EXPLORING LAND USAGE AT TANNEHILL STATE PARK:
GIVING ARTIFACTS A CONTEXT THROUGH
WATERSHED MAPPING

by

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ABSTRACT

Archaeologists have identified dozens of sites across the landscape of Tannehill Ironworks Historical State Park, but few are thoroughly investigated, leaving a gap in current understanding of settlement patterns and land usage in prehistoric times. This project uses existing site information in conjunction with GIS processing to help expand knowledge of land use and site locations at the park. Digital elevation models are used to map watershed in the region with the goal of locating the original context of sites found in a secondary context. GIS hydrography tools make it possible to generate a detailed watershed map that shows exactly how water, as well as artifacts, move across the landscape. By mapping the distance, direction, and greatest accumulation of water flow, the potential original locations of artifacts should be detectable. This methodology shows great promise in early testing. This model can be adapted to be applicable in stream and river environments across the Southeast. Artifacts and collections found out of context in these environments can be traced back to possible origin sites. It holds the promise to greatly enhance our understanding of long term landscape usage, as well as human adaption within the landscape.
DEDICATION

This thesis is dedicated to everyone who helped and guided me through the seemingly endless days of GIS processing and nights of writing. In particular, my lovely wife, Amanda, without whom I would have floundered, and to my parents, Mark and Cyndi, who have supported and encouraged me since day one.
LIST OF ABBREVIATIONS AND SYMBOLS

NED   National Elevation Model

GIS   Geographic Information System
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CHAPTER 1
INTRODUCTION

Most prehistoric sites in the Southeast are discovered in the course of cultural resource management (CRM) projects. This, combined with detailed archaeological analysis of major sites, has contributed to synthesized reports of prehistoric land usage across the region (see Anderson 1995; Futato 1996; Sassaman and Anderson 2012). However, there are still vast tracks of land for which virtually no information is available (Anderson 1995). This greatly diminishes current understanding of prehistoric life in the Southeast, limiting what can be inferred about prehistoric life ways. Considering that prehistoric sites are often represented by only a handful of artifacts, this paucity of information is especially damaging.

Tannehill State Park is one such example. Almost all of the research into the area has revolved around historic sites, with little attention paid to prehistoric occupation. The mining and forging operations for which the park is known date from 1830 to 1865 A.D. The various forges, mining tunnels, and living quarters of slaves and other workers from this period gain the most attention (Jones et al. 1991; D. Lewis 1994; H. Lewis 2013). However, many significant prehistoric sites are present at the park, many of which are identified as surface collections found along the banks of the park’s creeks (Hannah 1995; Hatcher 1979). Surface collections have long served as a significant indicator to archaeologists of where to dig, providing clues as to what might lie beneath the surface (Redman 1987; Redman and Watson 1970). However, often these artifacts are discovered in a disturbed state, with little to no contextual evidence. Mining,
farming, and logging in historic times disturbed many of these sites (Hannah 1995), but many were also washed away from their original location by water runoff and soil erosion. Much of the contextual information that could be gained from these artifacts is lost due to this disturbance. This project seeks to develop a method to trace collections found in secondary contexts back to their potential sites of origin using watershed mapping, thus tracking how water washes artifacts from their original location. Such a model will serve to greatly enhance current understanding of prehistoric occupation of areas like Tannehill.

Tannehill Historical State Park (Figure 1) sprawls over 15,000 acres in Alabama, bridging Jefferson, Tuscaloosa, and Bibb counties. Although the park is best known for the ironworks, slave quarters, and other antebellum ruins (Bennett 1986, 2010, 2011; Jones et al. 1991; Lewis 1994; Lewis 2013), it holds prehistoric sites as well, ranging from ca. 9400 B.C. to 1600 A.D. (tannehill.org 2014). This comes as little surprise considering the land offers a wide variety of resources. Several creeks converge in the area, of which Mill Creek (second order), Mud Creek (third order), and Cooley Creek (second order) are the most significant. These creeks offer a dependable and abundant source of fresh water, fish, and freshwater shellfish. The surrounding forests are lush, offering a variety of edible plants, including acorns and hickory nuts. Deer, squirrel, and other small game are abundant across the landscape as well. In addition to the plentiful sources of food and water, high quality chert and other stone suitable for lithic production are readily available at several locations across park lands, a resource that often served as a central focus of land usage and settlements throughout prehistory (Daniel 2001).
Surface finds of lithics, potsherds, and other cultural remains are not uncommon at Tannehill. Even extensive surface collections, consisting of dozens or hundreds of artifacts, are not unheard of. Two such sites, Josselyn Site 2G and Josselyn Site 2GA, yielded this type of large surface collection. They are housed in the University of Alabama at Birmingham Archaeological Collection. The avocational archaeologist Dan W. Josselyn collected Josselyn Sites 2G and 2GA in the 1940s. Josselyn found the two sites as surface collections at Tannehill State Park near the convergence of Mill Creek and Cooley Creek (Hatcher 1979: 12-13). The two sites yielded a combined 325 projectile points and projectile point fragments, in addition to a considerable amount of pottery and debitage, and a small sample of hammerstones and grinding stones.
(Hatcher 1979: 12-13). The approximate location of these sites is shown on a topographic map of the area in Figure 2. Although the artifacts from these sites have been a part of the collection since it was donated to UAB, like much of the collection the items were not officially accessioned until 2014. The sites also do not yet appear in the Alabama State Site File. The artifacts from both sites are mixed together in the same boxes, with the same location and provenience information left for both. This occurred before the artifacts were acquired by UAB, making the reason for the admixture unclear. Beyond this it is unknown if Josselyn 2GA is a completely separate site from Josselyn 2G, or a subsection of the same site. Lithics indicative of the Archaic (11,500-3200 B.P.), Middle Archaic (8900-5800 B.P.), Late Archaic (5800-3200 B.P.) and Woodland Periods (3200-1000 B.P.) are present in both sites (Anderson and Sassaman 2012; Cambron et al. 1964; Hatcher 1979; Lewis and Kneberg 1995; Sturtevant and Fogelson 2004). The size and variety of the collection indicate a steady, if not heavy, use of the landscape through a significant amount of time.

