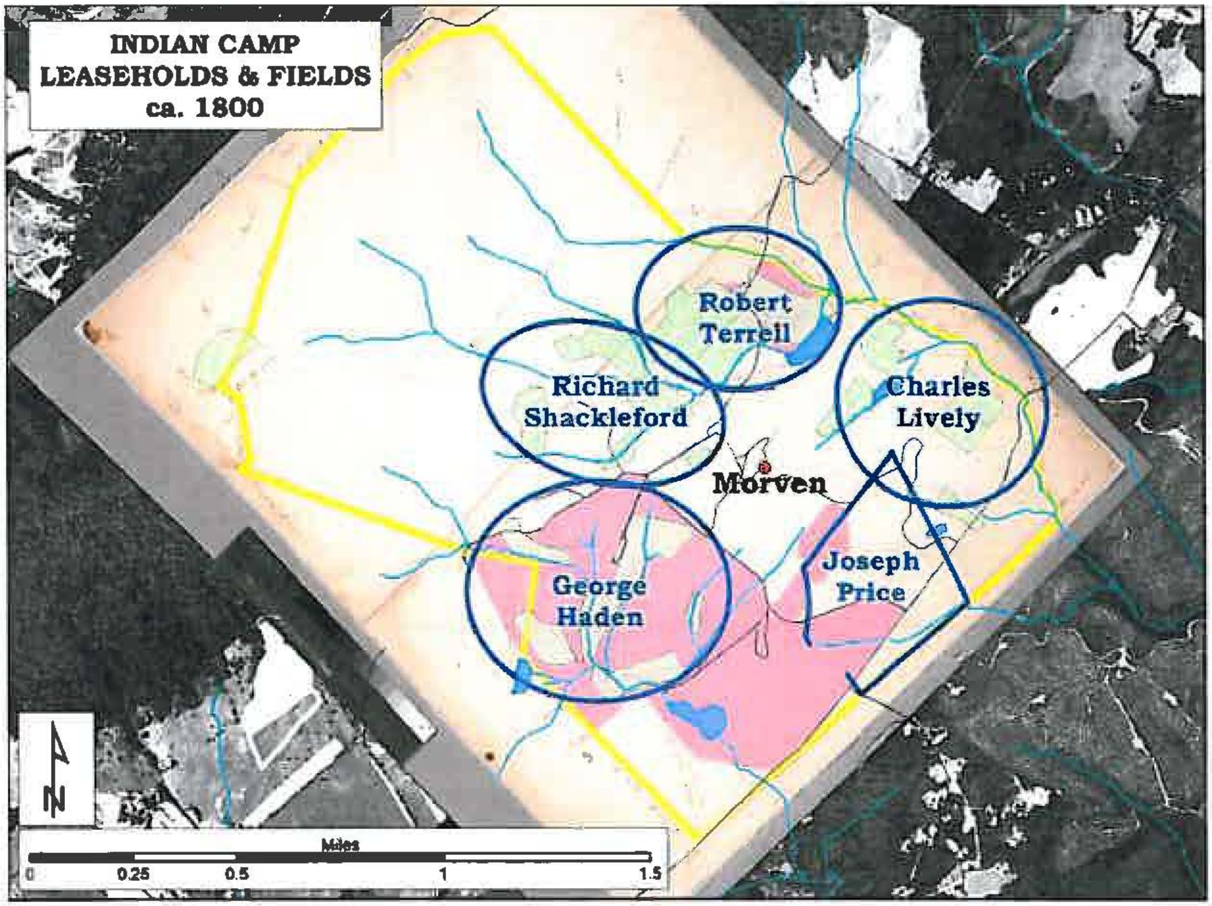
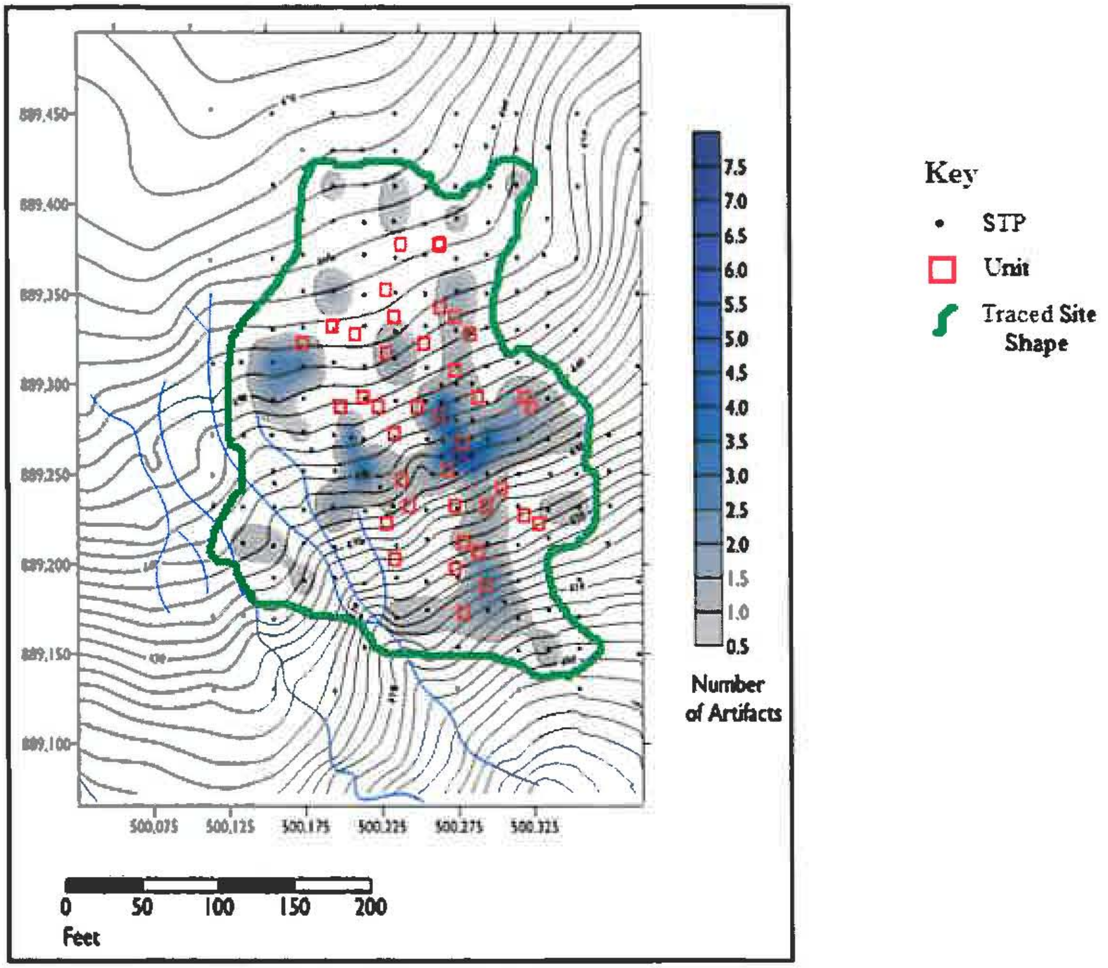


