UNIVERSITY OF GEORGIA
LABORATORY OF ARCHAEOLOGY SERIES
REPORT NUMBER 68

POPULATION, SETTLEMENT, AND SUBSISTENCE IN THE OCONEE RIVER VALLEY, GEORGIA

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Athens

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Population, Settlement, and Subsistence in the Oconee River Valley, Georgia

A Dissertation submitted in partial satisfaction of the requirements for the degree of

Doctor of Philosophy

in

Anthropology

by

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July 1994

TO TERRY AND PATRICK

ACKNOWLEDGEMENTS

It is difficult to know where to begin acknowledging the help given by countless individuals over the years.

First, I wish to acknowledge the support and patience given by my committee -- Drs. Michael Jochim, Michael Glassow, Mark Aldenderfer, Vincas Steponaitis, and a former member, Dr. Albert Spaulding.

Various other persons helped me as well, exchanging ideas, reading drafts, and giving advice. These include Dave Hally, Marvin Smith, Mark Williams, Gary Shapiro, Paul Fish, David Anderson, Keith Kintigh, Jean Hudson, Steve Kowalewski, Jim Hatch, and Dennis Blanton.

Craig Woodman, Kevin Peter, and other friends and colleagues at Science Applications International Corporation have for years known that my Ph.D. was expected in 1988, then 1989, then 1990, then 1991, then 1992, and then 1993. Well, to all of them, I can finally say that I have finished. I also wish to acknowledge the tremendous help provided by Cay FitzGerald, Karla Rice, Shirl Perrizolo, Annaliese Ketchum, and Misty Schymtzik in producing this document.

Jim Angelos deserves a tremendous amount of credit for guiding me out of a major case of dissertation avoidance.

Dr. Marty Walker, Dr. Paul Montgomery, and the doctors and nurses at the Santa Barbara Medical Foundation Clinic, Cottage Hospital Radiation Center in Santa Barbara, Fred Hutchinson Cancer Research Center in Seattle, Swedish Hospital Medical Center in Seattle, and Mountain States Tumor Institute in Boise in their own ways all ensured that I was able to finish my work.

Finally, I want Terry and Patrick, my wife and son, to realize that this is as much their accomplishment as it is mine. I love you guys.

ABSTRACT

Population, Settlement, and Subsistence
in the
Oconee River Valley, Georgia

by

James Latimer Rudolph

Analysis of surface collected pottery from Mississippi period sites in the Oconee River valley in central Georgia shows that there were two episodes of rapid population growth. One of these occurred during the fourteenth and early fifteenth centuries. The second episode may have taken place in the mid- to late sixteenth century.

I examined whether the periods of most rapid population growth corresponded to changes in settlement and subsistence. While there were indeed changes in site distribution during these periods, the changes were much more subtle than expected given other studies of population pressure as a cause of culture change. Over five or six centuries, site frequency in the region increased dramatically from only a handful of sites to hundreds, but the underlying settlement pattern stayed more or less the same.

There were exceptions. The relative importance of areas near shoals to areas with broad floodplains as settlement locations increased during some periods. There is also evidence that the use of upland resources increased over time. However, while hunting may have occurred in upland areas, there is no evidence that it was the predominant activity. It is more likely that as population

increased, the local Native American groups may have developed a strategy of short-fallow floodplain farming near the river and long-fallow swidden farming in the uplands. There is no indication, however, that the relative importance of these two types of farming changed through time.

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CHAPTER 1

INTRODUCTION

This dissertation examines the relationship between population, subsistence, and settlement patterns in a prehistoric horticultural society. The data used in this study come from over 1000 Mississippian sites in the Oconee River valley south of Athens, Georgia (Figure 1). Most of the data were collected during surveys and excavations by the University of Georgia for the Wallace Reservoir Archaeological Project (Fish and Hally 1985). I will first use the data to determine how the aboriginal population in the region changed through time. I will then compare the results of this analysis to information about changes in subsistence in the Oconee Valley. In particular, I am concerned with whether there is clear evidence for population growth actually causing economic change, as many archaeologists claim.

Anthropologists have argued long and bitterly over which variables cause economic change. Given the inclination, one could find explanations involving climate, energy, protein, soil, water, labor, population, migration, diffusion, risk, warfare, reproductive success, information, beliefs, scarce goods, surplus goods, acculturation, and disease. Some anthropologists focus on the effects of only one variable; others prefer multi-causal explanations (Johnson 1982). A variable may also drift in and out of fashion: ignored in the 1930's; a prime mover in the 1950's; fallen into disfavor--even disrepute--in the 1990's.

Throughout this dissertation, I will emphasize population size and distribution, energy, and protein as factors in Mississippi period subsistence

Figure 1. Location of Lake Oconee (Wallace Reservoir) in Georgia

change, most notably changes in farming, hunting, and shellfish exploitation. One could profitably use other variables as well, but I believe that these three are among the most important for explaining subsistence change in horticultural societies in the southeastern U.S. Also, most of my data come from survey records and surface collections, so I must use variables whose values can be inferred from a site's location, from the surrounding environment, or from artifacts collected on the site's surface. I will use these data to estimate relative population size, site age, duration of occupation, and the importance of different resource zones for farming, hunting, fishing, and gathering.

The dense forests of the southeastern U.S. often prevent archaeologists from obtaining reliable information on site densities and distributions, information that is critical for understanding the role of population in economic change. Most archaeologists in the southeast are fully aware of the hazards of using insufficient survey data, but too often they have assumed, in the absence of conflicting evidence, that population pressure was the cause of change in a prehistoric subsistence economy. Their failure to demonstrate that population pressure was even present, much less the cause of the observed changes, has drawn frequent criticism. Problems of this sort can be resolved only with better data, so one goal of the Wallace Reservoir Project was to survey the reservoir so thoroughly that site data would be more than adequate for studies of settlement and subsistence.

University of Georgia archaeologists surveyed nearly 80 percent of the Wallace Reservoir's 7800 hectares during the course of the project. Conditions were unusually favorable for archaeological reconnaissance, because the Georgia Power Company's contractors had stripped the reservoir of much of its vegetation.

This gave archaeologists an unprecedented opportunity to discover sites that would never have been found otherwise.

Those of us involved with the Wallace Project used to joke about the ubiquity of Mississippian sites in the Oconee Valley. At times it seemed as if every site in the reservoir had at least one Mississippian sherd on its surface. I had little doubt when I began this study that the number of Mississippian sites and probably the Mississippian population in the region had been high. During a subsequent review of survey data, excavation reports, collections, and analysis sheets, I recorded 1009 Mississippian sites. These included isolated sherds and projectile points, shell middens, rock shelters, small camps, villages, and mound centers. Since this study began, many more sites of this period have been discovered, especially in the uplands surrounding the reservoir.

I also saw evidence that the Mississippi period population in the valley increased rapidly through time, especially after A.D. 1500 (Rudolph and Blanton 1980). Therefore, I proposed that a better understanding of the temporal aspects of the change and a review of settlement and subsistence data would allow me to determine how population growth affected economic behavior, which aspects of the economy changed most significantly, and which seemed to change hardly at all. Among other things, I have discovered that the evidence for population growth in the valley is not as clear-cut as I once believed.

Those who are searching for yet another population pressure argument to applaud or disparage will be disappointed by this study, for I find myself falling into a middle zone where population is neither a prime mover nor irrelevant. I assume at the outset that change in population size or distribution can lead to significant changes in pre-industrial economies and that economic changes can sometimes cause populations to grow or decline, to disperse or cluster. This middle ground is a useful position, suffering only from its exposure to brickbats from all sides.

CHAPTER 2

EXPLAINING MISSISSIPPIAN ECONOMIC CHANGE

In this chapter I review the theoretical background of the study. I examine several interpretations of Mississippian economic change and discussions of how horticultural societies respond to population growth and to the scarcity of protein and energy. I also propose testable hypotheses about how horticultural groups respond economically to changing conditions.

Bruce Smith's (1978) theory of the Mississippian adaptive niche is the best general characterization of Mississippi period economic behavior. Smith's theory grew out of his analysis of faunal remains from sites in the middle Mississippi River Valley (Smith 1975), but he makes it general enough to account for broad similarities in settlement and subsistence throughout the Eastern Woodlands. Smith (1978) proposes that the archetypal Mississippian economy was an adaptation to alluvial bottomlands that contained oxbow lakes, seasonally flooded low areas, and natural levee ridges. In these habitats Indians exploited fish, waterfowl, deer, raccoon, turkey, nuts, fruits, berries, seed-producing pioneer plants, maize, beans, and squash. With these dependable, abundant energy and protein sources, Mississippian groups were able to maximize net energy intake, maximize protein intake, and minimize risk.

In Smith's (1978) view, Mississippian groups could maximize the net rate of energy gain because of the abundance and distribution of alluvium. Soils on levee ridges in the Mississippi Valley are fertile, well-drained, and annually replenished. The cultivation of maize and other crops on these ridges can be so productive that even modern farmers sometimes forgo the use of fertilizers (Muller 1978). Easy access complemented the productivity of the soils. Energy production was high and energy expenditure was low, so net energy intake was maximized.

Middle Mississippian groups could maximize protein procurement relative to energy costs because the oxbow lakes and low areas near the Mississippi River were accessible, productive, and seasonally renewed by flooding. Each year the Mississippi River left its banks and resupplied the oxbow lakes and swamps with fish. These habitats also attracted waterfowl, turtles, beaver, and other game. Oxbow lakes often occur next to old levee ridges, so Mississippian groups could live near their fields and near good hunting and fishing areas at the same time. This meant that they could obtain abundant protein with relatively little energy expenditure.

Risk has been defined as the probability of loss (Winterhalder 1986). According to Smith (1978) the inhabitants of the middle Mississippi Valley successfully minimized risk because fertile soils, fish, small mammals, waterfowl, and many wild plants were not only abundant and easily exploited, but were also dependable. Mississippian populations could count on the yearly cycle of rising and falling floodwaters to replenish their fields and restock their lakes. This cycle let them maintain a stable subsistence pattern, live in relatively permanent villages, and support religious and political hierarchies.

If protein and calories were the only variables of importance, Mississippian groups would have exploited the floodplain most efficiently by dispersing themselves into small hamlets. In fact, it is unlikely than any Mississippian settlement pattern was completely dispersed, because, as Smith (1978) argues, the threat of warfare (Larson 1972) also influenced subsistence and settlement. In times of peace, people in the Mississippi Valley could have lived in dispersed hamlets near the levee ridges and oxbow lakes, but in times of war they would have retreated to larger, safer nucleated settlements. They could not live in nucleated settlements for more than brief periods because feeding all the inhabitants of a single large village would have eventually required the inefficient exploitation of distant levees and lakes.

The theory of the Mississippian adaptive niche has been a useful tool for increasing our understanding of Mississippian economies. However, the theory only *describes* how people adapted to their environment; it does not *explain* these adaptations. The theory is functional rather than evolutionary (Ferguson and Green 1984) and is difficult to use in examining change through time.

In requiring simultaneous goals of energy maximizing, protein maximizing, and risk minimizing, Smith assumes implicitly that Mississippian groups followed an ideal strategy. Such a strategy may have been feasible for groups living along the Mississippi River, but most horticultural groups were probably not so fortunate. While it may be theoretically possible for a foraging group to maximize energy and protein procurement and minimize risk at the same time (Winterhalder 1986), most river valleys in the Eastern Woodlands were probably less productive and less predictable than the Mississippi Valley.

Furthermore, one often sees ethnographically among horticulturalists that maximizing energy or protein and minimizing risk may require conflicting strategies that can not usually be followed simultaneously (Jochim 1981; Johnson 1971).

A concern for security is a major determinant of subsistence practices for many groups, including farmers (Jochim 1981). Subsistence farmers may be well-aware of a variety of ways to increase the long-term productivity of their fields. But they must also consider the short-term needs of their families. In many regions, periods of scarcity caused by drought, frost, insects, or warfare are far less predictable than the annual cycle of rising and falling floodwaters found along the Mississippi River. The farmers in these regions can not afford to ignore these dangers if they are to survive. They must have a compromise strategy.

Some degree of security can come from storing one's produce, from pooling with others, or, for Mississippian groups, from redistribution. But the success of these measures would still depend in part on the predictability of the environment. As Winterhalder (1986) notes, to minimize risk, even optimally, is not always to avoid it.

A theory of Mississippian adaptation based on an optimizing rather than a maximizing strategy can recognize that changes in population size, resource availability, and other constraints influence economic behavior. As the constraints change, the relative costs of different resources change. Changes in these costs in turn will lead to modification of the optimal strategy. This optimal strategy, not to mention the less-than-optimal strategy actually followed, may be one in which energy and protein production are low but adequate for survival and in which risks are unavoidable but low enough to be tolerated. In developing testable hypotheses concerning the relationship between Mississippian population growth and economic change in the Oconee Valley of Georgia, I have assumed that an optimizing strategy is a more suitable model than a maximizing strategy.

I have relied on descriptions of pre-industrial horticultural societies as sources of appropriate ethnographic analogies suitable for developing test implications. However, it is difficult to find in the published literature ethnographic groups with subsistence economies analogous to those of the Mississippi period: most chiefdom-level societies do not rely on floodplain horticulture and most modern pre-industrial groups get some portion of their protein from domesticated animals, which were not available to Mississippian groups.

The most carefully collected ethnographic data come from groups practicing long-fallow swidden farming and many studies have demonstrated a relationship between length of fallow, settlement pattern, and population size. However, it is not clear whether these studies provide suitable analogies. Murphy and Hudson (1968) argue that at the time of European contact, Mississippian groups did not practice long-fallow swidden farming. Instead, they grew their crops in rich bottomland soils that needed only a short fallow period, if any. On the other hand, Kowalewski and Hatch (1991) have argued that long-fallow swidden farming may indeed have been practiced in the Georgia Piedmont, not along rivers, but in upland areas nearby. As will be seen in Chapter 6, the evidence for swidden farming in the Oconee Valley is largely circumstantial. Drawing analogies between Mississippian societies and modern swidden farmers must therefore proceed cautiously.

Changes in protein procurement among modern groups may be tempered by the availability of domesticated animals. Even among farmers that rely heavily on hunting and fishing for their protein, it is common to find a few domesticated animals--chickens, pigs, and so on. Many horticultural groups rely far more on domesticated animals than on game. This can not be said for Mississippian groups, for the only domesticated animal found on Mississippian sites is the dog; all other animal protein had to come from hunting or gathering.

Proposition 1: Through time the Mississippian society in the Oconee Valley experienced periods of significant population growth.

Thomas Malthus (1798) and Ester Boserup (1965) are the ultimate protagonists in arguments about the role of population in economic change.

To a Malthusian, population is a dependent variable: the food supply determines the size of the population. Malthus argued that human populations, like other animal populations, tend to grow until they reach the limits of the available food. Humans obviously have an advantage over other animals in our ability to expand our supply of food, but Malthus considered this advantage unimportant in the long run. He believed that changes in the food supply occurred only through new ideas, new technology, or new crops, and not in response to human needs. Even with innovations, the food supply could not increase as rapidly as the population. In a Malthusian world, improvements in the food supply would always be short-lived; if innovations led to more food, more food would lead to a higher population.

Boserup (1965) argues that Malthus's eighteenth century view of the world does not stand up to evidence from developing countries that people often willingly change their means of getting food when their population is growing. She suggests that population is an independent variable and that population growth has led to shortening of fallow, irrigation, terracing, the introduction of the plow, and many other changes in agriculture. On the other hand, Boserup also argues that if the food supply is adequate, farmers will resist change, despite the best efforts of government officials, educators, and agronomists.

I follow Boserup's position that population can be treated conveniently as an independent variable that can affect subsistence change. There are countless ethnographic and historical examples in which a growing population is one of several reasons people decide to change their methods of getting food.