![Figure 2. Topographic Map of Tannehill State Park with approximate location of Josselyn Sites 2G and 2GA marked in red. Map downloaded from the USGS National Map Viewer.](image-url)
Archaeologists have conducted a number of shovel tests along Mill Creek and around Josselyn Sites 2G and 2GA, but recovered nothing (Daniel Lowery, personal communication 2013). The reports of this testing remain unpublished and largely unavailable. This begs the question of how many other surveys remain unreported as well. It also highlights a major sampling problem facing archaeologists working in such areas. With no clear idea of where to test, a survey’s chances of success are virtually null. These results may only indicate that the archaeologist is digging in the wrong place rather than an absence of artifacts.

There are multiple processes that could lead to the disturbance of sites across the park. Logging, Antebellum mining and development, and farming activities all contribute to soil disturbance in the area. The artifacts in these two collections could have been revealed as soil eroded, baring the remains of shallow encampments or secondary refuse deposits. However, these sites sit on a sloped landscape that is far from ideal for a campsite. Furthermore, the extensive time frame and artifact variety points to more than a just temporary occupation. Collection heterogeneity in a sloped environment is often indicative of artifact wash (Rick 1976). Though many of the lithic tools from this collection were damaged and could have been discarded, this wide timeframe also means that these sites are unlikely to have been the result of secondary refuse deposits due to the wide variability of its contents (Wilson 1994). This points to the artifacts originating from another location. This is hardly surprising, as erosion from natural water runoff, farming, and logging over the centuries have left much of the uppermost portions of the nearby landscape in a disturbed state. Finding the original context of such an extensive collection holds the promise of greatly increasing the currently vague knowledge of land usage.
and settlement of Tannehill in prehistoric times. Finding these locations could provide major clues as to where similar sites at the park might be located.
CHAPTER 2
BACKGROUND

Virtually nothing is known of site usage, seasonality, or duration of prehistoric settlements at Tannehill. With so little information available for this area, any method of locating sites would be extremely beneficial. No published literature is available for prehistoric sites; all materials thus far revolve around the Antebellum industrial complex (Jones et al. 1991; D. Lewis 1994; H. Lewis 2013). A small grey literature exists, but even this is lacking, with only a handful of sources available. The reason for this is at least partially due to difficulty of finding prehistoric sites in much of the Southeast. However, information garnered from elsewhere in the region serves to illustrate the potential for prehistoric sites at Tannehill. A brief overview of the relevant time periods is necessary to understand their implications for this area.

The Archaic Period (11,500-3200 B.P.)

The Archaic covers a vast stretch of Native American history in the Southeast, lasting more than eight thousand years. Stemming from the early work of Caldwell (1958), the Archaic is traditionally considered a transitional period between the initial colonization of the Americas and the later Woodland and Mississippian Periods, characterized by greater levels of social complexity and larger populations. A flurry of recent developments in the archaeology of the period suggests a much more dynamic point in history than previously imagined. Rapid environmental change marked the period, with significant changes in climate at times occurring
within a human lifespan. Changing coastal environments, the maturation of Eastern Woodland environments, and dramatic shifts in temperature and precipitation all contribute to adaptations in settlement and landscape use during this time (see: Brooks et al. 2010; Chidester 2011; Gibson 2010; Kidder 2010). These changes unsurprisingly resulted in the progressive trend toward the development of ever more efficient technology and means of exploiting an increasingly diverse ecosystem. In fact, many hallmarks of complexity that become prominent in the later Woodland Period have roots in the Archaic. Alliance and exchange networks, monumental earthwork construction, sophisticated mortuary practices, and shifts to more modern subsistence practices are all found in the Archaic (Anderson and Sassaman 2012: 66-71). The Archaic is divided into three sub-periods based on changes in subsistence technology, environment, and demography.

*Early Archaic (11,500- 8900 B.P.)*

The onset of the Holocene Epoch marks the start of the Early Archaic Period. The sharp rise of global temperatures typical of the Holocene triggered a rapid change in regional ecosystems. Hardwood forests spread through much of the Southeast, where they had previously been confined to the lower reaches of the region. Oak and hickory trees constituted the bulk of these forests, creating a valuable new source of food in the region for both humans and fauna. The increased abundance of these forests served to increase their importance in the patterns of land use by Archaic peoples. This resulted in a sharp uptake in the usage of forest regions from that of the previous Paleoindian Period (Janetski et al. 2012). Large numbers of sites and artifacts evidence a relatively dense human population, at least compared to the previous Paleoindian occupation (Futato 1996).
The lithic technology of the time still shows evidence of continuity from Paleoindian tradition, with many point types, such as Dalton, remaining in use. Despite some continuation of style, new forms developed to exploit newly diversifying faunal resources more efficiently (McElrath et al. 2009). As megafauna disappeared from the landscape, deer and other small game became the prey of choice for Archaic hunters, creating the need for new tool forms. Projectile point form shifted from lanceolate to serrated and notched types at this time. Side notched points, like Decatur, emerged as early as 11,800 B.P. in Alabama. Corner notched types, such as Kirk and Pine Tree, became pervasive by 10,800 B.P. Bifurcated points, like Jude followed quickly at around 10,000 B.P. In addition to changes in form, tools also began to be made from more local materials, with less reliance on the heavily curated, formalized toolkits of earlier peoples. Rising populations began to limit the mobile range of bands, forcing them to orient around local environments, like that of Tannehill, rich in game, raw stone sources, and water (Anderson and Sassaman 2012: 71-74). Additionally, this period saw the advent of new tool types. A range of ground stone tools, such as nutting stones, came into use for processing mast (Janetski et al. 2012).

*Middle Archaic (8900-5800 B.P.)*

The Middle Archaic Period is characterized by great change in human lifeways. Wildly varying climactic conditions, new technological innovations, decreasing mobility, increasing social alliances, and increasingly elaborate burial rites all serve as hallmarks of the time (Jefferies 2009; Lowery and Martin 2009). The Mid-Holocene climate of the time resulted in seasonal extremes in temperature and precipitation than today. Overall hotter, drier climates led to the reduction of vegetation and increase in erosion in many areas, causing changes in greater subsistence and settlement patterns. Settlement and land usage focused more on marine
environments where more reliable food sources could be found (Anderson 1996: 162-165). Riverine and wetland environments remained much more resource rich than the highlands, which suffered from significant reduction in vegetation, drying of lakes and ponds, and increased erosion (Brooks et al. 2010).