Image Source: UVA Foundation http://www.uvafoundation.com/uploads/pages/images/Findings.pdf Accessed on: 3/19/11

Appendix G- Example of Site Shape—Site 17 at Monticello



Appendix H

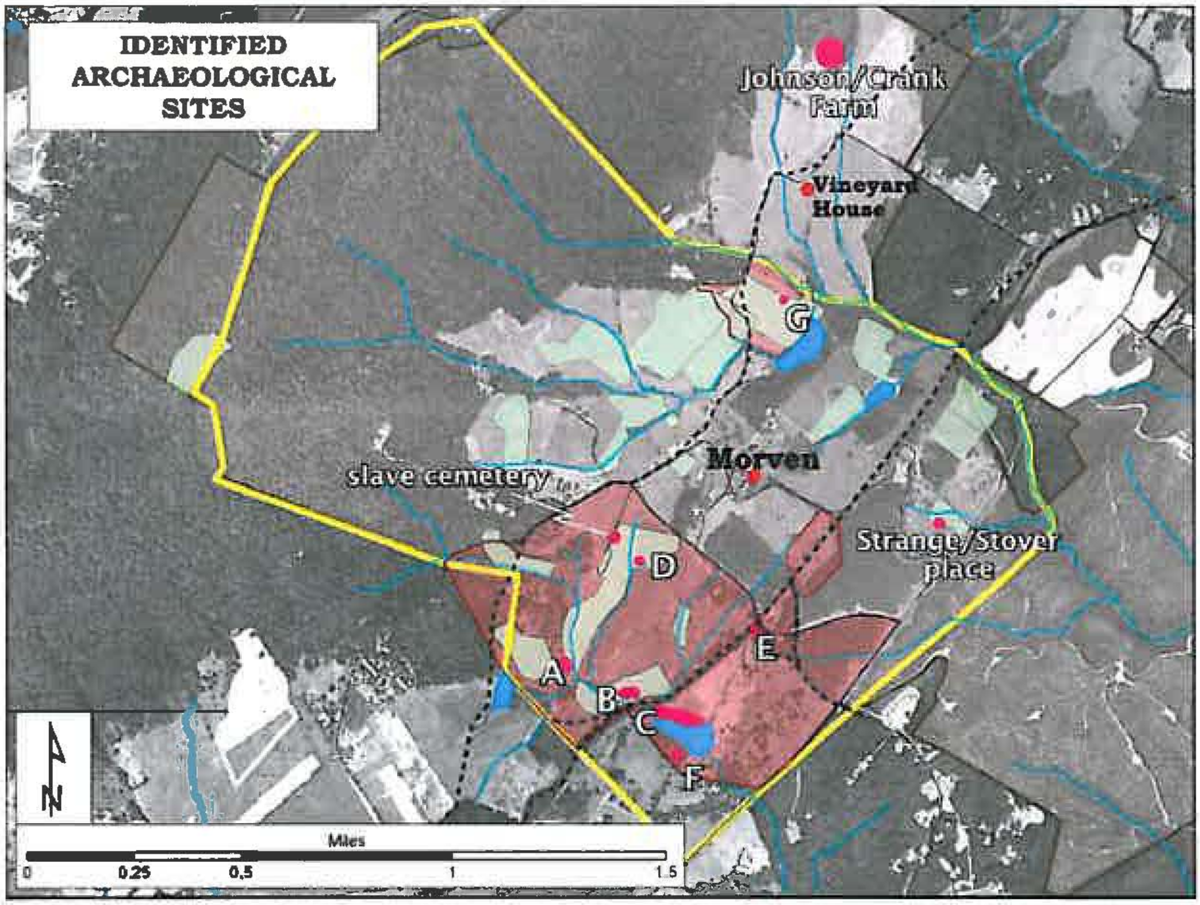


Image Source: UVA Foundation http://www.uvafoundation.com/uploads/pages/images/Findings .pdf Accessed on: 3/19/11

Appendix I- Prehistoric Sites along Indian Camp Creek

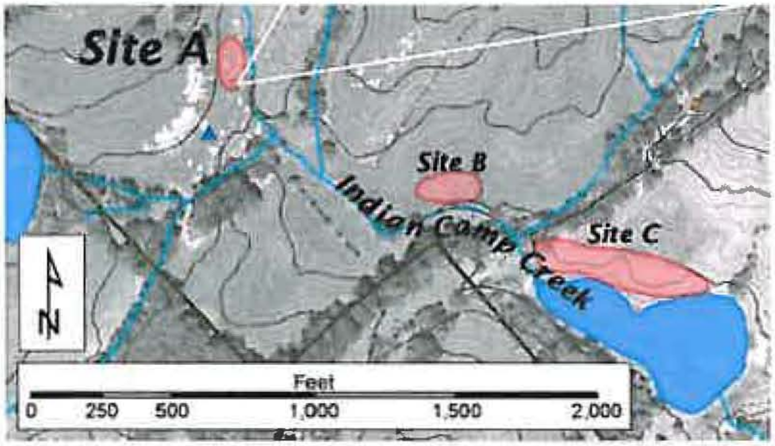