Boserup points out something that is often ignored by those who borrow her explanation: population growth is not necessarily an indication of population pressure. Any system of food production has a certain flexibility that allows it to function quite well without the need for radical alteration when population is growing. On the other hand, small alterations may be made as people experience or foresee minor or temporary food shortages that have little to do with the carrying capacity of the agricultural system. Also, when population growth does force change onto a society, the transition from one system to another may proceed slowly over many years. At any one time, an observer may see a complex mixture of different farming systems, and over time the relative importance of these systems will change.

Reasonable evidence for prehistoric population growth can be found whenever there is a dramatic increase over time in the absolute number of archaeological sites. Such evidence is not easy to come by in the southeastern U.S. As I mentioned in the previous chapter, the heavy vegetation of the region often prevents archaeologists from collecting reliable information on the number of sites in an area. In the Wallace Reservoir, however, archaeologists probably discovered the vast majority of Mississippian sites.

Professional and amateur archaeologists have worked in the Oconee Valley for over a century. The first documented investigations were in the 1870's, when Charles C. Jones, Jr.--mayor of Savannah, defender of the Southern Cause, the "MacCauley of the South," and a noted antiquarian--described several sites in the Oconee Valley. These included Scull Shoals (Ge4), a few kilometers north of the Wallace Reservoir, the Dyar mound (Ge5) within the reservoir, and Shoulderbone (Hk1) southeast of the reservoir.

Over the years, various surveys by professional and amateur archaeologists contributed to the body of knowledge about the distribution of sites in the region. However, it was not until plans were begun for the construction of Wallace Dam that the valley witnessed major archaeological investigations.

The first of these investigations was performed by Smith (1971), who conducted a survey of the Wallace Reservoir area and discovered 62 sites.

In the summers of 1973, 1974, and 1975, the University of Georgia conducted extensive surveys funded by the Georgia Power Company (DePratter 1976) and the Georgia Department of Natural Resources (Wood and Lee 1973) in the Wallace Reservoir area. These surveys were concentrated in areas of good surface exposure: plowed fields, unpaved roads, and powerline rights-of-way. Posthole diggers and shovels were used to excavate small exposures in areas of dense vegetation, but few subsurface sites were found. A total of 340 sites was recorded during these surveys.

During the final mitigation efforts in the Wallace Reservoir, the Georgia Power Company cleared much of the vegetation from the floodpool. This provided an unforeseen opportunity to continue the survey, to find sites previously obscured by vegetation, and to develop an unusually complete picture of site distribution in a piedmont river valley. This survey continued throughout the course of the mitigation phase of the investigations in the reservoir and is known as the Wallace Reservoir Mitigation Survey (Fish and Hally 1983).

During the survey two crews closely inspected almost all exposed areas within the reservoir. Several small portions of the reservoir were not cleared of vegetation, and most of these were not examined. All prehistoric cultural resources found were recorded, but a distinction was made between sites and artifact occurrences, each of the latter having fewer than ten artifacts on the ground surface.

In addition to surface survey, the Wallace Project also supported subsurface survey to identify sites that were not exposed on the ground. First, a backhoe was used to excavate deep trenches along transects across the reservoir. Second, the survey crews inspected burn burials, large scooped out depressions where trees were to be bulldozed, burned, and buried before the lake was filled. Both phases of subsurface survey produced evidence of buried Mississippian sites.

During the course of the Wallace Project, 19 Mississippian sites or components were excavated. Excavations at the Dyar site (Ge5) (M. Smith 1981a), the Cold Springs site (Ge10) (Fish and Jefferies 1985), the Joe Bell site (Mg28) (Williams 1981), and Ge175 (Shapiro 1983) were the most useful for increasing our understanding of Mississippian settlement and subsistence in the reservoir area.

Several dissertations have been written about the Mississippian occupation in the Lake Oconee area. Chung Ho Lee (1977) examined late Mississippian settlement in the reservoir based on data collected prior to the Wallace Mitigation Survey. Mark Williams (1981) studied the seventeenth century Joe Bell site (Mg28). Marvin Smith (1987) performed an extensive review of aboriginal population decline in the southeastern U.S. during the seventeenth century and used data from the Wallace Reservoir for part of the study. Gary Shapiro (1983, 1984) used excavated data from the reservoir to examine the relationship between vessel function and site function at late Mississippian sites.

Since the filling of Lake Oconee, Mark Williams of the Lamar Institute has directed excavations at several mound centers in the Oconee drainage outside the reservoir.

Also, over the past decade surveys have been performed in upland areas surrounding Lake Oconee by the U.S. Forest Service, Jerald Ledbetter, Dan Elliott, Chad Braley, and others. These surveys have continued on a small scale for many years and have produced a great deal of information on the distribution and age of Mississippian sites in the uplands.

Most recently, small upland Mississippian sites have been excavated by Jim Hatch of Pennsylvania State University. It is expected that Mississippian settlement and subsistence activities in the uplands surrounding the Oconee Valley will remain a major focus of research in the area for many more years.

All these studies together have provided information on well over 1000 Mississippian sites in a wide variety of environmental settings. In Chapter 4, many of these sites are dated more precisely using the pottery collected from their surface. This chronological information then is used to determine the absolute frequencies of sites in the project area during various phases of prehistoric occupation.

Hypothesis 1: An increase in population density was associated with an intensification of habitat use.

Earle (1980) and Christenson (1980) have proposed a model that can account for temporal changes in the mixture of different strategies in a subsistence economy. They emphasize the role of population growth as a cause of subsistence change, but their model does not require that population growth be the only independent variable. In developing the model they assume that any group will select over the long run those resources for which the group can fulfill its needs at the lowest cost.

According to Earle (1980), if a population grows until existing hunting, gathering, or farming practices do not provide enough food at a reasonable cost, then the group may intensify production or diversify the resources exploited.

Explaining why this happens requires introducing the concept of marginal cost, the cost of obtaining one more unit of a resource. Marginal cost is determined by how many units have been obtained previously and on how many more can potentially be obtained under the existing strategy. As efficiency declines with expanded production, the marginal cost of the resource rises. For wild plants and animals, increased exploitation of any species usually leads hypothetically to a decline in its density, so that continued exploitation will become less and less efficient and more costly. For horticulturalists, expanding production only by enlarging one's fields also becomes increasingly inefficient and more costly.

Intensification is the increased investment of energy or time to improve yields of a resource despite a decline in efficiency and a rise in marginal cost. For example, if an increased need for protein means that more deer are killed, the cost of obtaining additional deer will climb, at first slowly but later more rapidly. Intensification could mean spending more time and energy hunting deer within the same territory even though each deer killed costs more than the one before it. Intensification could be avoided if the hunters expanded into new territories, if their village or camp were relocated, or if the group found a way to decrease the need for venison. Intensification in horticulture could mean putting more time and energy into increasing crop productivity by weeding, terracing, or protecting plants from pests. If the goal is not efficiency but feeding one's family, then the possibility that the additional energy produced will be only slightly more than the energy spent might be of little concern in the short run. As long as the marginal cost remains lower than the energy obtained, intensification may be a viable strategy.

Diversification is the addition to the diet of resources that were not previously used. If the marginal cost of a resource is low, the exploitation of the resource may be intensified, but if the marginal cost is high, another resource may be added to avoid the additional energy needed to intensify production. For example, deer are a much larger package of protein than river mussels, and if both are abundant, people would often choose the former over the latter. If, however, the human population is too large to obtain all its protein from deer at a reasonable cost, then river mussels might become a necessary addition to the diet. Diversification also includes adding new crops to the horticultural assemblage and placing one's fields in a variety of locations, some of which are most productive in wet years and some of which are most productive in dry years.

Earle (1980) and Christenson (1980) point out that during population growth, diversification is more likely to occur in hunting and gathering and intensification is more likely to occur in farming. This is because there is a limit to how much additional energy or protein wild plants and animals can provide through intensification. Raising hunting pressure on deer will produce a short-term increase in the supply of meat, but the increase will be limited by the maximum number of deer in the forest. On the other hand, farmers can do many things to increase crop yields without diversifying. Many variables can limit horticultural productivity, but it is difficult to define the maximum potential yield if the farmer is willing and able to intensify.

Finally, the two terms are not mutually exclusive, especially if the group is intensifying habitat use rather than resource use. A Mississippian group could have intensified its exploitation of river shoals by putting greater effort into fishing, gathering shellfish and turtles, and trapping beaver and muskrat; but this intensification would appear to archaeologists as a more diverse faunal assemblage.

In Chapter 6 the examination of how Mississippian groups may have intensified habitat use will focus on two environmental zones in particular--river shoals and the uplands bordering the river valley. These are discussed below as subsidiary hypotheses.

Hypothesis 1a: An increase in population density was associated with increased exploitation of river shoals.

While Smith (1978) found in the Mississippi Valley that the best places for hunting and fishing were also good for farming, the Oconee River valley was not so amenable. Shapiro (1983) discovered in the project area that fish, turtles, and small mammals were most easily obtained near shoals, for there were few, if any, oxbow lakes. In contrast, maize was most efficiently grown in broad bottomlands. If a group had access to a suitable site close to both a broad floodplain and shoals, that location would have been ideal for settlement. However, the fertile soils of the broadest Oconee bottomlands and the aquatic resources of the shoals are far apart (see Chapter 5). Gaining access to both energy and animal protein required some variation from the settlement pattern found in the Mississippi Valley (Shapiro 1983). Shapiro suggests that Mississippian groups along the Oconee lived most of the year in villages near their maize fields in the broad bottomlands. During the warmer months, they also had specialized fishing and gathering camps near shoals. He also argues that deer would have been hunted primarily during the winter.

Shapiro (1983) had to modify Smith's (1978) theory only slightly to account for the exploitation of shoals in piedmont Georgia. The two theories are basically similar in requiring access to extensive, fertile soils; access to abundant, reliable sources of protein; and economic goals of maximizing net energy intake, maximizing protein intake, and minimizing risk, simultaneously if possible.

Over a decade ago, I argued (Rudolph 1983) that the formation of shell middens in the Oconee Valley was almost exclusively a late Mississippian phenomenon and that overpopulation was a reasonable explanation for the increased exploitation of river mussels. Various anthropologists have proposed a causal link between population growth and increased exploitation of aquatic resources, including freshwater and marine shellfish (e.g., Binford 1962; Cohen 1977; Harner 1970; Osborn 1977). These arguments often focus on hunter-gatherers, but Harner (1970) suggests that horticulturalists respond to increased population density by intensifying cultivation, de-emphasizing land-based plants and animals, and placing greater emphasis on water-based resources, such as fish and molluscs. In Chapter 6 I will reassess my conclusions and Shapiro's using the chronological data presented in Chapter 4.

Hypothesis 1b: An increase in population density was associated with increased resource procurement in upland areas.

For several years, the importance of protein scarcity in determining human behavior was one of the most controversial issues in anthropology (Beckerman 1975; Gross 1975; Ross 1978; Johnson 1982; Diener 1982). This issue polarized cultural ecologists from each other and from structural anthropologists, symbolic anthropologists, evolutionary ecologists, and sociobiologists. The virulence of the debate has died down in the past few years, and those cultural ecologists who are less inclined toward unicausal explanations suggest that the availability of protein is one of many environmental factors that may exert a limiting influence on population density, settlement size and permanence, and political organization (Beckerman 1975; Vickers 1980).

The best ethnographic data concerning the importance of protein come from Amazonia, where there has been a concerted effort by many scholars to test the protein scarcity hypothesis. Gross (1975) began the debate when he suggested that societies with dense populations rarely existed in the Amazon Basin because protein was scarce, not because suitable soils were scarce as others had once hypothesized. He argued that modern Amazonian groups just barely obtained adequate protein from their environment even with low population densities;

groups with higher population densities would have had serious protein deficiencies and could not have survived long unless they lived near major rivers.

Gross's argument was attacked from all sides: opponents claimed that he had ignored important ethnohistoric sources, that his population estimates were wrong, that there was indeed adequate animal protein in the rainforest, that there was abundant plant protein, and that he had ignored the effects of acculturation and disease. Nonetheless, Gross's hypothesis stimulated a great deal of research, for anthropologists realized they needed accurately measured data to test it.

By 1983 researchers had shown that the protein scarcity hypothesis as proposed by Gross was invalid. But the collapse of Gross's argument does not mean that protein availability is irrelevant. It is apparent from these investigations that temporal and spatial variation in the availability of animal protein does influence behavior, often in subtle ways previously unrecognized. Economic strategies were devised by Amazonian groups that intentionally or unintentionally allowed them to avoid severe protein scarcity rather than merely respond to it.

Among horticultural groups in the Amazon and elsewhere, variation in protein availability is frequently a consequence of game depletion. Animals are often killed faster than they can reproduce, large game are depleted more rapidly than small game, animals learn to avoid the outskirts of villages, some animals leave, others become more wary, and, as a consequence, hunting yields decline over time (Hames 1980a). These trends become more apparent the longer an area is subject to predation, and this means that game depletion is a response to settlement age. The longer a village is occupied, the more difficult it becomes to obtain adequate protein, unless alternative strategies for obtaining protein are found. These strategies may include relocating villages, shifting hunting zones, and garden hunting.

Village relocation occurs with some frequency among shifting horticulturalists. Informants in Amazonia rarely give game depletion as a reason for moving, but they may agree that improved hunting is one consequence of a move (Hames 1980a).

Research in Amazonia by Hames and Vickers has centered on understanding how the intensity of exploitation in different hunting zones may be a response to game depletion. Hunters are well aware that certain habitats are more productive than others, that some are more accessible than others, and that some are more dependable than others (Gross 1983; Hames and Vickers 1982; Nietschmann 1972). Changes in productivity, accessibility, and dependability of game in these zones can be expected to affect behavior in different ways.

Hunting zone preference may be influenced by distance or, more precisely, travel time (Hames 1980a; Yost and Kelley 1983; cf. Beckerman 1983). The distance one travels to a particular zone will determine the nature of the game one is willing to hunt and the effort one is willing to expend once a distant hunting zone is reached.

There may be scheduling problems that influence the use of a hunting zone. During certain periods hunters must stay near the village to perform other important tasks, such as clearing gardens, fishing, rituals, tool making, or village defense. At these times, nearby heavily exploited zones will be hunted despite their low productivity. Hunting in distant more productive zones might await a time when the hunters can spend several days on hunting trips (Hames 1980a).

One means of increasing protein procurement is garden hunting, a practice that is closely related to the differential use of hunting zones. Linares (1976) was the first to discuss this practice after she had excavated the site of Cerro Brujo on Bocas del Toro in Panama. The faunal assemblage from the site suggested to Linares that "... although large forest tracts must have existed in Bocas at that time, the Cerro Brujo inhabitants were concentrating on species that live in forest-edge conditions and readily invade man-made clearings (1976: 345)." She interprets garden hunting as a strategy in which animal protein and carbohydrates are spatially concentrated, which in turn reduces seasonality and scheduling problems. In this respect, garden hunting at Cerro Brujo had advantages similar to the subsistence strategies entailed in the Mississippian adaptive niche.

In describing hunting practices among the Bari, Beckerman (1983) proposes what can be treated as a generalization for garden hunting: "...it seems a reasonable first approximation to assume that the centrifugal force of hunting in driving game away from the vicinity of the house is roughly balanced by the centripetal force of gardens (especially the abandoned gardens) in drawing game toward the vicinity of the house (1983:276)." The relative importance of these two forces is influenced by the overall level of game depletion, the age of the settlement, and the intensity of hunting.

For the Xavante (Flowers 1983), the Waorani (Yost and Kelley 1983), the Tatuyo (Dufour 1983), the Bari (Beckerman 1980, 1983), and the Miskito

(Nietschmann 1972), garden hunting seemed to be a way both of obtaining meat and of ridding one's garden of unwelcomed visitors. Judging from the descriptions offered by these authors, the importance of garden hunting varied considerably from casual and infrequent to deliberate and intensive.

Finally, the Lacandon Maya developed a surprisingly sophisticated system of garden hunting, which ensured high yields over a long time. The Lacandon carefully tended plants growing in abandoned milpas, called *acahual*, for the plant foods and for the animals the plants attracted.