Subsistence strategies increasingly changed as people adapted to new environmental conditions (Carmody 2009). Mast (hickory nuts, acorns, walnuts, etc.) formed a major part of the diet during the Middle Archaic (Gremillion 1996: 102-103). These formed dependable sources of carbohydrates and plant fats that could reliably be found year after year and could be stored for use in leaner times. This time also saw a rise in the exploitation of riverine fauna. Fish and shellfish, both of which are abundant in the creeks at Tannehill, formed an increasingly important place in the diet of the time. The climate and floodplain productivity promoted shellfish growth, making them an especially valuable resource (Anderson and Sassaman 2012: 73-74). Evidence from across the Southeast from this period also sees a significant shift away from the exploitation of small mammals like squirrel to an increasing reliance on white tail deer (Styles and Klippel 1996: 118).

Changes in subsistence brought with it new developments in technology. Prominent among these changes is the introduction of stemmed biface technology, such as Morrow Mountain, Guilford, White Springs, and Benton types (Anderson and Sassaman 2012: 73-74). The Middle Archaic also saw a greater dependence on local material rather than far flung sources of high quality stone. Expedient technology, meant to fill the need at hand became much more common than the heavily curated toolkits of earlier periods. This often included scavenging Early Archaic tools when they were found (Amick and Carr 1996). Rarely were tools curated (MacDonald 2009). As a whole, this evidence indicates a much greater restriction of territory than in previous
periods. This is likely the result of a surge of new people into the favorable areas caused by the attendant demographic shifts of the Mid–Holocene climate change. At the same time as territorial ranges decreased, settlements became much more sedentary. Relatively reliable, immobile food sources in the form of mast and shellfish created the conditions necessary to allow people to settle into seasonally mobile settlements rather than the highly mobile hunting bands of earlier times (Krakker 2012).

Little evidence of structure and site use exists for the Middle Archaic, limiting how much is known about settlement patterns of the time. Due to the more restricted tracts of land capable of supporting human settlement, and complicated by minimal site visibility, far fewer Middle Archaic sites are known than either Early or Late Archaic. Evidence of relatively permanent structures dates back to at least seven thousand years ago (Krakker 2012), in addition to a wide variety of temporary structures (Sassaman and Ledbetter 1996). There is great variation in structure type and site usage, with structures ranging from large, relatively permanent buildings evidenced by multiple post holes and hearths, to small temporary huts whose only evidence may be a ring of stones used to hold down hide walls (Sassaman and Ledbetter 1996). The variety in site types indicates seasonal movement across the landscape to exploit resources. Light, simple structures could be used for camps in the summer months, and more durable structures for winter encampments.

The most dramatic development of Middle Archaic is the advent of mound centers. Large mounds of freshwater shellfish were piled along the rivers of the Midsouth and Florida. Earthen mounds were raised throughout the Lower Mississippi Valley, Tennessee Valley, and northeast Florida. Such sites were widely varied, ranging from a single mound to a complex of 11 mounds complete with earthen rings at Watson Brake in Louisiana. The mounds themselves are typically
1 to 1.75 meters high, and either conical or dome shaped (Saunders 2010). Many of these centers seem to have served as the focus of semi-permanent residential contexts, with evidence of almost year-round occupation. The artifact assemblages from these contexts mirror that of more common settlements (Peacock et al. 2010; Saunders 2010). Others were abandoned rather quickly, likely serving to monumentalize an important event or location (Anderson and Sassaman 2012: 73-74). Some were also utilized in cycles, being built, abandoned, and reoccupied over time (Schwarden 2010).

Along with the beginnings of mound complexes, the Middle Archaic saw the development of increasingly complex social organization. Though local material remained the primary source of goods, far reaching trade networks developed in many parts of the Southeast. Ritual goods, such as bannerstones developed alongside advances in more practical tool forms. Evidence of warfare and violence rises sharply (Anderson and Sassaman 2012: 73-74). Taken together with the level of organization needed for monumental construction, the Middle Archaic holds much evidence of increasing social complexity and scale than any previous time in the history of the Southeast.

*Late Archaic (5800-3200 B.P.)*

With the onset of primarily modern climactic conditions came the onset of the Late Archaic. Population densities increased sharply during this time, with up to a 40 percent increase in sites reported over that of the Middle Archaic (Anderson and Sassaman 2012: 74-110). Unlike previous periods, no major gaps in geographic occupation are evidenced in this period. Resource rich wetland environments remained valued stretches of real estate, with these environments becoming even more heavily exploited than in the previous Middle Archaic. Evidence of coastal settlements rises sharply after 4200 B.P., where shell mounds and shell rings were found in
abundance (Thompson and Worth 2011). Due to more favorable environmental conditions, the uplands were also settled once more (Anderson and Sassaman 2012: 74-110).

New variations of lithic technology in the Late Archaic include a shift to the use of points with broad blades and large, robust stems, Savannah River and Ledbetter Stemmed types being prominent among them. The increased moisture of the climate meant many resources became more dependable, meaning settlements could be much more stable. Reliance on seed and mast increased. Pottery became the newest addition to inventories of Late Archaic people around 5000 B.P. as a means to store these resources in a more reliable fashion. To this end, groundstone mortars and pestles, fire cracked rock, and clay vessels and storage pits all serve as evidence for the increased reliance on seeds and nuts, with hickory and acorn prominent parts of the diet. This is at least partly due to the more sedentary lifeway making these resources more easily stored and processed over the winter months (Anderson and Sassaman 2012: 74-110). Many Late Archaic structure types are similar to those of the preceding period, especially light summer dwellings. However, many Late Archaic settlements were relatively permanent, or at least seasonally reoccupied. Deep middens, prepared clay floors, post holes, and hearths full of multiple layers of charcoal and ash all evidence this occupational pattern (Sassaman and Ledbetter 1996).

Woodland (3200-1000 B.P.)