Image Source: UVA Foundation http://www.uvafoundation.com/uploads/pages/images/Findings.pdf Accessed on: 3/19/11

Appendix J- Ceramic Sherd Found at Site A

Image Source: UVA Foundation http://www.uvafoundation.com/uploads/pages/images/Findings.pdf Accessed on: 3/19/11

Appendix K

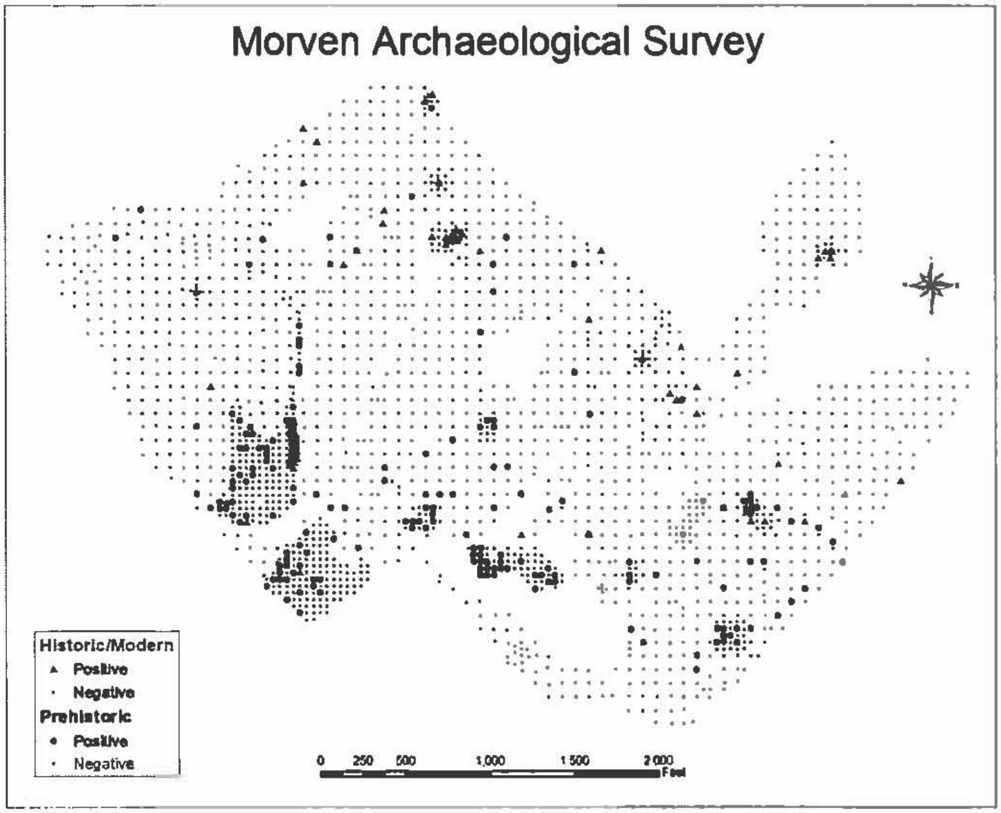


Image Source: The Thomas Jefferson Foundation

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