> The cultural importance of the acahual in food production is not directly in its vegetal output, however prodigious that may be; rather, the acahual plays its most important role as a preferred grazing area for selected animals....In fact, certain species seem to have adapted specifically to exploit this human-made niche, for they are found in larger numbers in acahual-bearing areas than they are in totally wild situations (Nations and Nigh 1980:17).

In summary, garden hunting, like other subsistence practices, can be intensified. It need not be an important source of protein, but once it becomes a source, the hunter can expend greater effort hunting in this man-made habitat and encouraging its use by animals. However, the number of garden pests would clearly be related to the density of fauna in the surrounding region. Intensified exploitation in surrounding forests could lead to a decline in hunting yields in the vicinity of the garden. Thus, intensified gardening and intensified hunting may be closely related processes.

Testing the hypothesis that exploitation of upland resources changed through time requires, first, determining from the site distributions that there is indeed increased settlement or use of upland locations in certain periods. Second, I will weigh the evidence that these upland locations would have been used for gardening and at least in part because of the available game.

Hypothesis 2: An increase in population density led to a shift from floodplain horticulture to a mixed strategy of short-fallow floodplain and upland long-fallow horticulture.

There was a period in the 1950's and 1960's when many anthropologists deemed energy expenditure and procurement the most important determinants of human behavior. Survival requires energy, and some reasoned that ultimately all human behavior was a quest for calories. Many of the explanations offered at this time were so all-encompassing that a backlash against the "calorific obsession" (Brookfield 1972:46) was all but preordained.

Despite the backlash, there are numerous examples in which ethnographers have recognized and measured the importance of energy expenditure and procurement in human settlement and subsistence.

Horticultural decision-making depends in part on labor productivity, the amount of labor required to produce an adequate supply of food per unit of time or land, and labor efficiency, the ratio of energy expended to energy produced. Both are influenced by population density, soil depletion, and land circumscription.

A shift toward increased reliance on long-fallow swidden farming should be revealed archaeologically by increased settlement in areas where floodplain horticulture would have been impossible and by less frequent site reoccupation, as people would have moved their villages when soil became exhausted.

Cultural anthropologists have produced a voluminous literature on tropical slash-and-burn farming and its effects on settlement patterns and soil quality. For many years it was assumed that slash-and-burn farming used up the nutrients in the soil rapidly and that farmers were forced by soil depletion to move frequently to other locations. More recent research suggests that a simple relationship between slash-and-burn, soil depletion, and village movement does not exist.

Carneiro (1960) was among the first to question this relatively simplistic view. He argued that for the Kuikuru, the population density was so low and the amount of desirable soils so large that slash-and-burn farming would not have been a cause for village movement (1960). There was always enough land nearby to feed the community.

Gross (1983) and others have questioned Carneiro's argument in light of recent data suggesting that the Kuikuru lived in a habitat unusually productive for Amazonia. Elsewhere, depletion of good soils near villages not only occurred, but it was recognized by the farmers themselves as one reason for relocation.

Other researchers suggest that the problem is not one of soil depletion, but of other aspects of horticultural productivity. For example, over time weeds and pests infest the garden plots and make them more and more difficult to tend. This not only affects crop yields but also increases the amount of work for the farmer.

Gross (1983) discusses the importance of labor productivity as a determinant of the frequency of village movements among the Xavante, Bororo, Timbira, and Kayapo of Brazil. These groups were well aware of how hard they had to work. Gross notes "...impending scarcities of certain goods (e.g., game, garden produce) are telegraphed to villages by falling output-input ratios. People become aware that they must expend greater effort or time to secure a constant amount of food or other goods (1983: 437)." However, resource depletion and labor productivity were not the only, or even the most important, reasons for uprooting one's family. Disease and warfare were often far more compelling.

The occupation or reuse of a site is related to the intensity of protein production, the intensity of energy production, the time it takes for the local environment to recover from exploitation, and the patchiness of the environment. If an area is exploited heavily until it is no longer able to provide adequate resources given the amount of energy spent in cultivation, then it may be temporarily abandoned if alternative locations are available. Once the local flora, fauna, or soils have recovered, it is possible that people would return to this location. If desirable locations are widespread, then reoccupation is less likely than if desirable locations are uncommon.

Evidence for reoccupation or reuse of sites can also tell us whether there were certain locations that were exceptionally desirable and remained so for many centuries and whether certain locations were particularly undesirable.

Reoccupation is difficult to detect because the length of a site's occupation may be much less than the length of time required for there to be archaeologically recognizable change in artifact assemblages. In other words, a site could be occupied, abandoned, reoccupied, abandoned again, and reoccupied a last time without there being a dramatic change in the pottery used by the inhabitants. Consequently, it is difficult to detect evidence of reoccupation from the pottery alone. Nonetheless, I make an effort in Chapter 6 to examine the evidence for changes in the frequency of site reoccupation in different habitats.

CHAPTER 3
CERAMIC ANALYSIS

Understanding change in Mississippian population, subsistence, and settlement requires dating the sites as accurately as possible. Since most of the sites in the Wallace Reservoir were not excavated, their ages can be estimated only from a detailed analysis of the pottery and other artifacts found during the survey. In this chapter I discuss how I analyzed the surface collections from the reservoir and general features of the ceramic assemblage. This analysis is a prelude to a discussion in Chapter 4 of how I dated Mississippian sites. This chapter includes a discussion of variation in the pottery from the Oconee Valley, emphasizing those variables considered most chronologically sensitive.

I examined 6962 sherds from 520 sites, 52 percent of the Mississippian sites known at that time for the project area. This sample included six sites with over 100 sherds, 175 sites with 10 to 99 sherds, 260 sites with two to nine sherds, and 79 sites with only one sherd. The average collection had 13 sherds analyzed, although the total collection of Mississippian pottery from each site was usually much larger than the sample of analyzed sherds. Almost 95 percent of the analyzed sherds were rims, because they usually contain much more information than body sherds for inferring age and vessel form. I also examined 385 body sherds. These were usually from small collections that contained no diagnostic rim sherds.

Thirteen rim sherds is a small sample for statistical purposes, but it is important to note that this sample represents a minimum number of 13 vessels on the surface of a site.

I did not select a random sample of sites. During a brief episode of optimism and naivete, I had hoped to analyze all sites in the project area and I began with collections made during the Wallace Mitigation Survey. Unfortunately, there was insufficient time to analyze artifacts collected during surveys by DePratter (1976), Wood and Lee (1973), and others. Despite my arbitrary sampling method, I have not found evidence that the sample is unrepresentative of the total number of sites in the reservoir in terms of either site distribution or site chronology. On the other hand, it is possible that because of heavy vegetation, sites found during earlier surveys were larger and denser than those found when the vegetation had been cleared. With the exception of pottery from one unit at the Dyar site, I did not analyze excavated collections.

The variables I recorded for each sherd were rim form, rim decoration, neck form, body decoration, incised and complicated stamped motif, width and number of incised lines, width of rim fold and rim roll, depth of pinching, orifice diameter, and sherd length.

Rim Form

This category includes *unmodified*, *folded*, *rolled*, and *T-rims*. *Unmodified* rims have no apparent alteration. *Folded* rims are thickened by folding the lip or adding a strip of clay to cover the outer vessel surface just below the lip. *Rolled* rims show a slight outward bending of the lip so that the roll is no wider than the thickness of the sherd. *T-rims* are shaped in cross-section like a *T* or an inverted *L*. Rare rim forms include sherds with *lugs*, *handles*, *effigy figures*, or *incised lips*.

Of 6624 sherds showing some evidence of rim form, 58.4 percent are unmodified, 21.9 percent are folded and not rolled, 11.1 percent are rolled and not folded, 7.2 percent are both folded and rolled, 1.1 percent are T-rims, and 0.3 percent have other rim forms.

Rim Decoration

This category includes *plain*, *scalloped*, *notched*, *noded*, *pinched*, *punctated*, and *incised* rim sherds. *Plain* rims are undecorated. If a vessel's body decoration extends onto an otherwise undecorated rim, the rim decoration is still classified as plain. *Scalloped* rims are folded rims on which the base of the fold has been molded to create an undulating edge. *Notched* rims have carefully applied vertical grooves. *Noded* rims have one or more rows of nodes around the rim. *Pinched* rims have a row of pinched vertical ridges encircling the lip. *Punctated* rims are punched by hollow canes or solid sticks in one or two rows. *Incised* rims have lines on the rim that are distinct from any decoration on the vessel body. Incised rims are usually also T-rims. With the exception of incised and plain rims, most classes of rim decoration occur primarily on folded rims.

Of 6595 sherds showing the outer rim surface, 68.6 percent are plain, 1.9 percent are incised, 0.1 percent are scalloped, 0.9 percent are notched, 0.4 percent are noded, 24.4 percent are pinched, 3.2 percent are cane punctated, 0.4

percent are solid punctated, and 0.1 percent have other types of rim decoration.

Table 1 illustrates the association between rim form and rim decoration. Approximately 57.1 percent of the collection are sherds with unmodified, plain rims; 24.3 percent have folded, pinched rims; 3.1 percent have folded, cane punctated rims; and 10.6 percent have rolled, unfolded, plain rims. Other combinations total 4.9 percent of the assemblage.

Neck Form

I described neck form by using curvature and orientation. Neck curvature along the vertical axis is classified as *concave*, *convex*, or *straight*. Neck orientation refers to the angle at which the neck approaches the plane of the orifice. Neck orientation is *vertical*, *inverted*, *carinated*, or *everted*.

Of 4819 sherds, 25.8 percent have concave necks, 36.7 percent have convex necks, and 37.5 percent have straight necks.

Four hundred fifty sherds were large enough to reveal neck orientation: 16.7 percent are vertical, 32.0 percent are inverted, 8.9 percent are carinated, 40.4 percent are everted, 1.8 percent are from plates, which have no necks, and 0.2 percent are classified as other. Sherds from plates are very distinctive and are probably over-represented in this small sample.

Sherds showing concave, vertical necks and concave, everted necks are probably from jars. Sherds showing inverted necks, those with carinated necks, those with convex necks, and all sherds with straight necks except for vertical, straight necks are probably from bowls.

Table 1

Association of Rim Form with Rim Decoration

RIM DECORATION	RIM FORM						
	Unmodified	Folded/ Not Rolled	Folded/ Rolled	Rolled/ Not Folded	T-Rims	Other	Total
Plain	3743	38	6	695	11	5	4498
Pinched	8	1152	437	0	0	0	1597
Cane Punctated	14	189	13	2	0	0	218
Solid Punctated	7	12	5	1	0	0	25
Scalloped	0	4	3	1	0	0	8
Notched	12	23	6	10	0	2	53
Noded	17	4	1	0	0	0	22
Incised	18	10	2	17	52	14	113
Other	2	2	1	1	7	3	16
Total	3821	1434	474	727	70	24	6550

Body Decoration

I divided body decoration into *complicated stamped*, *check stamped*, *simple stamped*, *undifferentiated stamped*, *incised*, *engraved*, *smooth plain*, *coarse plain*, and *burnished plain*. Stamped sherds are those showing even the slightest indication that the vessel had been stamped with a carved paddle. Stamped sherds that resemble Woodland types are not included in the analysis. *Complicated stamped* sherds have either rectilinear or curvilinear designs that change direction. If a sherd shows only straight, parallel grooves, it is called *simple stamped*, although the grooves could be a portion of a complicated stamped design. *Check stamped* sherds are those that fit published descriptions of Savannah check stamped pottery (Rudolph and Hally 1985). *Undifferentiated stamped* sherds are severely weathered, very small, poorly stamped, or overstamped. *Incised* sherds were decorated while the clay was wet so that drag marks are visible. This category includes the types Lamar incised and Morgan incised. *Engraved* sherds are very rare sherds on which lines were cut into the vessel surface after the clay had dried. Plain sherds have no evidence of decoration whatsoever. *Coarse plain* sherds have a roughened or scraped surface. *Smooth plain* sherds have a matte finish. *Burnished plain* sherds are slightly glossy. In practice, distinguishing among the three categories of plain sherds is subjective. Other rare forms of body decoration include *painting*, *red filming*, *adding nodes*, *punctating*, *brushing*, *fingernail impressing*, and *corncob impressing*.

Of 5312 sherds showing body treatment, 2.0 percent are classified as undifferentiated stamped, 3.5 percent are complicated stamped, less than 0.1

percent are check stamped, less than 0.1 percent are simple stamped, 41.2 percent are incised, less than 0.1 percent are engraved, 5.9 percent are coarse plain, 45.6 percent are smooth plain, 1.2 percent are burnished plain, and 0.5 percent have other forms of body decoration. If one combines categories, then 5.7 percent are stamped, 41.3 percent are incised or engraved, and 52.7 percent are plain. Since bowls are often incised just below the rim while jars are often stamped well below the rim, it is likely that the proportion of incised rim sherds in the analyzed sample is greater than the proportion of incised vessels in the total assemblage. The opposite may be true for stamped sherds.

Table 2 illustrates the association between body decoration and the four most common classes of rim form and rim decoration. This table shows that unmodified, plain rims usually have plain or incised bodies; folded rims usually have unknown body decoration; and rolled, plain rims usually have plain or stamped bodies. Folded rim sherds are often broken just below the fold, so that body decoration can not be determined. Of the folded rim sherds with visible body surfaces, 82.8 percent are plain, 5.0 percent are incised, 11.7 percent are stamped, and 0.4 percent have other decorations. Stamping often occurs below the shoulder on jars, so this body decoration may be under-represented in the assemblage.

Three classes of sherds make up the majority of the pottery studied. These were unmodified, plain rim sherds with incised bodies (25.2 percent); unmodified, plain rim sherds with plain bodies (24.2 percent); and folded rim sherds with unknown body decoration (18.9 percent).

Table 2

Association of Body Decoration with Rim Form and Rim Decoration

RIM FORM/DECORATION	BODY DECORATION					
	Plain Rim*	Incised	Stamped**	Unknown	Other	Total
Unmodified, plain	1686	1780	96	170	11	3743
Folded, pinched***	326	12	46	1203	2	1589
Folded, cane punctated***	70	12	10	110	0	202
Rolled, not folded; plain	534	40	70	49	2	695
Total	2616	1844	222	1532	15	6229

Notes:

* Includes coarse plain, smooth plain, and burnished plain sherds.

** Includes undifferentiated, simple, check, and complicated stamped sherds.

*** Includes rolled and unrolled folded rim sherds.

Motif

During much of the analysis, I recorded identifiable motifs on incised and stamped sherds. This task proved to be so time consuming that I eventually gave up except when the motif was diagnostic of the Etowah (A.D. 1000-1200) or Savannah (A.D. 1200-1350) cultures. Sites of these two cultures are rare in the Oconee Valley, so I made sure that they were fully documented.

Obliteration

I noted whether the body or rim decoration was intentionally obscured or smoothed over.

Number of Incised Lines

I counted the number of separate lines on incised sherds as a way of estimating the minimum number of incised lines in a motif. There is error in this measurement because some sherds do not show the entire motif and because some motifs with spiral or cross-hatched designs cannot be easily described in this fashion. However, the measurement still proved useful for dating some sites.

Figure 2 shows the frequency distribution of incised sherds with different numbers of lines.

Incised Line Width

I measured the width of a typical line on each incised sherd. Figure 3 shows the frequency distribution of incised sherds by line width.