The Woodland Period evolved from the Late Archaic trend of population growth and increased sedentary settlement. Many more sites from this period have been identified than from any previous period (Anderson and Mainfort 2002). Cultures across the Southeast became more firmly ensconced within their own territorial boundaries, developing into distinct regional traditions. The Southeastern edition of the Handbook of North American Indians (Fogelson
2004) divides the Southeastern Woodland into seven distinct cultural sub-regions, divided largely along geographic boundaries and marked by differences in ceramic traditions: The Gulf Coastal Plain, Florida, the south Atlantic coast, The Lower Mississippi Valley, the Central Mississippi Valley, the eastern interior, and the western interior. Little evidence exists for institutions that might have united diverse groups through shared tradition or ritual. However, these communities intermittently shifted to periods of pan regional ceremonial practice and trade, of which Hopewell is the most prominent (Anderson and Sassaman 2012: 112-128). Some trends, largely rooted in the Archaic, are common throughout the Woodland Southeast, including increasingly sedentary groups and a continued expansion of burial mounds complexes and mortuary ceremonialism (Jefferies 2004).

The onset of the Woodland is also marked by an even greater reliance on seed and nut resources, and with it the widespread adoption of pottery (Jefferies 2004). This pottery developed into an astounding array of local traditions, with different styles, decorations, surface treatments, and pastes being employed. In fact, more research is focused on deciphering these attributes than is given to any other facet of Woodland culture. Through all of this the Woodland saw a dramatic change in social structure. At the beginning of the period people lived in small, relatively egalitarian groups based around hunting and foraging strategies. By the end many people clustered in densely packed ceremonial centers dependent on farming maize, and presided over by hereditary elites (Anderson and Mainfort 2002).

Early Woodland (1200-100 B.C.)

Diminished site visibility is endemic of the Early Woodland, with land use and settlement practices being obscured by high community mobility and reduction of midden accumulation
from the Late Archaic (Sassaman and Anderson 2012: 115). The widespread adoption of ceramic pottery is the most prominent marker of these sites, with distinct regional variations of surface treatments and style marking different traditions. In fact, in many cases the prevalence of pottery from the time is the only feature that distinguishes Early Woodland sites from those of the previous Late Archaic. Distinct ceramic styles begin to appear at this time, with at least four distinct traditions identified: the Gulf Coastal Plain, the interior Midsouth, and the Middle Atlantic. These are presumed to be indicative of culture groups within the areas (Anderson and Mainfort 2002).

Gardening of seed plants, such as squash, goosefoot, sumpweed, sunflower, knotweed, and maygrass came into widespread use during the Early Woodland throughout much of the interior Southeast. However, in areas of abundant resources (i.e. the Lower Mississippi Valley and southern Florida) the exploitation of wild game and plants remained the primary means of subsistence (Anderson and Mainfort 2002; Kidder 2002; Widmer 2002).

Tools made of non-local chert, which became common throughout the Southeastern Late Archaic, were rare in the Early Woodland (Anderson and Mainfort 2002). However, lithic styles often do not vary greatly from the Late Archaic predecessors. For example, the projectile points of the Tchula Period of the Lower Mississippi Valley differ little from those produced by the Poverty Point Culture (Kidder 2002).

Most site information for the time comes from surface collections (Anderson and Mainfort 2002). Due to this little is known of Early Woodland settlements except that they are diverse and typically small, with most sites consisting of only a handful of structures holding no more than fifty or sixty people (Anderson and Sassaman 2012: 112-121; Anderson and Mainfort
2002). However, some large sites do exist, such as those reported in Western Tennessee. Known settlements range from seasonal camps with less than a dozen structures to large, year round encampments with well-defined structures, large subterranean storage pits, and dense middens (Anderson and Mainfort 2002). Some sites, like Aaron Shelter, held large numbers of features, including storage pits, shallow basins, postholes, and multiple burials. The number and spread of these features are indicative of frequent reoccupation by larger groups (Faulkner 2002).

*Middle Woodland (100 B.C.- A.D. 500)*

The distinct regional traditions that began to form in the Early Woodland persisted into the Middle Woodland with some modification. Pottery remains the most prominent marker of sites in this period. Despite a dramatic increase in the construction of ceremonial mound centers, settlement patterns remained much the same as during the Early Woodland (Anderson and Mainfort 2002). Settlements consisted primarily of small, dispersed villages that likely moved frequently, though these began to consolidate and grow quickly toward the end of the period (Anderson and Sassaman 2012: 121-126). Agricultural practices intensified, with increased reliance on crops, clearing of land, and production of specialized vessels and storage pits (Anderson and Mainfort 2002).

Unlike the Early Woodland, this period has significant evidence of widespread interaction in the form of shared burial mound, iconography, and mortuary good practices. Ceremonial centers, both large and small, based around platform mounds and burial complexes emerged and declined across the eastern United States during the Middle Woodland. Some could be several hundred acres in size; others consisting of only a single mound. The success of such centers appears to be tied to patterns of trade. These sites seem to have been the center of
communal ceremony and gatherings rather than the focal point of residence (e.g. Clay 2002; Anderson and Mainfort 2002). Attesting to the ceremonial function and regional connectedness of these centers is the appearance of Hopewellian ritual goods, such as copper and ceramic earspools, flint blades, shell and pearl beads, and exotic stones in mound contexts across the Southeast (Kidder 2002; Anderson and Sassaman 2012: 122). The presence of such exotic goods in select burials also serves to hint at the formation of early roles of leadership within social organizations. No evidence exists for hereditary power, so these rules likely earned their roles through personal accomplishment and charismatic manipulation of followers (Anderson and Mainfort 2002).

The expansion of regional trade relations also resulted in an increase of non-local lithics being present in the archaeological record. Most exotic goods are linked to the Hopewellian ritual sphere, with a few blades and groundstone tools also being imported. However, the majority of tools continue to be flaked from local chert. A clear continuation from earlier periods remains in place, with stemmed dart points dominating most lithic assemblages (Kidder 2002; Rafferty 2002).

*Late Woodland (A.D. 500-1000)*

The Late Woodland is a time of great cultural change. Unlike previous periods populations boomed, with communities growing much larger, and becoming plentiful and widespread (Anderson and Mainfort 2002). Some of the first solid evidence of hereditary leadership comes from the Coles Creek Culture of Late Woodland (ca. 700 to 900). Large civic ceremonial centers, made up of formalized residential and temple mounds surrounding a plaza, first arose in this period (Anderson and Mainfort 2002). These sites served as permanent
communities ruled over by hereditary elites and supporters. The growing populations resulted in greater pressure on resources, helping the rise of agriculture. The first widespread cultivation and reliance on maize in the Southeast arose in this period (Anderson and Sassaman 2012: 121-126).

Along with this shift in settlement and subsistence came the almost simultaneous, continent-wide introduction of the bow and arrow. Bifacially flaked corner-notched, side notched, and stemmed arrow points enter the archaeological record in the Late Woodland as early as 700 A.D. (e.g. Blitz and Porth 2013; Rolingson 2002; Kidder 2002; Rafferty 2002), with widespread adoption by 900 AD. This weapon allowed for dramatically increased efficiency in both hunting and warfare (Bingham et al. 2013). Examples of violence and competition became much more common in the Late Woodland, appearing in the analysis of human skeletal remains (Anderson and Mainfort 2002; Rafferty 2002). In such an environment the advent of the bow served as a means for groups to defend themselves or to eliminate competitors. Furthermore, such an environment acts to cement social cohesion as groups seek to maintain order in the face of newly risen adversity. The result is a higher level of complexity than previously seen in most of the Southeast (Bingham et al. 2013).

Josselyn Site 2G and Josselyn Site 2GA

“A Preliminary Classification and Cataloguing of the Dan W. Josselyn Archaeological Collections” catalogues all contents of the two sites (Hatcher 1979). Josselyn Site 2G consists of 243 lithic artifacts, including three flake unifaces, one flaked bifaces, 56 stemmed projectile points, 11 stemless projectile points, 12 reworked projectile points, 77 projectile point fragments, 27 preforms, two drills, two drill fragments, one microspike, one bipointed biface, 31 biface fragments. Additionally 11 hammerstones, one nutting stone, and 7 milling stones, and dozens of pieces ofdebitage and pottery make up the site (Hatcher 1979: 12). Josselyn 2GA is made up of
82 lithics, including 12 lithic flakes, three flake unifaces, one flake biface, 18 stemmed projectile points, four stemless projectile points, 23 projectile point fragments, 10 biface fragments, and 11 preforms (Hatcher 1979: 13). Table 1 displays all known typed projectile points from both sites, and Figure 3 shows a sampling of these.

Figure 3 Left: a selection of projectile points from Joselyn Site 2G, Right Top: two examples of reworked lithics from Joselyn Site 2G, Right Bottom: a selection of projectile points from Joselyn Site 2GA. Photography courtesy of Virginia Lucas.
<table>
<thead>
<tr>
<th>Type</th>
<th>Qty.</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benton</td>
<td>3</td>
<td>Middle Archaic</td>
</tr>
<tr>
<td>Bradley Spike</td>
<td>2</td>
<td>Late Archaic to Early Woodland</td>
</tr>
<tr>
<td>Coosa</td>
<td>6</td>
<td>Woodland</td>
</tr>
<tr>
<td>Decatur</td>
<td>1</td>
<td>Early Archaic</td>
</tr>
<tr>
<td>Elora</td>
<td>1</td>
<td>Late Archaic to Early Woodland</td>
</tr>
<tr>
<td>Flint Creek</td>
<td>11</td>
<td>Late Archaic to Early Woodland</td>
</tr>
<tr>
<td>Flint River Spike</td>
<td>2</td>
<td>Middle Woodland to Late Woodland</td>
</tr>
<tr>
<td>Greenville</td>
<td>1</td>
<td>Woodland</td>
</tr>
<tr>
<td>Guilford</td>
<td>1</td>
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</tr>
<tr>
<td>Jack’s Reef</td>
<td>1</td>
<td>Late Woodland</td>
</tr>
<tr>
<td>Jude</td>
<td>1</td>
<td>Early Archaic</td>
</tr>
<tr>
<td>Kirk Serrated</td>
<td>1</td>
<td>Early Archaic to Middle Archaic</td>
</tr>
<tr>
<td>Maples</td>
<td>1</td>
<td>Middle Archaic to Late Archaic</td>
</tr>
<tr>
<td>Morrow Mountain</td>
<td>4</td>
<td>Middle Archaic</td>
</tr>
<tr>
<td>Mud Creek</td>
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<td>Mulberry Creek</td>
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<td>Middle Archaic to Late Archaic</td>
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<tr>
<td>Pickwick</td>
<td>2</td>
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</tr>
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<td>Pine Tree</td>
<td>3</td>
<td>Early Archaic</td>
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<tr>
<td>Savannah River</td>
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<td>Middle Archaic to Woodland</td>
</tr>
<tr>
<td>Snyder’s</td>
<td>2</td>
<td>Woodland</td>
</tr>
<tr>
<td>Swan Lake</td>
<td>2</td>
<td>Late Archaic to Early Woodland</td>
</tr>
<tr>
<td>White Springs</td>
<td>2</td>
<td>Middle Archaic</td>
</tr>
</tbody>
</table>
Table 2: Typed Projectile Points from Josselyn Sites 2GA

<table>
<thead>
<tr>
<th>Type</th>
<th>Qty.</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>Kirk Serrated</td>
<td>1</td>
<td>Early Archaic to Middle Archaic</td>
</tr>
<tr>
<td>Ledbetter</td>
<td>1</td>
<td>Late Archaic to Early Woodland</td>
</tr>
<tr>
<td>White Springs</td>
<td>1</td>
<td>Middle Archaic</td>
</tr>
</tbody>
</table>

*Other Known Prehistoric Sites*

Like Josselyn 2G and 2GA, the majority of prehistoric artifacts collected at Tannehill belong to sites with no entry in the Alabama State Site File, and no published records of their existence. This makes it difficult to establish a clear picture of how many prehistoric sites are located in the area, and how they may be related to one another. Three sites, shown in Figure 4, are identified in the State Site File near Josselyn 2G and 2GA. Jack Bergstresser and Steven Meredith discovered the first, 1Je845, by shovel testing along Mill Creek. Three tests encountered artifacts between the surface and a depth of 20 to 35 cm. The shovel tests recovered debitage and prehistoric pottery of unknown type (Alabama State Site File 2009). The second site, 1Je846, was also discovered by Bergstresser and Meredith through shovel testing. It was found on a gradual slope between Mill Creek and the slope of Red Mountain. Three shovel tests returned artifacts from between the surface and a depth of 10 cm deep. These also contained debitage (Alabama State Site File 2009). The last site, 1Tu752, was discovered by Ted Hannah during the course of a cultural resource management project. Only one test was positive, containing four chert flakes. Hannah (1995) noted that the disturbed state of the soil due to erosion and the removal of soil during logging.
Figure 4: Known prehistoric sites at Tannehill State Park.
CHAPTER 3