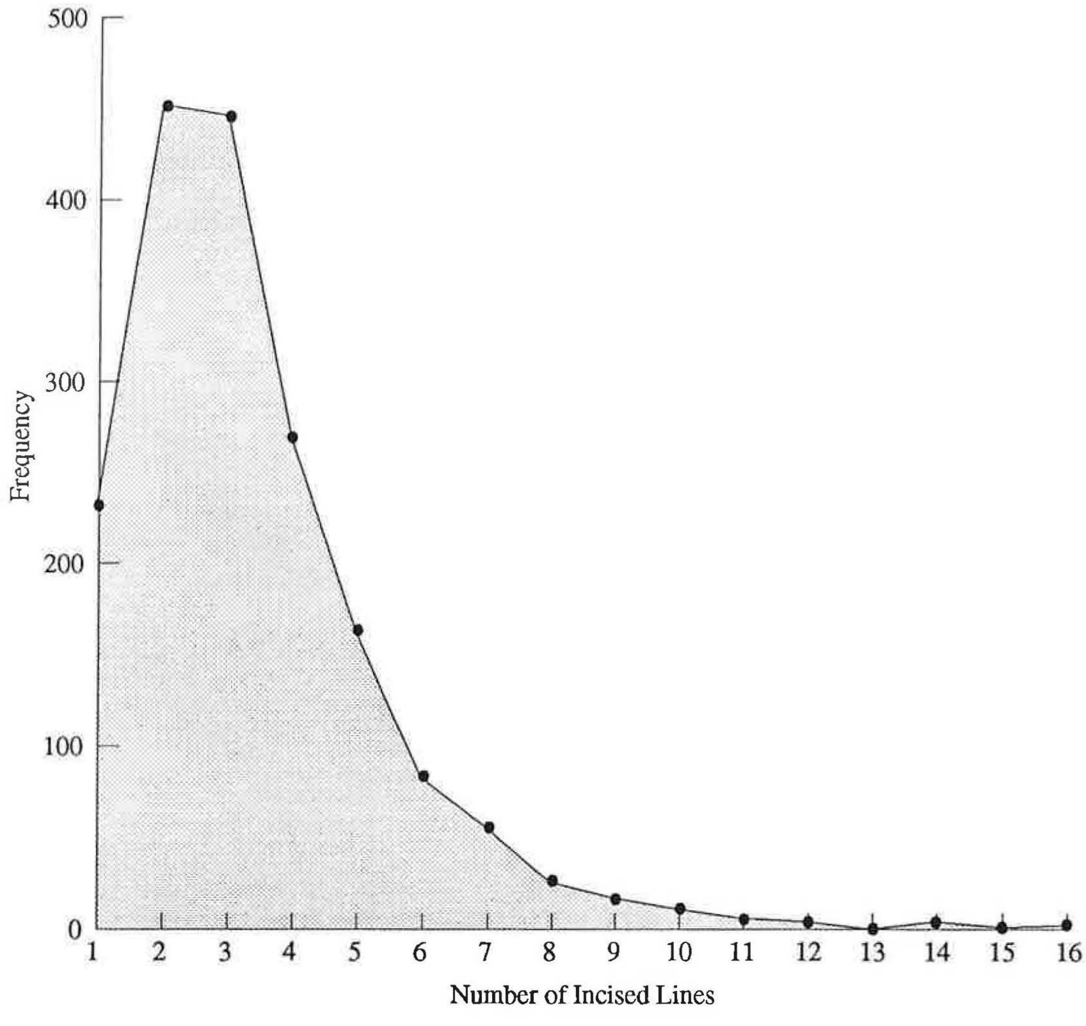


Figure 2. Frequency of Incised Sherds by Number of Lines

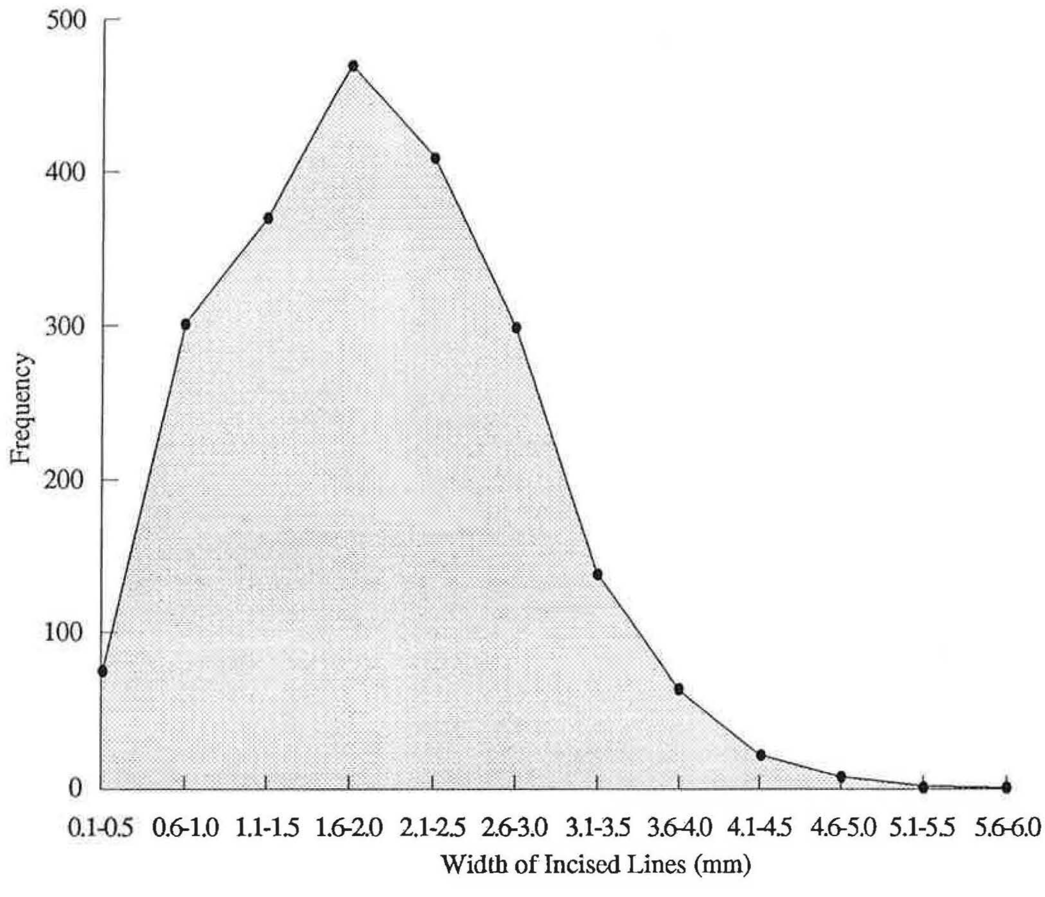


Figure 3. Frequency of Incised Sherds by Line Width

Fold Width

I measured rim folds from the lip to the base of the fold. Figure 4 shows the frequency distribution of different rim fold widths for folded pinched rims and folded, cane punctated rims.

Roll Width

I measured rolled rims from the lip to the base of the roll.

Depth of Pinching

On some sherds pinches were made with considerable pressure; on others they were made delicately and with great care; and on still other sherds the pinches were smoothed over and flattened. I recorded the depth of a pinch by measuring the vertical distance from the top of a pinched ridge to the bottom of the depression between ridges.

Orifice Diameter

I placed most rim sherds longer than 2.5 centimeters on a template to record orifice diameter. The accuracy of this measurement depends on the curvature and length of the sherd. A very small sherd was measured if its curvature was great enough to indicate that it had come from a bottle or very small jar. Long sherds were not measured if they showed very little curvature. Many rims were so unevenly formed that I could not estimate vessel diameter.

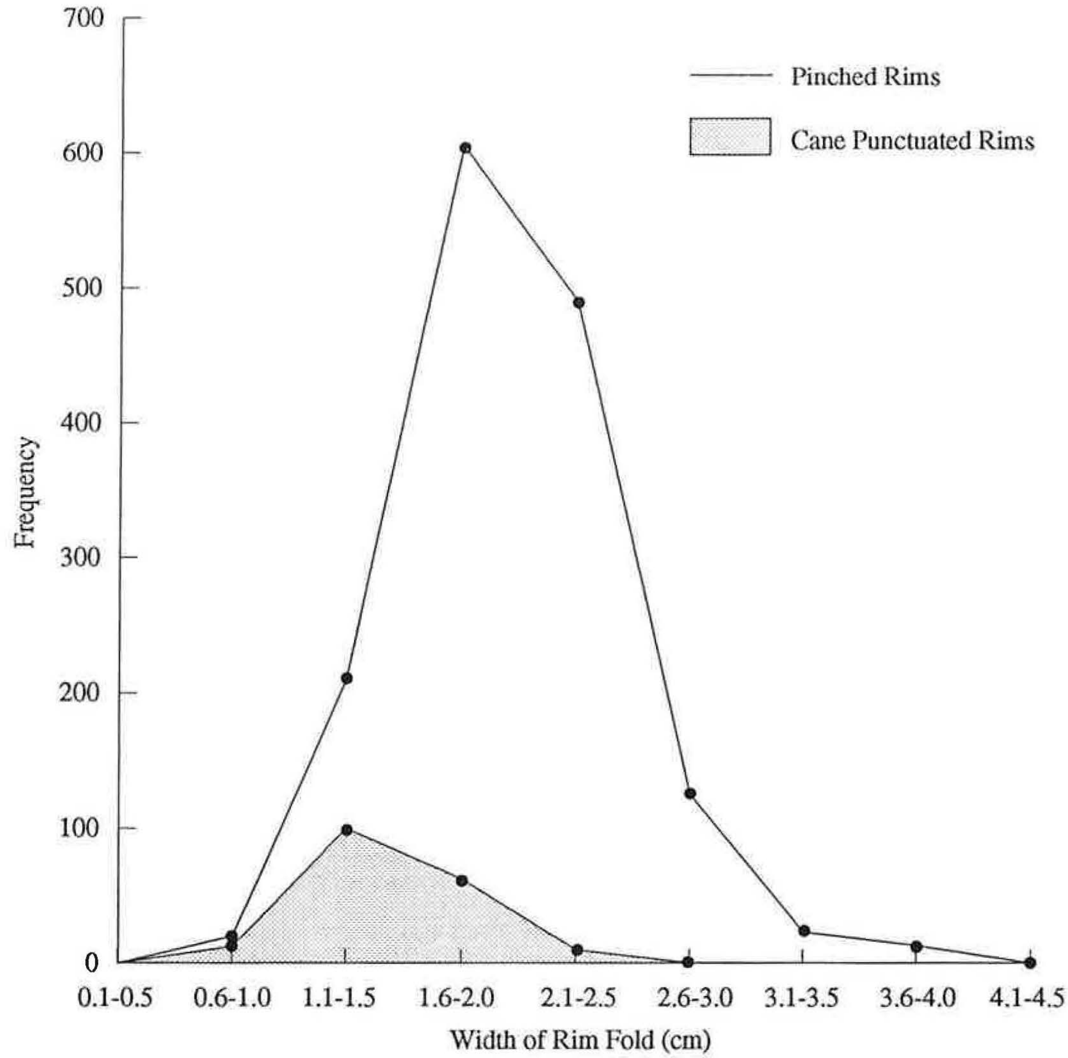


Figure 4. Frequency of Folded Rim Sherds by Rim Fold Width

Sherd Length

I measured the maximum length of a sherd along the lip.

The preceding discussion has shown the wide range of Mississippian pottery from the Lake Oconee area. In Chapter 4 I discuss the ceramic types used by others to assign sites to particular phases and the variables and attributes I employed in my own attempts to date surface collections from the Wallace Reservoir. My analysis emphasized those variables that I believed from previous experience had temporal significance. Many of these same variables have other dimensions as well--the distance between the northern and southern ends of the reservoir, site function, vessel function, and, of course, stylistic preferences of individual potters. These additional sources of variation need to be explored in the future.

CHAPTER 4

MISSISSIPPIAN SITE DENSITY IN THE OCONEE VALLEY

Understanding economic change in the Lake Oconee area requires assigning hundreds of surface collections to the appropriate phases. In this chapter I discuss the methods I used for dating the sites and estimate the number of sites occupied during different phases.

Archaeologists probably understand the Mississippian ceramic sequence in the Oconee River valley better than any other sequence in the state. Marvin Smith (1981a, 1981b, 1983) and Mark Williams (1983, 1985), in particular, have put great effort into interpreting ceramic changes in the Oconee Valley and have identified seven Mississippian phases--Armor, Stillhouse, Scull Shoals, Iron Horse, Duvall, Dyar, and Bell--that together span six centuries.

While no Mississippian phase sequence in Georgia is more reliable than the sequence for the Oconee Valley, it was not developed with small or mixed surface collections in mind. To define the phases, Smith and Williams understandably used the largest excavated pottery collections available, those from the Cold Springs, Dyar, Scull Shoals, and Joe Bell sites (Figure 5); but diagnostic traits that are uncommon in collections of hundreds of sherds may almost never occur in collections of fewer than 10 sherds. Also, because temporally sensitive variables in the Oconee Valley are often continuous, it is difficult to use the sequence to date mixed surface collections from sites occupied during two or more successive phases.

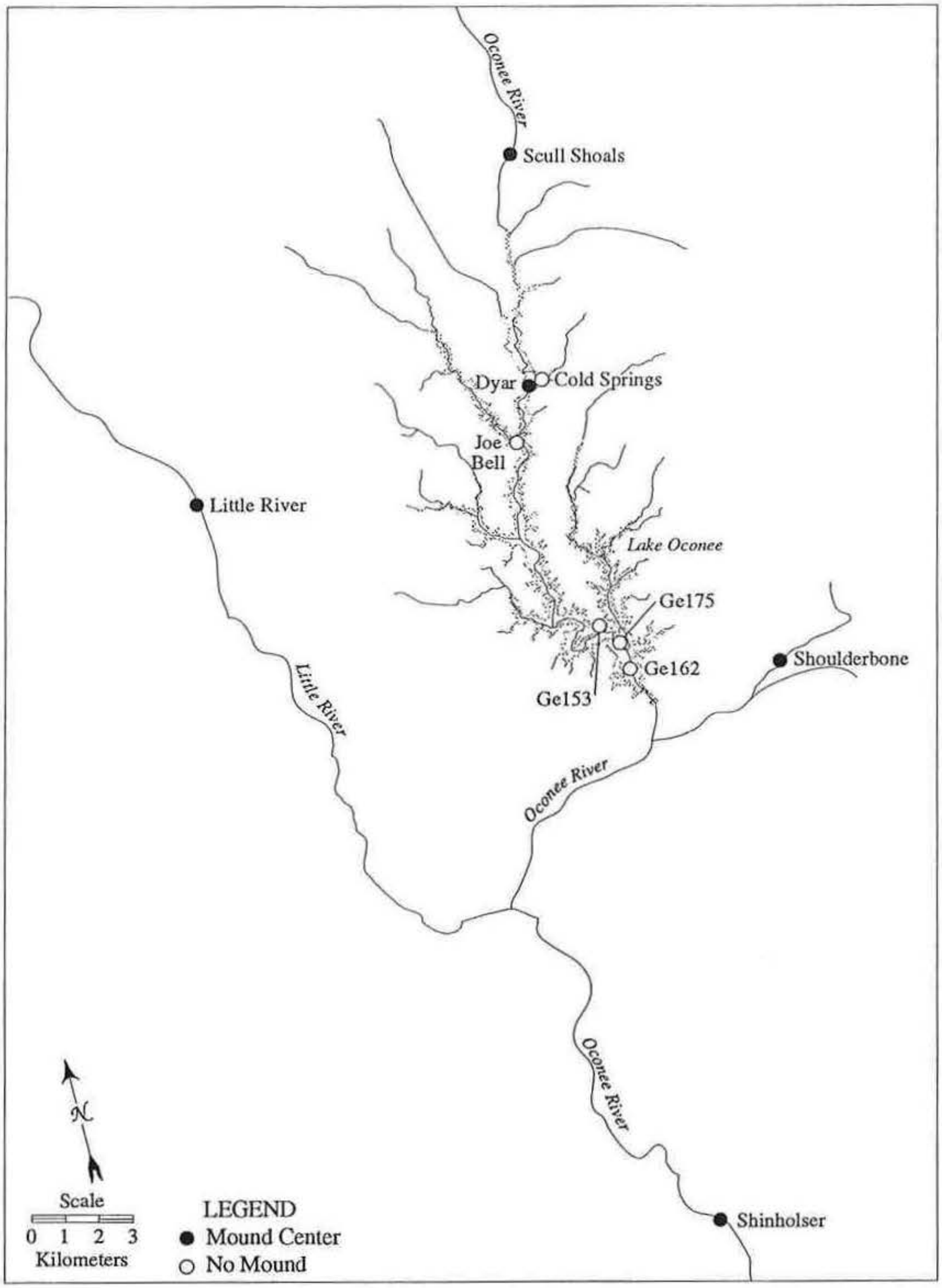


Figure 5. Various Mississippian Sites in the Oconee Watershed

The Mississippi Period in Georgia

Each generation of archaeologists discovers the inadequacy of its predecessors' nomenclature. Taxa have proliferated as new terms are invented and others redefined. Furthermore, some archaeologists carelessly employ words like *period*, *culture*, *phase*, *stage*, and *complex* interchangeably, despite caveats that this practice obscures rather than clarifies our interpretations (Willey and Phillips 1958).

The temporal and cultural taxa used in Table 3--*period*, *culture*, and *phase*--are those presented by Hally and Rudolph (1986) in a detailed summary of the late prehistoric occupation of the Georgia Piedmont. A *period* is an arbitrary span of time that has no inherent cultural meaning. By *culture* I am referring to a behaviorally and historically meaningful subdivision of the late prehistoric occupation in Georgia. The distinctions between the cultures in Table 3--Woodstock, Macon Plateau, Averett, Etowah, Savannah, and Lamar--are based primarily on ceramic variation. The distinction between *Mississippi period* and *Mississippian culture* is important because some Mississippi period cultures in the Georgia Piedmont show none of the features--platform mounds, shell tempered pottery, or intensive maize horticulture--that characterize the archetypal Mississippian culture found in the Mississippi River valley (Hally and Rudolph 1986; Wauchope 1966). A *phase* is a temporal and spatial subdivision of a culture. Archaeologists sometimes equate a phase with a society or polity (e.g., Anderson, Hally, and Rudolph 1985; Shapiro 1983), but such an inference is rarely based on solid evidence.

Table 3

Mississippian Cultural Sequence in the Oconee Watershed

Period	Culture	Phase
Late Mississippi	Lamar	Bell
		Dyar
		Iron Horse
		Duvall
Middle Mississippi	Savannah	Scull Shoals
Early Mississippi	Etowah	Stillhouse
		Armor
	Woodstock/ Macon Plateau	No Phase

AD 1600 — AD 1500 — AD 1400 — AD 1300 — AD 1200 — AD 1100 — AD 1000 — AD 900

Despite extensive survey and excavation in the Lake Oconee area, few sites were found to have clear stratigraphic separation of two or more Mississippian components. One of these is the Dyar site, which was occupied during the Stillhouse, Duvall, Iron Horse, and Dyar phases and provided most of our information about these phases. No excavated site contained stratigraphically distinct Dyar and Bell phase occupations. Information about diagnostic attributes of the Bell phase comes principally from the work of Williams (1983) at the Joe Bell site (Mg28).

To test various hypotheses about ceramic change at the Dyar site, I analyzed 372 sherds from Provenience 11 at the site. Provenience 11 has been the focus of several studies of ceramic change (Smith 1983; Rudolph 1983; Kowalewski and Williams 1988). Unfortunately, it was excavated next to the large platform mound on the site, so the collection may not be typical of any other assemblage in the Oconee Valley.

Many of the collections used in this study are very small; diagnostic attributes of a particular phase or culture might be unlikely to occur even if a collection were that age. For this reason, the presence of an attribute carried far more weight than its absence when I assigned a site to a phase.

Early Mississippi Period (A.D. 900-1200)

Four cultures found in the Georgia Piedmont date to the Early Mississippi period: Woodstock, Averett, Macon Plateau, and Etowah. Only one of these, Etowah, occurs in the Oconee Valley. The earliest Etowah phases are found in the Etowah River valley, possibly in the Chattahoochee River valley, and in the Oconee River valley (Figure 6). There are no early Etowah mound centers in Georgia, which suggests that the political organization of these groups was less complex than at the famous Macon Plateau site or at later Etowah sites.

Armor Phase: In the Oconee Valley, the Armor phase is the earliest manifestation of the Etowah culture as well as the earliest Mississippian occupation. There is no precise indication of when this phase begins. The one available radiocarbon date is A.D. 905 +/- 95 (uncorrected). Hally and Rudolph (1986) give a terminal date for the phase of around A.D. 1100.

Relatively few sites in the Oconee Valley can be associated with the Armor phase. No Armor phase components have been found outside the Wallace Reservoir area. The largest Armor phase site is Cold Springs (Ge10) (Figure 5).

Armor phase pottery is either plain or complicated stamped. Sherds are tempered with fine sand or occasionally with quartz grit; shell tempering is absent (Smith 1981b).

Most of the complicated stamped sherds from Cold Springs are too small, too weathered, or too poorly made to reveal stamping motifs. The most common motifs are the ladder base diamond, the two bar diamond, and variations of the cross diamond (Table 4) (M. Smith 1981b). Throughout the Piedmont, the ladder base diamond is a good diagnostic early Etowah motif.

Stillhouse Phase: The later Etowah culture is characterized by extensive mound

Figure 6. Major Rivers in Georgia.

Table 4

Armor Phase Motif Frequencies at 9Ge10 and 9Ge818

	Cold Springs *(9Ge10)* *	*9Ge818* **	TOTAL *N*	TOTAL *%*
One Bar Diamond	6	0	6	4.6
Two Bar Diamond	30	0	30	22.9
Ladder-Based Diamond	48	7	55	42.0
Three Bar Diamond	3	0	3	2.3
Cross Diamond (all variations)	27	1	28	21.4
Concentric Circles	1	0	1	0.8
Pseudo-Line Block	3	0	3	2.3
Other Diamond Motifs	5	0	5	3.8
TOTAL	123	8	131	100.1

Notes: * Provenience 23, Lot Number 3 and Feature 17.

** Surface collection.

building, which suggests that groups in the region witnessed an increase in sociopolitical complexity. Late Etowah phases have been defined in the valleys of the Coosawattee, Etowah, Savannah, and Oconee rivers (Figure 6).

In the Oconee Valley, the late Etowah occupation is called the Stillhouse phase (M. Smith 1981a). Most radiocarbon dates for the phase, all from the Dyar site (Ge5), are far too late to be valid; but one date of A.D. 1015 +/- 60 (uncorrected) may be reasonable. Smith (1983) dates the Stillhouse phase to A.D. 1000 to 1200.

The two largest Stillhouse components in the Wallace Reservoir are the Dyar site (Ge5) (M. Smith 1981a) and Ge162 (M. Smith 1981b) (Figure 5). Most other Etowah collections from the reservoir are too small to allow phase identification.

The Dyar site (Ge5) may be the only Stillhouse phase mound center in the Oconee Valley, although excavations at Scull Shoals to the north and Shinholser far to the south (Figure 5) suggest that Stillhouse components are present at these sites also.

The Stillhouse phase ceramic assemblage at the Dyar site (M. Smith 1981a) is almost exclusively plain or complicated stamped (Table 5). Stillhouse phase pottery is usually grit tempered, never shell tempered.

On complicated stamped sherds the two bar diamond is overwhelmingly the most common motif (Table 6). The ladder base diamond is often assumed to be strictly an early Etowah motif, but it does occur infrequently in later contexts.

I assigned sites to the Etowah culture if they contained at least one Etowah

Table 5

Stillhouse Phase Ceramic Frequencies from Dyar (9Ge5)

	N *
Rectilinear Complicated Stamped	140
Curvilinear Complicated Stamped	51
Etowah Complicated Stamped	230
Savannah Check Stamped	16
Red Filmed	4
Fabric Marked	3
Brushed	4
Incised	1
Burnished Plain	126
Smooth Plain	547
Coarse Plain	264
TOTAL	1386

Note: * Feature 50, Feature 23, and Provenience 11 (levels 14 and 15).

Table 6

Stillhouse Phase Motif Frequencies from 9Ge5 and 9Ge162

	Dyar (9Ge5) *	9Ge162 **	TOTAL N	TOTAL %
One Bar Diamond	4	4	8	6.3
Two Bar Diamond	74	21	95	74.8
Ladder-Based Diamond	2	1	3	2.4
Three Bar Diamond	4	2	6	4.7
Cross Diamond (all variations)	4	1	5	3.9
Other Diamond Motifs	9	1	10	7.9
TOTAL	97	30	127	100.0

Notes: * Provenience 23, Provenience 27, Feature 50, and Feature 23.

** Surface collection.

complicated stamped sherd. Twenty-four sites are classified as Etowah and seven sites are possibly Etowah. Some of these were identified by other researchers. I could not distinguish sites of the Armor phase from those of the Stillhouse phase using surface collections alone.

With the exception of the occupations at Dyar, Cold Springs, and Ge162, Etowah components in the project area are very small. Of the 22 definite or possible Etowah sites I personally analyzed, nine had only one diagnostic sherd, seven had two sherds, five had three sherds, and one site had five sherds.

Middle Mississippi Period (A.D. 1200-1350)

The Middle Mississippi period occupation in the Georgia Piedmont happens to correspond to only one culture, Savannah (Table 3). Archaeologists have excavated Savannah sites in the Coosawattee, Etowah, Oconee, and Savannah river drainages (Figure 6).

The Savannah culture differs from those preceding it in its pottery, which is often curvilinear complicated stamped or check stamped, and in the level of sociopolitical complexity, as reflected in the frequent construction of platform mounds and earthlodges (Hally and Rudolph 1986; Rudolph 1984).

Scull Shoals Phase: The Savannah culture occupation in the Oconee River valley is called the Scull Shoals phase (Williams 1985). There are no radiocarbon dates from Scull Shoals phase contexts, but dates from other Savannah phases suggest that the Scull Shoals phase dates to the thirteenth and fourteenth centuries. Hally and Rudolph (1986) give dates of about A.D. 1200 to 1350.

There is little evidence of a Scull Shoals phase occupation in the Wallace Reservoir proper, although there are definite Savannah mound centers only a short distance to the north (Scull Shoals) and south (Shinholser) (Figure 5).

Most of the pottery from the Scull Shoals site--nearly 90 percent--is plain or unidentifiable (Table 7). Only 11 percent of the sherds--Savannnah complicated stamp, Savannah check stamp, and corncob impressed--indicate the Savannah culture. Even these types are not strictly diagnostic, since they apparently occur in low frequencies in the Stillhouse phase assemblage at the Dyar site (Smith 1981a).

I assigned sites to the Savannah culture if they contained Savannah complicated stamped pottery, usually with either barred circle or bull's-eye motifs; corn cob impressed pottery; or Savannah check stamped pottery.

It is difficult to distinguish Etowah and Savannah sites from surface collections alone. Archaeologists in Georgia have traditionally distinguished Etowah complicated stamped pottery from Savannah complicated stamped pottery on the grounds that Etowah pottery had rectilinear motifs and Savannah pottery had curvilinear motifs. This made for a chronological sequence far simpler than the data justified, for Middle Mississippi period assemblages often contain both rectilinear and curvilinear motifs (Rudolph and Hally 1985). A surface collection with one or two Etowah complicated stamped sherds might date to the Savannah period, and a few Savannah complicated stamped sherds can occur on an Etowah site.

Table 7

Scull Shoals Phase Ceramic Frequencies from 9Ge4

	N *
Rectilinear Complicated Stamped	320
Curvilinear Complicated Stamped	266
Unidentified Stamped	955
Savannah Check Stamped	137
Simple Stamped	1
Red Filmed	35
Cord Marked	23
Corn Cob Impressed	11
Incised	6
Punctated	16
Plain (smooth and coarse)	2934
Burnished Plain	474
TOTAL	5178

Note: * From lower 30 centimeters of premound level, Unit 4 (Provenience 11), Mound A.

Seven sites in the reservoir are classified as Savannah and 12 sites are classified as possibly Savannah. Two sites, Ge10 (Cold Springs) and Ge818, appear to have both a definite Etowah component and a probable Savannah component (Smith 1983; Teresa Rudolph, personal communication 1989).

Of the 16 definite or possible Savannah sites I analyzed, 13 had a single diagnostic sherd, two sites had two sherds, and one site had four sherds.

Late Mississippi Period (A.D. 1350-1650)

The Late Mississippi period occupation in Georgia is associated with the Lamar culture. Over the past half century the word *Lamar* has modified virtually every taxon known to southeastern archaeologists: *ceramic series* (Ferguson 1971), *ceramic assemblage* (Shapiro 1983), *ceramic style* (Fairbanks 1952; Ferguson 1971; Russell 1975), *ceramic complex* (Sears 1952), *ceramic continuum* (Caldwell 1957), *phase* (Dickens 1976; Willey and Phillips 1958), *focus* (Caldwell 1952; Kelly 1938), *aspect* (Caldwell 1952; Fairbanks 1940, 1952; Sears 1958), *culture* (Caldwell 1952; Fairbanks 1952; Hally and Rudolph 1986; Russell 1975; Sears 1958), *complex* (Fairbanks 1950; Miller 1948; Sears 1958), *cultural complex* (Fairbanks 1956), *horizon* (Caldwell 1957; Fairbanks 1946; Ferguson 1971; Kelly 1938; Sears 1950, 1956, 1958; Willey 1939), *horizon style* (Ferguson 1971; Kelly and Larson 1957), *tradition* (Caldwell 1955, 1957; Sears 1952), *period* (Caldwell 1957; Fairbanks 1952, 1956; Rudolph and Blanton 1980; Sears 1952, 1958; Shapiro 1983), *entity* (Russell 1975; Sears 1956), and *phenomenon* (Ferguson 1971; Penman 1976). Not surprisingly, many archaeologists ignore the dilemma entirely by using *Lamar* as a noun rather than an adjective, or, as if the term were too precise, by using *Lamar-like*, *Lamar variant*, and *Lamaroid* (Russell 1975).

There are various Lamar phases throughout the Georgia Piedmont (Hally and Rudolph 1986), as well as phases on the coast of Georgia, in South Carolina, and in western North Carolina that could be assigned to Lamar.

Lamar pottery is usually grit tempered and has two basic vessel shapes, constricted neck jars and incurving rim bowls. Both vessel shapes come in a variety of sizes (Hally 1983, 1984; Shapiro 1983). The jars are usually plain or complicated stamped. Complicated stamping is almost invariably poorly executed, overstamped, or smeared. Jars often have folded or applique strips added to the rim. Lamar bowls often have incurving or carinated rims with pronounced shoulders. Bowls generally have incised decorations above the shoulder and plain or complicated stamped surfaces below the shoulder. Incised motifs are usually variations on the guilloche and the interlocking scroll-and-plateau.

In discussing the various Lamar phases--Duvall, Iron Horse, Dyar, and Bell--I will be using excavated data whenever possible to establish chronologically sensitive variables suitable for dating surface collections.

Duvall Phase: In the Oconee River valley, the earliest Lamar occupation is called the Duvall phase. Duvall phase sites are relatively common and include at least two mound centers--Dyar (Ge5) in the Wallace Reservoir (M. Smith 1981a) and

Shoulderbone (Hk1) below Wallace Dam (Mark Williams, personal communication 1986) (Figure 5).

There are four radiocarbon dates for the Duvall phase, all from the Dyar site. Hally and Rudolph (1986) give a range of A.D. 1350 to 1450. Smith (1983) gives a range of A.D. 1300 to 1450.

Marvin Smith has analyzed over 4000 sherds from the Duvall phase assemblage at the Dyar site (1981a: Tables 3, 7, and 8). The predominant types in the sample include rough plain, smooth plain, burnished plain, Morgan incised, and complicated stamped (Table 8). The plain types together comprise over 80 percent of the sherds from several Duvall phase contexts.