METHODS

Geographic Information Systems (GIS) programs offer a potential solution to the problem of soil and water, and the resulting artifact, movement across a landscape like that of Tannehill. While historic farming, logging, and mining activities loosened and disturbed the soil in many parts of the park, water runoff remains the primary cause of erosion, especially along the high ridges buffering many of the area’s creeks. GIS programs offer a wide variety of hydrological tools to aid in tracking the movement of water across a landscape, provided adequate elevation models are available. Theoretically, artifact movement should mirror the movement of water, as they are washed along with the soil in runoff. By utilizing the proper tools in a GIS program, it is possible to follow water runoff, essentially backtracking artifacts found in surface collections in riverine environments to a likely origin site. While it would be virtually impossible to pinpoint an exact location with this method, it should be possible to give a relatively small area of possible origin. Ground survey and shovel testing can then be used to confirm the results. This project utilizes GIS to trace artifacts found in a disturbed surface collection back to a point of possible origin through watershed mapping.

This project uses Arcmap 10.0, as it offers a full range of hydrology tools as part of the Spatial Analyst Toolset (ArcGIS 2014). The elevation model used in this project is a 10 m resolution National Elevation Model (NED) from the United States Geological Survey (2014). This is the highest resolution elevation model currently available for the area, and is of sufficient resolution to allow for accurate processing of water runoff. Figure 5 shows the base NED used in
this project. Three processes are of particular use for this purpose: flow accumulation, flow direction, and flow length.

GIS Processing

The first step in processing is to load the NED (Figure 5) into ArcMap, open a new map and then add a new layer. Load the NED into this layer. At this point the raw data must be prepared for processing. The base layer often contains elevation anomalies, called sinks. These are cells whose neighboring cells are of higher elevation. This means that water cannot flow out of these cells in the projection, creating flaws in later steps. Sinks may be natural parts of the landscape, but are more often simply cells in which data was improperly recorded. In either case filling the sinks creates a smoother dataset better suited to hydrology processing as sinks in the image distort actual water flow.

Figure 5. National Elevation Data for Tannehill State Park, Josselyn Site 2G marked in red.
The Fill tool in the hydrology toolset fills sinks by modifying the elevation to match that of the surrounding cells. Double click the Fill tool in the Hydrology Toolset found in the Spatial Analyst Toolbox. Load the base NED into the window that opens in the Input Surface Raster box, select a location and name for the new fill layer in the Output surface raster box, as seen in Figure 6.

![Figure 6. Fill Dialog Box.](image)

Leave the Z limit box blank. This box allows the user to limit the depth of sinks to be filled. For instance, setting a Z limit of 4m will prevent the tool from filling any sinks less than four deep. This allows the user to prevent the tool from filling natural sinks that must be factored into the study. However, there are no such sinks in the test area for this project, so this box should remain empty. Click OK to process the layer. Once Arcmap is finished processing, the layer will automatically be added as a new raster layer on top of the raw dataset. Turn off the NED base layer.
Flow Direction

The Flow Direction tool generates a raster layer from the elevation model that displays the direction of water flow from every cell in the image. Direction is calculated based on the steepest neighbor of each cell. As water follows the path of least resistance, the steepest slope marks the direction water will flow. Each cell has eight neighboring cells, meaning there are eight valid directions which may be displayed by this process, labeled 1, 2, 4, 8, 16, 32, 64, and 128 (ArcGIS 2014). Arcmap displays these by assigning each direction a color, with each cell that corresponds with that direction filled with this color. With each cell’s flow direction labeled and color coded it is possible to quickly see exactly which direction water will flow in any given part of the landscape. Given the theory that artifact movement will follow water flow, determining the direction in which water is moving should also display the direction of artifact movement.

To create this layer first double click the Flow Direction tool. Import the fill layer created in the previous step into the Input Surface Raster box in the Flow Direction window that appears (Figure 7). Select the location and name for the new layer in the Output Flow Direction Raster box. Click OK to begin processing. Once processing is complete, the new layer will be added as a raster dataset as in the previous step. Turn off the fill layer.

![Flow Direction Dialog Box](image)

*Figure 7. Flow Direction Dialog Box.*
It is recommended to reset the color of the layer. The automatic color scheme (Figure 8) chosen by Arcmap will be made up of eight completely different colors. This can cloud the image, increasing the difficulty of viewing the layer. A simpler color scheme of makes the image easier to decipher (Figures 9 and 10).

Figure 8. Flow Direction Default Layer.
**Flow Accumulation**

The Flow Accumulation tool uses the flow direction to measure the accumulated flow of every cell (ArcGIS 2014). As seen in Figure 11, this tool shows where water accumulates in the landscape, whether that be in a body of water, or just a significant dip in the landscape. The primary accumulation of water at Tannehill occurs in the various creeks of the park, which
become clearly defined with the use of this tool. To narrow down the visible accumulations to only that which might indicate water flow significant enough to move artifacts, the symbology must be edited in the Layer Properties window of Arcmap. The layer must be set to display only areas of high accumulation. I set the areas to be displayed as only those which had a flow of 5,000, meaning that it had 5,000 upstream cells contributing flow to it. Through experimentation, it was determined that any lower flow accumulation displayed features too small to have an impact on the study. The drains and small streams highlighted by any smaller value do not have the level of accumulation necessary to collect the level of water flow necessary to move artifacts.

To create this layer, first double click the Flow Accumulation tool. The flow direction raster serves as the basis for this process. Load the flow direction raster dataset into the Input Flow Direction Raster box (Figure 11), and then set the destination and file name for the flow accumulation rater in the Output Accumulation Raster box. Click OK to process.
The flow Accumulation will be added as a raster layer (Figure 12), but unlike the previous sets it cannot be properly viewed upon being added. The default setting displays the image on a black to white scale, with all values shown. On this scale any cell with a low accumulation will show as black. Because of this, the image will appear almost completely black.

![Figure 12. Flow Accumulation Default Appearance.](image)

Edit the symbology to properly display the layer. Right click on the layer, then select Layer Properties. In this window select the Symbology tab (Figure 13).
Click Classified in the menu on the left side of the window. Change the symbology to display only two classes (Figure 14).
Click the Classify button and then set the first break value as 5,000 (Figure 15).