It is clear from data at the Dyar site and elsewhere, that folded pinched rims become wider through time (Rudolph 1983). Variation in the width of folded rims was illustrated previously in Figure 4. The precise range of widths for Duvall phase pinched rim sherds is more obscure. In the lower Duvall phase strata at Dyar, the mean fold width for folded, pinched rims is 13.1 millimeters and the standard deviation is 2.7 millimeters. I decided, therefore, that folded, pinched rims less than 16 millimeters wide would be assigned to the Duvall phase. In the lower strata, there are 41 measurable folded, pinched rims of which 78 percent can be assigned to the Duvall phase using this criterion. Forty-two sherds in the upper Dyar phase strata in Provenience 11 had measurable folded pinched rims, of which four sherds are classified as Duvall. These four sherds could be evidence either that the 16 millimeter cut-off is too wide or that there was mixing between the strata.

Table 8

Duvall Phase Ceramic Frequencies from Dyar (9Ge5)

	N *
Bold Incised	2
Medium Incised	7
Fine Incised	7
Morgan Incised	55
Curvilinear Complicated Stamped	124
Rectilinear Complicated Stamped	214
Etowah Complicated Stamped	46
Brushed	3
Check Stamped	3
Punctated	4
Corn Cob Impressed	1
Red Filmed	1
Burnished Plain	336
Smooth Plain	2613
Coarse Plain	686
TOTAL	4102

Note: * From Structure 1, Structure 4, and Provenience 11 (levels 10, 11, and 12).

Rudolph and Blanton (1980) assumed that all folded, cane punctated rims were early Lamar, that is, Duvall phase. I have found in the current analysis that the fold width of cane punctated rim sherds from throughout the reservoir ranges from 8 to 28 millimeters. Some are so wide that they could be much later than the Duvall phase. Based on data from the Dyar site, I have decided that cane punctated rim folds narrower than 19 millimeters will be called Duvall phase. Using 19 millimeters as the cut-off, 88 percent of folded, cane punctated rims at Dyar and 87 percent of those at other sites in the project area are classified as Duvall phase.

Morgan incised pottery has very narrow vertical or cross-hatched lines on the necks of jars. I consider Morgan incised diagnostic of the Duvall phase because of its stratigraphic context at the Dyar site. Recently, however, Kowalewski and Hatch (1991) have suggested that this type also occurs during the Iron Horse phase (see below). Additional data from Iron Horse phase contexts are needed to determine this type's value for dating sites.

Duvall phase Lamar incised pottery generally has three parallel lines in a simple scroll pattern. Lamar incised vessels are rare during the Duvall phase, and the simple scroll motifs of the early Lamar period are uncommon. Most incised sherds in the collection had one, two, or three lines; but the entire motif, had it been visible, probably would have contained more than three lines.

At Dyar, only 12 sherds (5 percent) in the lower Duvall phase strata are incised. Of these, seven also have folded, cane punctated rims. The other five sherds are Lamar incised, but do not show a complete motif.

Complicated stamping is more common on early Lamar sites than on later sites. Most complicated stamped sherds in the collection are too poorly executed to allow motif identification. For this reason, sherds that are complicated stamped, are clearly not Etowah or Savannah types, and do not have definite Dyar or Bell phase rims are classified as possibly Duvall phase.

In summary, I have assigned sites to the Duvall phase if they contain folded, cane punctated rims with folds less than 19 millimeters wide; folded rims, other than cane punctated rims, with folds less than 16 millimeters wide; Morgan incised sherds; or Lamar incised sherds on which the entire motif is a simple scroll pattern of two or three parallel lines. Sites are classified as possibly Duvall phase (and possibly Dyar phase) if they contain folded rims, other than cane punctated rims, exactly 16 millimeters wide, or if they contain poorly executed complicated stamped sherds with no other diagnostic attributes.

In all, 463 sherds in the collection are assigned to the Duvall phase and 197 are considered possibly Duvall phase. I have assigned 164 sites to this phase and I believe that 58 additional sites are possibly associated with this phase.

Duvall or possible Duvall surface collections are usually very small. Of the 222 sites, 108 sites have only one definite or possible Duvall sherd, 50 have two sherds, 44 have from three to five sherds, 14 have from six to 10 sherds, and six have more than 10 sherds. The latter include Provenience 11 at the Dyar site, which has 106 definite or possible Duvall rim sherds.

Iron Horse Phase: The Iron Horse phase follows the Duvall phase. At Ge5

Smith (1983) found that some of the pottery seemed transitional between Duvall phase and Dyar phase assemblages. The Dyar phase as originally defined was therefore subdivided into Early Dyar phase and Late Dyar phase. However, no one felt confident enough to create a completely new phase until Mark Williams successfully distinguished an Early Dyar component at the Scull Shoals site (Ge4). He assigned the early component to the Iron Horse phase and decided that all Late Dyar phase sites should be identified as simply Dyar phase.

There is relatively little information about the Iron Horse phase *per se*; therefore, much of the following discussion is derived from descriptions of early Dyar phase sites and pottery.

Iron Horse phase, or early Dyar phase, sites have been identified throughout the Wallace Reservoir. Excavated sites probably affiliated with the Iron Horse phase include Dyar (Ge5), Ogeltree (Ge153), Ge175, and Scull Shoals (Ge4) (Figure 5).

There are no radiocarbon dates for the Iron Horse phase, but Williams estimates a date range of A.D. 1450 to 1525.

Pottery types present in Iron Horse phase contexts include rough plain, smooth plain, burnished plain, Lamar incised, Morgan incised, and complicated stamped (Table 9). Morgan incised is less common in the Iron Horse phase than in the Duvall phase and Lamar incised is more common. Complicated stamped pottery is slightly more common than before. Plain types are less abundant than during the Duvall phase, but they still comprise the majority of the pottery.

Both Morgan incised and Lamar incised motifs are generally the same

Table 9

Iron Horse Phase Ceramic Frequencies from Dyar (9Ge5)

	N *
Bold Incised	21
Medium Incised	65
Fine Incised	12
Morgan Incised	11
Curvilinear Complicated Stamped	92
Rectilinear Complicated Stamped	113
Etowah Complicated Stamped	20
Brushed	1
Simple Stamped	3
Check Stamped	2
Corn Cob Impressed	5
Fabric Marked	2
Burnished Plain	164
Smooth Plain	1027
Coarse Plain	164
TOTAL	1702

Note: * Structure 2 and Provenience 11 (levels 4, 5, and 6).

during the Iron Horse phase as those made earlier. Complicated stamped sherds are usually poorly executed, but figure-nine and filfot-cross motifs have been observed on a few sherds.

Rims are predominantly plain, folded and pinched, or folded and punctated. Folded pinched rims are much more common than folded punctated rims, the opposite of the Duvall phase pattern.

I have chosen not to use the Iron Horse phase or the most recent definition of the Dyar phase in dating the surface collections from the reservoir. Criteria used so far to define the Iron Horse phase are often based on gradual changes in attribute frequency that cannot be detected in small or mixed collections. I attempted to distinguish Iron Horse phase collections from later Dyar phase collections, but found that far too many sites appeared to have both components represented. Since I have been unable to distinguish confidently Iron Horse phase sites from sites that are slightly later, I have decided to assign all sites occupied between the Duvall phase and the Bell phase to one phase, Dyar.

Dyar Phase: Dyar phase sites are very common in the Oconee River valley from Watkinsville south to the fall line (Rudolph and Blanton 1980). Dyar phase mound centers include Scull Shoals, Dyar, possibly Ge35, and Shinholser (Figure 5). The Dyar phase community in the Oconee Valley was probably visited in A.D. 1540 by the de Soto expedition. De Soto's chroniclers described the area as the province of Ocute, the principal chief (Smith and Kowalewski 1980; Shapiro 1983).

There are five radiocarbon dates available for the Dyar phase; all come from the Dyar site. Hally and Rudolph (1986) and Smith (1983) all have the phase ending at A.D. 1600, but their initial dates apply to the beginning of the Iron Horse phase. Under the definition of the Dyar phase used here, the phase would begin at A.D. 1450.

A sample of 3100 sherds from Dyar phase contexts at the Dyar site (M. Smith 1981a: Table 8) includes coarse plain, smooth plain, burnished plain, complicated stamped, and Lamar incised (Table 10). Complicated stamping is less common during the Dyar phase than during Duvall. Stamping is still very poorly executed. Morgan incised sherds are completely absent by the late Dyar phase. The frequency of Lamar incised pottery has increased substantially. Incising motifs during this phase consist of four to eleven lines and a variety of scroll-and-plateau designs.

Average incised line width is greater on Dyar phase sherds than on sherds of other Lamar phases in the Oconee Valley. Bold incising, which is more than 2 millimeters wide, is generally considered a Dyar phase trait, because incising is very rare during the preceding Duvall phase and is common but usually narrower during the later Bell phase. During the Bell phase, motifs with many lines become more common. Therefore, sherds with incised lines more than 2 millimeters wide and sherds with motifs containing from three to eight lines are classified as Dyar phase. If incised sherds have fewer than four lines that are also less than 2 millimeters wide or if sherds have more than eight lines that are also 1 to 2 millimeters wide, then I classify them as possibly Dyar phase or possibly Bell

Table 10

Dyar Phase Ceramic Frequencies from Dyar (9Ge5)

	N *
Bold Incised	34
Medium Incised	320
Fine Incised	87
Curvilinear Complicated Stamped	47
Rectilinear Complicated Stamped	62
Etowah Complicated Stamped	2
Brushed	1
Fabric Marked	1
Punctated	1
Burnished Plain	211
Smooth Plain	1159
Coarse Plain	335
TOTAL	2260

Note: * From Provenience 11 (levels 2 and 3).

phase.

Rims are either unmodified or folded and pinched; punctated rims are absent. The width of rim folds is significantly greater than during the preceding phases (Rudolph 1983). For the Dyar phase strata in Provenience 11 at the Dyar site, the mean rim fold width is 19.7 millimeters and the standard deviation is 3.8 millimeters. I decided that rim folds greater than 16 millimeters wide and less than 28 millimeters wide would be assigned to the Dyar phase unless they were cane punctated.

In summary, I have assigned sites to the Dyar phase if they contain folded rims, other than cane punctated rims, with folds 17 to 27 millimeters wide; Lamar incised sherds with lines more than 2 millimeters wide; or Lamar incised sherds with complete motifs containing four to eight lines. I consider folded rims, other than cane punctated rims, that are exactly 16 millimeters wide and poorly executed complicated stamped sherds with no other diagnostic attributes to be possibly Dyar phase or possibly Duvall phase. Folded rims, other than cane punctated rims, that are exactly 28 millimeters wide; Lamar incised sherds with complete motifs having no more than three lines, all of which are less than 2 millimeters wide; and Lamar incised sherds with complete motifs having more than eight lines and lines 1 to 2 millimeters wide are possibly Dyar phase or possibly Bell phase.

A total of 2493 sherds from the analyzed sample are Dyar phase, 200 sherds are possibly Duvall or Dyar phase, and 805 sherds are possibly Dyar or Bell phase. I have classified 417 sites as Dyar phase and 58 additional sites as possibly Dyar phase.

Of the definite and possible Dyar phase sites, 112 had only one diagnostic or possibly diagnostic sherd, 85 had two sherds, 117 had three to five sherds, 128 had six to 20 sherds, 30 had 21 to 100 sherds, and three sites (Dyar, Ge550, and Pm250) had more than 100 diagnostic sherds. It is evident that Dyar phase collections tend to have many more sherds that Duvall phase collections.

Bell Phase: The Bell phase is the latest Mississippi period occupation in the Oconee Valley.

The major excavated Bell phase component is the Joe Bell site (Mg28) (Williams 1981) (Figure 5). Mark Williams excavated this site and dates the Bell phase to A.D. 1600 to 1650.

No platform mounds date to the Bell phase. There are, however, many small Bell phase sites in the reservoir and in the surrounding uplands.

Williams (1981) determined that during the Bell phase, complicated stamped pottery was nearly absent. Incising, on the other hand, was common, and the motifs often contained numerous fine lines.

Rim forms include unmodified rims, very wide folded and pinched rims, and T-rims.

The Dyar site was not occupied during the Bell phase, and the Dyar site sample contained only one folded rim sherd wider than 28 millimeters. I feel, therefore, that 28 millimeters is a reasonable cut off for identifying Bell phase folded rims.

The T-rim does not occur at Dyar. It is generally a strong indicator of the Bell phase as defined at Mg28 (Williams 1983).

None of the incised sherds from Provenience 11 at the Dyar site has eight or more narrow lines. Therefore, this also seems to be a reasonable criterion for identifying a Bell phase incised sherd.

I have assigned sites to the Bell phase if they contain folded, pinched rims with folds more than 28 millimeters wide and no evidence of stamping; T-rims; or Lamar incised sherds with complete motifs having more than eight lines that are also less than 1 millimeter wide. I have classified sites as possibly Bell phase (and possibly Dyar phase) if they contain folded rims, other than cane punctated rims, that are exactly 28 millimeters wide; Lamar incised sherds with motifs having fewer than four lines that are also less than 2 millimeters wide; and Lamar incised sherds with motifs having more than eight lines that are between 1 and 2 millimeters wide.

A total of 154 sherds are definitely Bell phase and 805 sherds are possibly Bell phase. As a result, 97 sites are definitely Bell phase sites and 208 are possibly Bell phase sites, for a total of 305 sites. Of these, 127 sites had only one sherd, 76 sites had two sherds, 65 sites had three to five sherds, 35 sites had six to 20 sherds, and two sites had more than 20 sherds.

Discussion

A variety of information was used to date sites in the Oconee Valley, but the most important were the presence of the following:

- o Etowah complicated stamped motifs (Etowah culture)
- o Savannah complicated stamped motifs (Savannah culture).
- o Cane punctated rim folds narrower than 19 millimeters (Lamar culture, Duvall phase).
- o Folded rims, other than cane punctated rims, with folds less than 16 millimeters wide (Duvall phase); with folds 17 to 27 millimeters wide (Lamar culture, Dyar phase); and with folds more than 28 millimeters wide and with no evidence of stamping (Lamar culture, Bell phase).
- o Morgan incised sherds (Duvall phase).
- o Lamar incised sherds with complete motifs having two or three parallel lines (Duvall phase); with lines more than 2 millimeters wide or with complete motifs containing four to eight lines (Dyar phase); and with complete motifs having more than eight lines that are also less than 1 millimeter wide (Bell phase).
- o T-rims (Bell phase).

Appendix A lists the components and the number of diagnostic sherds associated with each of the sites analyzed. I analyzed 602 collections in all. Of these, 520 contain Mississippian pottery, 38 had only Mississippian projectile points, and 45 were redefined as non-Mississippian. I also had information on the components present at 13 other sites whose collections I did not analyze. In all, I identified 24 definite and seven possible Etowah components, seven definite and 12 possible Savannah components, 164 definite and 58 possible Duvall components, 417 definite and 58 possible Dyar components, and 97 definite and 208 possible Bell components. Fifty-eight analyzed sites, usually those with only one or two sherds or a single projectile point, can not be classified. I was unable to analyze collections from 406 sites. One hundred twenty of these were artifact occurrences that would have contained fewer than 10 lithic and ceramic artifacts. It is likely that most of these contain only one or two sherds.

CHAPTER 5

ENVIRONMENTAL SETTING

The purpose of this chapter is to describe the resources available to the late prehistoric inhabitants of the Oconee Valley. This information will be especially important in Chapter 6, where I examine temporal variation in settlement patterns. I begin with a general description of the Georgia Piedmont and then proceed to a more specific discussion of the Oconee Valley, including the terrain, the characteristics of the Oconee River and its tributaries, soils, vegetation, and fauna.

The Piedmont

Lake Oconee lies within a region known to both scientists and laymen as the Piedmont. In 1791 the naturalist William Bartram described the region as it appeared along the Savannah River, about 100 kilometers east of the project area:

> ...from Augusta the mountainous country begins (when compared to the level sandy plain already passed), although it is at least an hundred and fifty miles west, thence to the Cherokee or Apalachean mountains; and this space may with propriety be called the hilly country, every where fertile and delightful, continually replenished by innumerable rivulets, either coursing about the fragrant hills, or springing from the rocky precipices, and forming many cascades; the coolness and purity of which waters invigorate the air of this otherwise hot and sultry climate (Van Doren 1928:53).

His words would have fit the Oconee Valley just as well.

The Piedmont is a belt of igneous and metamorphic rocks stretching from eastern Alabama to New York. The width of this province ranges from 40 kilometers northeast of Virginia to 200 kilometers in Georgia. To the north and west are the Blue Ridge mountains; to the south and east lie the Atlantic and Gulf Coastal Plains.

Lake Oconee is 40 to 70 kilometers north of the level Coastal Plain and 120 to 150 kilometers south of the rugged mountains (Figure 7). Unlike the areas closer to the mountains, the lower Piedmont is gently rolling and contains very broad interfluves whose summits present a nearly level skyline. This terrain is formed by the region's distinctive geological structure and by millions of years of erosion and dissection that transformed it into a peneplain, a gently undulating surface of low relief.

The fall line, the southern border of the Piedmont, occurs where piedmont and coastal plain rocks overlap. In some places there are escarpments, shoals, and waterfalls, but often the transition between the two regions is gradual and difficult to observe. The fall line has also been defined as an imaginary line connecting the heads of navigation on rivers of the Atlantic and Gulf slopes.

The modern climate of the Piedmont is characterized by long, hot summers and short, mild winters. Annual rainfall averages around 115 to 130 centimeters. Normally about 28 percent of the annual precipitation falls in the spring, 27 percent in the winter, 27 percent in the summer, and 18 percent in the fall (Payne 1976).

The last freeze of the winter usually comes by the end of March, but crop-damaging freezes in mid-April are frequent enough to be a hazard. Spring is short and stormy, and spring rainfall often comes in the form of thunderstorms.

Summer begins in late May and lasts until September. Maximum daily

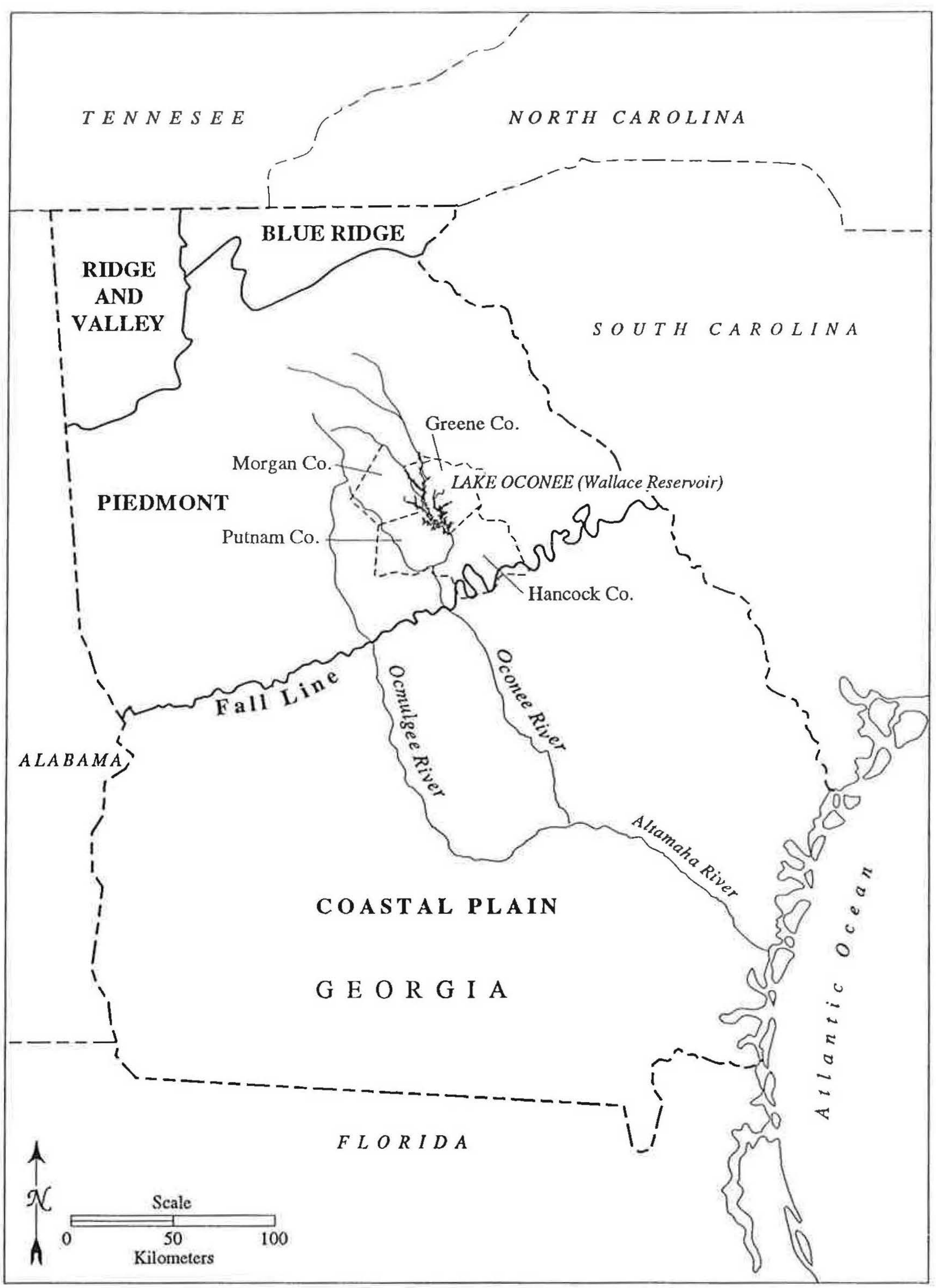


Figure 7. Physiographic Provinces in Georgia

temperatures during the summer often exceed 32 degrees C. As in the spring, precipitation occurs mainly as afternoon thunderstorms, but the frequency of storms is greater during the warmer months. Despite the relative overall abundance of rainfall in Georgia at this time of year, it is distributed across the state irregularly and localized droughts may occur (Carter 1978).

Cooler autumn weather arrives in late September, and fall is usually the mildest and driest season of the year. The first freeze typically occurs in November; only rarely does it occur as early as mid-October.

Afternoon temperatures in the winter are usually around 10 degrees C; temperatures below -7 degrees C occur occasionally. Winter rainfall, unlike summer rainfall, is usually uniform over a large area. Snowfall is rare in the Lake Oconee area.

The Oconee River Valley

The headwaters of the Oconee River arise in the Piedmont north of Athens (Figure 1). The Oconee itself is formed south of Athens by the Middle Oconee and North Oconee rivers and winds its way through the lower Piedmont and upper Coastal Plain to join the Ocmulgee River in forming the Altamaha. Bordering drainages are the Ocmulgee to the west, the Chattahoochee to the north, the Savannah to the northeast, and the Ogeechee to the southeast (Figure 6).

In humid climates, such as that in Georgia, chemical weathering of igneous and metamorphic rocks often produces a soft, red, clayey, decomposed rock layer known as saprolite, from which soils eventually form. In some parts of the

Piedmont, the saprolite is very thick and the bedrock lies far below the present surface, but in the project area, bedrock sometimes lies at the surface.

Over millions of years the Oconee and other streams flowing toward the Atlantic have cut into the piedmont surface more and more deeply. Often these rivers encounter resistant layers of bedrock that slow the downcutting. For example, in the southernmost part of the study area, the Oconee flows across the Siloam granite. This bedrock formation has kept the river from changing course very often, so the valley is narrow, floodplain is limited, and shoals are large and extensive. Stream gradient here is over 1.9 meters per kilometer (Figure 8). In the northern part of the study area, gradual uplift has caused the Oconee to meander. Stream gradient is less than 40 centimeters per kilometer (Figure 8). Here the valley is broad, floodplain is extensive, shoals are rare, and swamps are more common than to the south.

Summit elevations of hills and ridges in the project area range from 122 meters to 220 meters above sea level, with a mode of 174 meters. Floodplain elevations range from 134 meters at the northern end of the project area to 110 meters at the southern end. Hilltops are usually 30 to 60 meters higher than nearby bottomlands.

A few kilometers above Wallace Dam in the vicinity of shoals and islands, the Oconee River's channels have a combined width of 300 meters or more. At the northern end of the reservoir, the river is only 50 meters across.

Major tributaries of the Oconee include the Apalachee River and Richland Creek. Smaller tributaries of the Oconee include Greenbrier Creek, Town Creek,

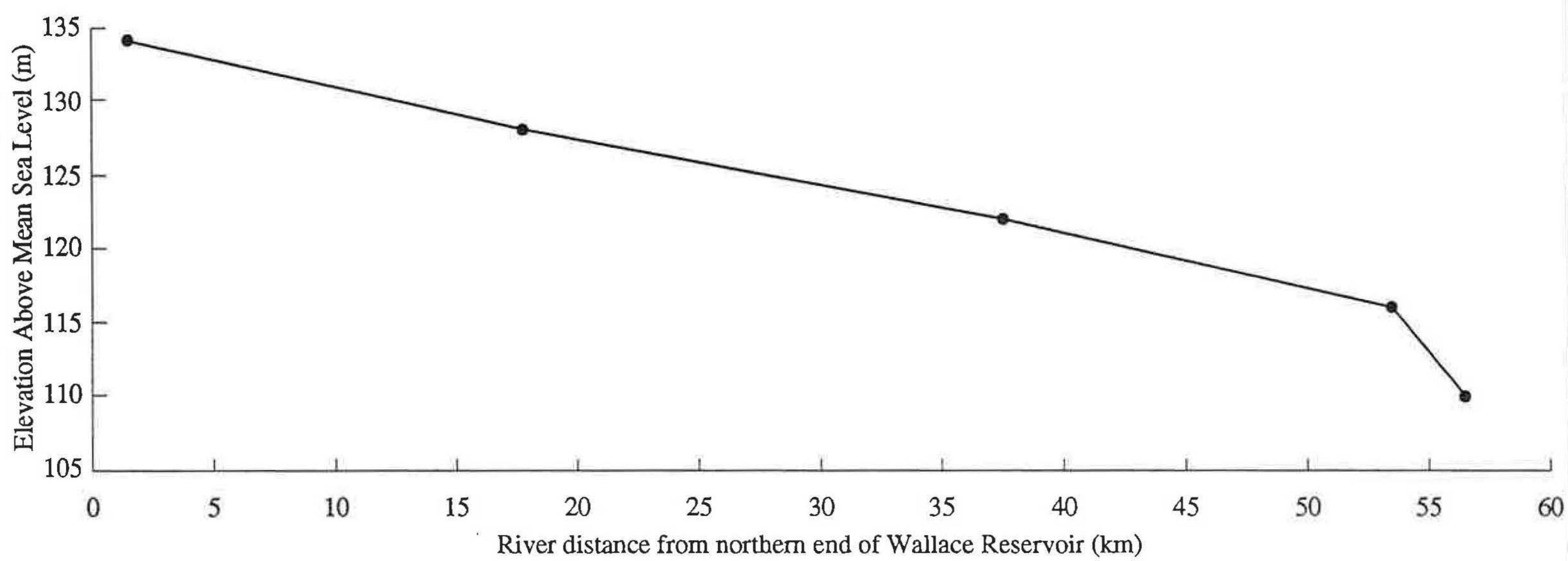


Figure 8. Oconee River Stream Gradient within the Wallace Reservoir

Sugar Creek, and Lick Creek, some of which have been channelized during the past century.

Streamflow of the Oconee River and other piedmont streams can vary dramatically from season to season and year to year. At a gaging station on the Oconee near Greensboro, discharge was recorded for 70 years (1903 to 1932 and 1937 to 1978). The mean daily discharge rate was 1441 cubic feet per second (cfs); the minimum daily discharge rate was 59 cfs in October, 1959; and the maximum daily discharge rate was 53,300 cfs in August, 1908. The mean minimum daily discharge rate for the 70 years of observation is 276 cfs; the mean maximum daily discharge rate is 13,811 cfs (raw data provided by Roger D. McFarlane, Water Resources Division, U.S. Geological Survey). Figure 9 illustrates annual variation in the mean daily discharge rate for the Oconee River at Greensboro.

Flooding occurs most often in the late winter or early spring, when region-wide rainstorms, sparse vegetation, and frozen or saturated ground increase runoff. Flooding is less frequent during the summer and is more likely to occur as freshets along smaller tributaries than on the main river. Figure 10 illustrates the frequency at which certain months are likely to have one of the three highest mean monthly discharge rates in a year. Clearly, flooding may occur year-round, but is most likely during the late winter and early spring.