![Classification Dialog Box](image)

*Figure 15. Classification Dialog Box.*

Finally, set the value cells in the range of 0-5,000 as no color, and apply an easily visible color for all cells above 5,000 (Figure 16). This will display only the areas of highest flow accumulation, the creeks in this instance. Setting low value cells to show no color means that this layer can then be displayed on top of any other to easily highlight high flow areas (Figure 17).
Figure 16. Layer Properties Dialog Box Final Settings.

Figure 17. Corrected Flow Accumulation Raster.
Flow Length

Flow Length measures the distance water will flow before it reaches its ultimate end point on the landscape (the place at which it will either accumulate or drain out of the area.) Like flow direction, this is rendered as a color coded raster data set, although flow length is determined using the flow direction raster layer as reference (ArcGIS 2014). The flow length may be set to display either downstream or upstream flow. For the purposes of this project the tool is set to display downstream flow. As with flow direction, determining how far water can possibly move across the land should also show how far artifacts can move.

Double click the Flow Length tool. Load the flow direction raster into the Input flow direction raster box (Figure 18). Select the output location and name. Ensure that the direction of measurement is set to downstream.

Click OK to process and the layer will be added to the map (Figure 19).
With the idea that artifact movement should mirror water movement, it should be possible to essentially trace surface collections backwards from where they have accumulated to a general area from which they likely originated. Unless otherwise disturbed, these artifacts should not have moved beyond the distance noted by the flow length. Likewise, it is highly unlikely that they would move in a direction other than that taken by water runoff, or the path of least resistance. With both the flow direction and flow length data sets layered, the colors overlap so that a pathway can be traced from the surface collection to a rough area of possible origin by matching the flow direction with maximum possible distance these artifacts could have moved along the tract. This layer (Figure 20) is created by setting a Flow Length layer on top of a Flow Direction layer, then setting the former to be partially transparent, allowing both layers to be seen at the same time.
With these factors considered, I flagged a three hectare plot of land as the likely origin site for Josselyn Sites 2G and 2GA. All three test areas are illustrated in Figure 21. The area is northeast of the site, located on the top of a nearby ridge. Water runoff from this area flowed directly to location of Josselyn Site 2G. Furthermore the flow length indicated that the location of Josselyn Site 2G was the furthest point of water flow for this runoff before water entered Mill Creek.

The second potential site was a two hectare plot of land on a creek bend. The third area was only seven tenths of a hectare, and like the first area is located on a high ridge overlooking the nearby creek. Both of these areas had sufficient height and water flow to be conducive to artifact movement.
Field Methods

Shovel testing was used to verify the accuracy of the generated model, with Area 1, which was linked to Josselyn 2G, of primary interest. One test was taken every 15 m within the test area. The soil from each test was screened through .25 inch mesh screen. While ideally the entirety of each area would have been tested, ground conditions did not allow for this. In Area 1 much of the area was blocked off by a fence placed across park lands. The fence was privately owned, and several deer stands were clearly visible on the western side of the fence, so this area, which included Josselyn Sites 2G and 2GA, was not tested. Only three transects of ten tests each were taken from this area due to this limitation. Of the 30 tests taken in Area 1, three held artifacts, as illustrated in Figure 22. Each was located within 15 meters of the other two. Test Pit
8 in Transect 1 contained five broken pieces of fired clay and three pieces of fire cracked rock. Test Pit 9 in Transect 1 held one piece of debitage and eight pieces of fire cracked rock. Test Pit 8 in Transect 2 contained two pieces of debitage and four pieces of fire cracked rock. The three positive tests all show evidence of significant heat being applied to the artifacts. The debitage found in two of the pits is also consistent with the high amount of debitage found in Josselyn Site 2G in both raw material type and color.

![Figure 22. Study Area 1, positive shovel test locations marked in black.](image)

It is important to note the environmental conditions and topography of this test area. It sits atop a 183 meter high ridge. The ridge slopes sharply on both the western side, facing Mill Creek, and the eastern side. The western facing escarpment declines all the way to the bank of Mill Creek, gradually decreasing in pitch as it nears the water. The slope ranges from roughly 50° at the steepest point, to only 10° as it nears the creek. Rick (1976) notes a slope of only ten degrees is sufficient to create artifact movement, a requirement easily met in this landscape. Josselyn Sites 2G and 2GA are located in the area where the terrain begins to level. The ground of this area was highly eroded, to the point that much of the ridge top was bare rock and gravel.
Few trees larger than five inches in diameter were standing on the ridge, while tree throw (the pit and ring of soil left by a falling tree) and fallen trees were common, further evidence of the significant erosion of the area. Though little grass grows on the steeper slopes of the ridge, dense undergrowth and grass is found closer to the stream as the incline decreases. This vegetation is likely responsible for slowing the descent of artifacts, preventing them from being washed into the creek. Smaller artifacts, such as projectile points, are dramatically slowed by such vegetation while larger items travel further (Rick 1976). This is consistent with these sites containing large numbers of projectile points and stone flakes, but very few larger tools. As discussed earlier, settlement information can be difficult to determine under the best of conditions. Considering the conditions of the ridge, it is unlikely that any significant evidence of settlement or dwellings could be recovered from this area without thorough investigation. Though scant, the recovered evidence is suggestive of some form of use or occupation by prehistoric people of the area. While these preliminary results cannot definitively link the area with the artifacts of Josselyn Site 2G, it certainly shows promise to the model being tested. Further testing could shed more light on the area as well.

The second test area, shown in Figure 23, was located in a bend of Mill Creek. Unlike the other two areas, it was not located on a ridge, but still on sloping ground. Area 2, consisting of 32 tests, resulted in no positive shovel tests. However, the previously mentioned site Je845 is located only a few meters outside of the test area.

The environment of Area 3 was much like that of Area 1. This area, seen in Figure 24, is located on a 154 meter high ridge overlooking the convergence of Mill Creek and Mud Creek. Like Area 1, it also shows significant evidence of soil erosion. Three transects of 11 tests each were planned for this area, but the land between the first and third transects was far too steep to
test. Of the 22 tests taken in this area, two were positive. Test Pit 9 in Transect 1 contained 4 oz.
of charcoal. Test Pit 11 in Transect 2 contained 3 pieces of clear bottle glass of undetermined age. Both areas were selected due to a similar water flow and accumulation profile as Test Area 1 to test the possible predictive capabilities of watershed mapping in GIS. Although both areas either held artifacts, or had a nearby site, the results were somewhat unsurprisingly less promising than those of Test Area 1. Without knowing what environmental conditions to search for, it seems unlikely that GIS could be used to create a predictive model based on the parameters used in this test.

Figure 23. Study Test Area 2, Site JE845 marked in red.

Figure 24. Study Test Area 3, positive shovel test locations marked in black.
Though the use of GIS is quickly becoming a common facet of archaeological study, nothing comparable to this model could be found. The benefits of any successful predictive model are obvious. The discovery of new archaeological sites often boils down to guesswork or pure luck. This makes finding a surface collection in a disturbed state all the more disheartening. This model holds the promise to alleviate some of these issues. Ten percent of the test pits in the primary research area held artifacts. The fact that a significant section of the area is currently unavailable for testing makes these results all the more promising. It is doubtful that this area would have been tested without the use of this model. Any chance to make archaeology more precise is a major boon to the field. Should further testing return equally positive results, this type of study holds great potential for expanding current knowledge of archaeological sites in stream environments across the Southeast.
CHAPTER 4
FUTURE WORK

The location of Josselyn Site 2G was inaccessible during the testing phase of this project. It is located near the boundaries of Tannehill and private property, and was unfortunately blocked by privately owned fencing. This area will be tested in future work, should access to this area be granted. A new series of shovel tests on this site could further verify that the artifacts found in this collection are indeed found in a secondary context rather than simply part of a shallow context revealed by erosion. Further testing also stands to bolster the voracity of the results of this project. A more extensive examination of the escarpment between Test Area 1 and Josselyn Sites 2G and 2GA also needs to be conducted. Rock, vegetation, and sinks along the slope should catch a portion of any artifacts being washed from the ridge top to the terrain below. Any such artifacts found on this slope could strengthen the case of this project’s conclusions.

Lidar imaging, which provides extremely detailed elevation and topographic data of unparalleled resolution, could advance this study by leaps and bounds. Lidar is an acronym for light detection and ranging. It essentially measures light reflected from lasers shot at the ground from an aerial platform, typically attached to a plane. They are typically taken from 1 km or less above the Earth’s surface, eliminating cloud and weather interference. The position of the plane is tracked through GPS triangulation, ensuring the highest possible degree of accuracy. The laser pulses sent from the onboard platform bounce back to the sensors. Lasers will bounce back at every obstacle layer. In an area with tree cover, such as much of Tannehill, the canopy will be
the first layer to bounce back a pulse. The various layers of ground cover are the next, and the
landscape itself the last. Depending on the number of pulses, this creates an image with 5-30 cm
resolution in most cases, with the potential of up to 2 cm resolution. This is a far cry from the 5-
10 m resolution data available from most types of imaging. Due to the way the imagery is
produced, it renders on three axis, creating 3D imagery that allows the user to view all levels of
the landscape, meaning water flow could be traced much more accurately, with the entirety of
the landscape and land cover accounted for (Lillesand et al. 2008: 626-714). This type of image
allows the user to penetrate ground cover and vegetation, providing a clean view of the
landscape. These data serve to document the landscape, its cover, and many archaeological
surface features, opening an astounding array of possibilities (Chase et al. 2012).

Lidar holds the promise of taking the model beyond its current limitations by not only by
providing more accurate topographic information, but by giving the capability of articulating the
whole of the landscape. Lidar opens the potential for large tracts of land to be thoroughly
examined regardless of the obstacles typical to such study. This brings new ways to explore
settlement patterns and scale in the context of a wider view of landscape integration and
topography, providing a new way to examine ancient use of space (Chase et. al. 2012).

The current parameters take into account flow direction, length, and accumulation. Lidar
would allow for a much wider range of factors to be considered. Landscape contour, natural
pathways, obstacles, and features could all be measured within the bounds of a Lidar image. This
data would also be much more accurate than current data. A much more accurate model than that
generated in this project could be created, with the potential of finding a much more refined area
from which a collection such as Josselyn 2G could have originated. Additionally, due to the
astoundingly high resolution of Lidar imagery, micro-topographic features become visible
without need for expensive and time consuming preliminary ground survey (Evans et. al. 2013). Even small archaeological features, like those typical of the Southeast, are visible in this imagery. In eroded landscapes, like those in this study, stone formations (tent rings, etc.) could be revealed in the topography. Any such features would only serve to highlight settlements and site origin points more accurately, allowing a more refined area to be selected for ground survey.

The exorbitant cost of current Lidar imagery is the primary hindrance to using this imagery. With the growing demand for high resolution topographic imagery the USGS has launched the 3D Elevation Program (3DEP) initiative with the goal of creating a Lidar map of the entirety of the United States. This initiative began in 2014, with the intention of acquiring imagery at a relatively rapid pace (USGS 2014). The project will make Lidar imagery much more readily available and affordable, easing much of the financial limitations to its use.
CHAPTER 5
CONCLUSION

An “amateur archaeologist” recently said to me that creek and river banks are the ideal place for those practicing his hobby to find Native American artifacts. His reasoning was simple, and many would consider it sound. First, popular artifacts, such as projectile points and other stone tools, are relatively common in such areas. Second, he said that such artifacts can provide little to no information because they have been moved from their original context, a sentiment shared by many trained archaeologists. It is evident that soil, along with any small rocks or artifacts contained within it, is being washed across the landscape at Tannehill. Water runoff and erosion from previous development are the prime causes for this and, hence, for the movement of artifacts from their original location. This is a major problem when delving into the history of the park, as untold information is lost due to these items being washed away from their original context. The loss of information is a setback to any study of land usage and settlement of these environs. With hundreds of artifacts located in both the Josselyn Collection and Tannehill’s own collection found as surface collections in secondary context much information stands to be learned from potentially relocating the sites from which these items originated. If the preliminary testing of the methodology described in this paper is any indication, this proposition stands to be turned on its head. As is always the case with new methods, further testing is necessary, but should the methodology prove to be reliable it holds wide applicability not only within Tannehill, but to similar environments across the Southeast. GIS programs offer a simple way to
potentially trace surface collections in riverine environments back to their original context. Considering the scant settlement and land usage information known in places like Tannehill, overlooked sites, like Josselyn Site 2G, stand to provide a wealth of new information.
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