Soils

The study area contains typical piedmont soils, usually reddish, acidic,

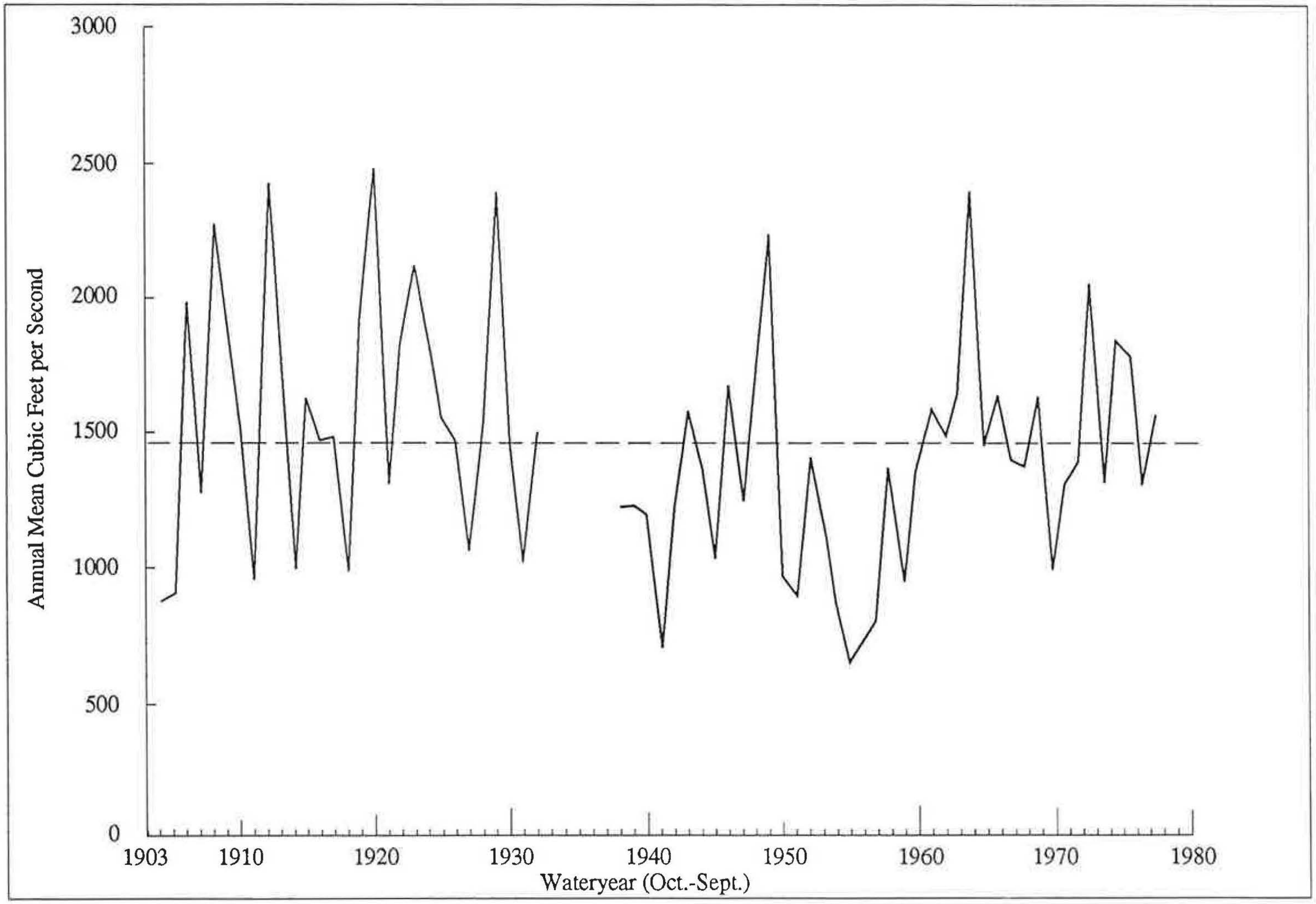
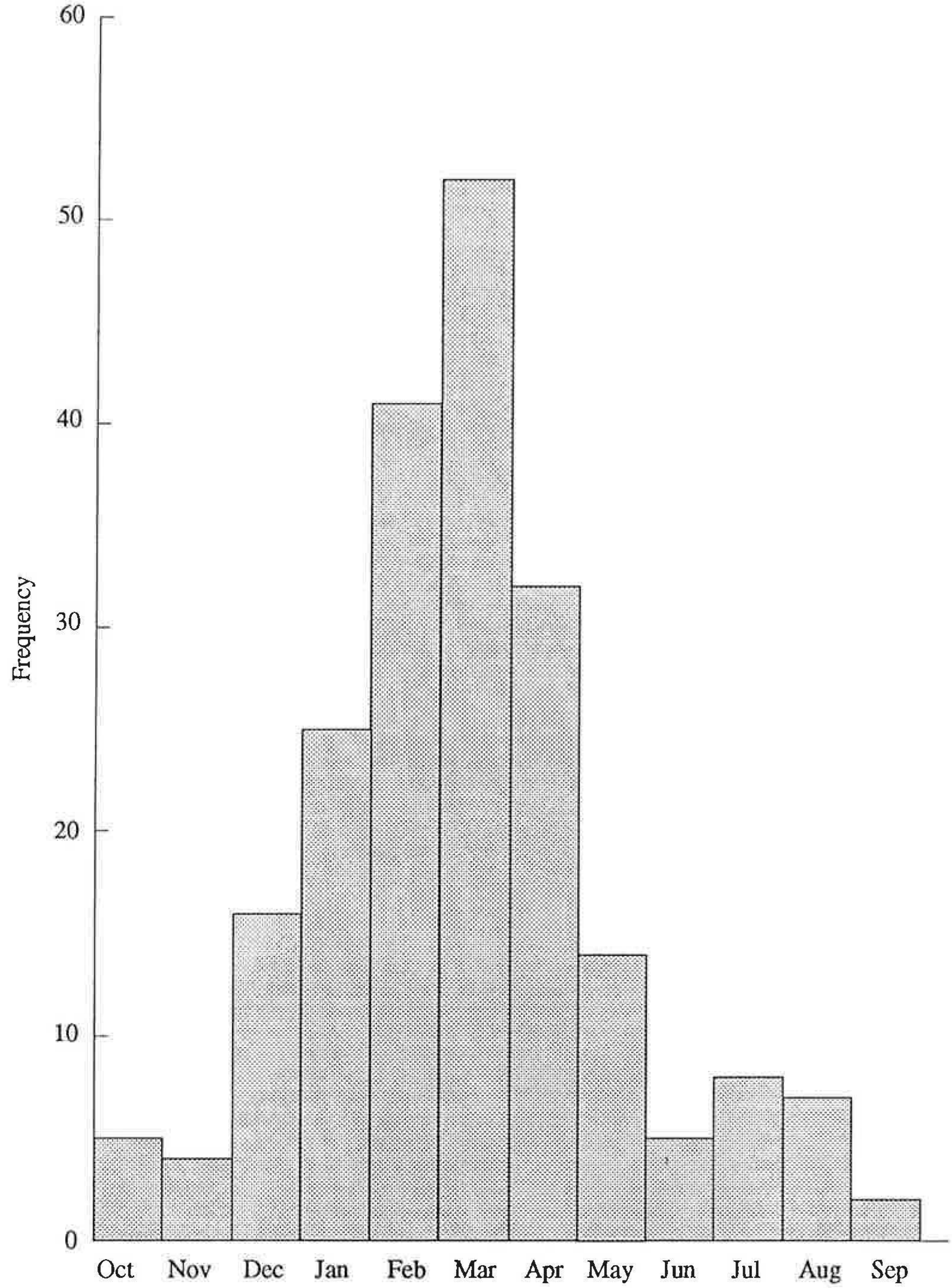


Figure 9. Mean Daily Discharge Rates, Oconee River near Greensboro, Georgia, 1904-1978



Note: Observations over 70 years (1904-1932, 1937-1978) when month had first, second, or third highest mean daily discharge rate for year.

Figure 10. Frequency of Flooding by Month

sandy clays low in natural fertility. There is, however, considerable variation in the soils because of the relationship between soil type, surface slope, stream gradient, and landform.

Determining which of the soils in the Oconee Valley were best suited to aboriginal horticulture is difficult. There has been significant alluviation and erosion since the eighteenth century that has led to the loss of soils in upland areas and to the creation in the bottomlands of new strata that show no signs of pedogenesis (Trimble 1969). Trimble (1969) has argued that cotton farming in the nineteenth and early twentieth centuries led to severe erosion and to the deposition of large quantities of sand and silt in the bottom of piedmont streams. This led to a building up of the river channel, to an increased chance of overflow, and to the creation of swamps where none existed before.

Other authors have questioned Trimble's evidence. For example, Brook (1981) has noted that the late nineteenth century was a period of greater rainfall than today and that this probably contributed to increased flooding frequency. Staheli (1976) argues that piedmont swamps, many of which are claimed by Trimble to be of historic origin, actually predate European settlement.

Regardless of the causes, there is no doubt that changes in the river and in adjacent bottomlands had profound effects on the local agricultural economy. Trimble (1969) determined that during the early historic period, farms were often located in the river bottoms. Over time, many bottomlands were abandoned as the flooding hazard became too severe to warrant major investment in clearing and cultivating. Trimble adds that sedimentation was a more important problem along headwater streams than along major rivers. It is likely that some locations presently too wet or too sandy for farming may have been excellent locations in the past.

Sir Charles Lyell (1849) recognized the effect that careless farming practices were having on the Piedmont:

> Formerly, even during floods, the Altamaha was transparent, or only stained of a darker color by decayed vegetable matter, like some streams in Europe which flow out of peat mosses. So late as 1841, a resident here could distinguish on which of the two branches of the Altamaha, the Oconee or Ocmulgee, a freshet had occurred, for the lands in the upper country, drained by one of these (the Oconee) had already been partially cleared and cultivated, so that that tributary sent down a copious supply of red mud, while the other (the Ocmulgee) remained clear, though swollen. But no sooner had the Indians been driven out, and the woods of their old hunting-grounds begun to give way before the ax of the new settler, than the Ocmulgee also became turbid (1849:256).

Vegetation

Reconstructing the original forest cover of the Piedmont is difficult (Braun 1950; Wharton 1978). The region "is either plowed, paved, or in succession" and no virgin forests survive (Godfrey 1980:25). This is not a recent phenomenon, for the amount of forested land in the Piedmont has actually increased over the last 50 years. At the turn of the century as much as 75 percent of the Georgia Piedmont may have been in cultivation. Today, Lake Oconee is surrounded by commercial tree farms, residences, pastureland, and forests of pine, oak, and hickory.

Several individuals have used historic records to reconstruct the native piedmont forests. Using descriptions written at the time of European settlement, Nelson (1957) concluded that most piedmont forests in Georgia were mixed hardwoods and pines. Plummer (1975) reconstructed the original forests by examining the frequency of witness trees on nineteenth century land survey plats. His results are similar to those of Nelson (1957), although they show regional variation more precisely. However, Bourdo (1956) has argued that witness trees cannot be used reliably for quantitative studies because land surveyors intentionally selected larger trees of particular species rather than the most common size and species.

Even though we cannot reconstruct the precise composition of mature forests in the Oconee Valley, we can make reasonable inferences based on historical and modern studies of similar forests. But mature forests were not the only natural habitat in the late prehistoric Piedmont. Mississippian groups in the Piedmont were farmers; the forests near their villages were undoubtedly interspersed with old fields, abandoned villages, and other areas where succession was proceeding.

Reviewing successional stages is relevant to a discussion in Chapter 6 of the frequency of site reoccupation. Some site locations may have been abandoned periodically when soils were no longer able to support intensive farming. However, old fields would still have contained edible plants and would also have attracted game.

Fortunately, the successional stages that follow abandonment of a cultivated field in the Piedmont are well known, regular, and predictable (Godfrey

1980).

Bartram in 1773 (Van Doren 1928) observed old fields along the Little River, northwest of Augusta, and offers this description of the plants Native Americans might have found:

> We then passed over large rich savannas or natural meadows, wide spreading cane swamps, and frequently old Indian settlements, now deserted and overgrown with forests. These are always on or near the banks of rivers, or great swamps, the artificial mounts and terraces elevating them above the surrounding groves. I observed, in the ancient cultivated fields, 1. Diospyros [persimmon], 2. Gleditsia triacanthos [honey locust], 3. Prunus Chicasaw [Chickasaw plum], 4. Callicarpa [French mulberry], 5. Morus rubra [red mulberry], 6. Juglans exalta [shell barked hickory], 7. Juglans nigra [black walnut], which inform us, that these trees were cultivated by the ancients, on account of their fruit, as being wholesome and nourishing food. Though these are natives of the forest, yet they thrive better, and are more fruitful, in cultivated plantations, ...(Van Doren 1928:57) [common names from Harper (1958)].

The earliest secondary plant succession in a mesic habitat, the most common habitat in the Piedmont, is affected by the number of years a plot was in cultivation and by the last crop grown. In general, however, ground-hugging herbaceous plants start to grow soon after harvest. These plants include chickweed, henbit, cranesbill, shepherd's purse, and water cress. During the following summer, crabgrass and horseweed dominate the old field, and Queen Anne's lace, pineweed, rabbit tobacco, ragweed, and berry briars also grow there. In the second year of abandonment, Queen Anne's lace, rabbit tobacco, nettles, nightshades, milkweed, thistles, and pineweed are all present, but horseweed, ragweed, and other Asteraceae dominate. The third season is dominated by broomsedge. Many of the species from earlier years are still present, and goldenrod appears for the first time (Godfrey 1980).

In the fourth or fifth year, woody seedlings appear among the broomsedge, goldenrod, and brier thickets. In the project area, these seedlings are primarily loblolly pine, which takes seven or eight years to become dominant. Shrubs among the young pines include sumac, trumpet creeper, and poison ivy (Godfrey 1980).

In 30 to 40 years the pines reach their maximum height to form a canopy as high as 25 meters. Pine saplings cannot tolerate the shade beneath the canopy, so deciduous trees form the understory. The first to arrive are red maple, sweetgum, tulip tree, and perhaps sassafras. About 20 years later, one finds sourwood, dogwood, black cherry, redbud, winged elm, black haw, downy arrowwood, squaw huckleberry, and holly. Later, willow oak, southern red oak, black oak, white oak, and post oak appear and these eventually dominate the mature canopy (Godfrey 1980).

The mature forest is one in which oaks, usually over 30 centimeters in diameter, form the canopy. Mesic locations are most likely to contain black, red, willow, scarlet, and Spanish oaks, as well as tulip trees. In slightly moister areas one will also find beech trees. Hickories arrive a few decades to over a century later. In drier mesic habitats these are likely to be mockernut and pignut hickories; in moister mesic areas one can expect bitternut and shagbark hickories. It takes nearly 150 years for a forest to develop in which oaks are about 60 centimeters in diameter and hickories about 30 centimeters in diameter. In the mature mesic forest, species of the subcanopy continue to be red mulberry, red maple, sourwood, sassafras, and dogwood (Godfrey 1980).

Wharton (1978) suggests that the mature oak-hickory forest once covered 50 to 75 percent of the piedmont uplands, but other authors argue for somewhat lower percentages. Deep, red soils, like those in the project area, are dominated by white oak, black oak, southern red oak, and pignut hickory. Dogwood and dwarf paw paw are common in the subcanopy. A study in the Piedmont near Athens found that on sandy clay or clay soil, there were white oak, northern red oak, post oak, black oak, southern red oak, scarlet oak, yellow oak, shortleaf pine, and various hickories. Chestnuts were once common, but disease and timbering led to their disappearance.

Bartram (Van Doren 1928) described the upland vegetation along the Great Ridge, the divide between the waters of the Oconee and Savannah.

> The Great Ridge consists of a high forest, the soil fertile, and broken into moderately elevated hills, by the many rivulets which have their sources in it. The heights and precipices abound in rock and stone. The forest trees and other vegetable productions are the same as already mentioned about Little River: I observed Halesia [silverbell], Styrax [storax], Aesculus pavia [red or Carolina buckeye], Aesc. sylvatica [Carolina buckeye], Robinia hispida [rose acacia], Magnolia acuminata [cucumber tree], Mag. tripetala [umbrella tree], and some very curious and new shrubs and plants, particularly the physic-nut, or Indian olive [*Pyrularia pubera*](Van Doren 28:59) [names in brackets from Harper (1958)].

Apparently Bartram was in the vicinity of the modern community of Philomath, 27 kilometers east of the Oconee River (Harper 1958), although Bartram also mentions that he camped three miles (4.8 kilometers) from the

Oconee.

True xeric sites are uncommon in the central Georgia Piedmont, although soils on hilltops tend to be more xeric than soils in other locations. Upland species are often tolerant of dry conditions and of shallow soils leached of minerals and lacking in organic material.

Hilltop species include post oak, black oak, and Spanish oak in somewhat xeric conditions; blackjack oak, American chestnut, and chestnut oak in true xeric conditions; and stunted oaks and pitch pine on very dry, thin soils (Godfrey 1980).

Naturally occurring Xeric sites are rarely cultivated today, so the understanding of succession in such locations has been inferred from areas where the dryness is caused by erosion or grading. The sequence of plants on xeric sites is less predictable than on mesic sites. The first species to grow in xeric habitats include poverty grass, panic grass, broomsedge, peppergrass, plantain, buttonweed, pineweed, bitterweed, low ragweed, wild onion, and various lichens (Godfrey 1980). Following initial stages of succession, plants more typical of mesic conditions may move into the site. Subsequent successional stages may resemble those at a mesic site but will proceed more slowly.

In the Piedmont, most moist habitats are found next to rivers. Nelson, Ross, and Walker (1975) estimate that 9 percent of the forest land in the Piedmont was once bottomland forest. These habitats are among the most diverse in the region and many have escaped cultivation or development until recently. They include streamside forests, alluvial forests, swamp forests, and beaver ponds.

Because of the coarse, sandy sediments, streamside levee soils are drier than those farther from the river and support a slightly different vegetation than the rest of the bottomlands. Areas back from the levees but free of standing water support alluvial forests. Swamp forests grow in lower areas where water stands from several weeks to most of the year. Beaver ponds often occur along smaller streams.

Succession begins in alluvial soils very quickly; asters and grasses appear almost immediately. Daisy fleabane, goldenrod, milkweed, and ragweed soon appear and rapidly grow as high as 3 meters.

Woody succession begins with the appearance of buttonwood, swamp dogwood, and *Viburnum*. Saplings of black willow, tag alder, and box elder are among the woody pioneers, and they eventually surpass the buttonwood and swamp dogwood. Maples, river birch, sycamore, hornbeam, and green ash are important also, but the canopy is formed by red maple, sugar maple, hackberry, American elm, shagbark hickory, water oak, and willow oak (Godfrey 1980).

Numerous shrubs, herbs, and grasses grow beneath the canopy. Cane (*Arundinaria gigantea*), growing as high as 10 meters, may be found beneath the canopy (Godfrey 1980).

Streamside forests consist of river birch, sycamore, sugarberry, and green ash (Nelson, Ross, and Walker 1975). Many streamside trees lean over the river to capture sunlight. These are likely to be undercut by the river or pulled down during floods, so that the forests next to a river tend to be at an arrested successional stage.

The swamp forest is characterized by standing water. Flooding rarely lasts more than a week in much of the bottomlands, and terraces and levees may be underwater for no more than a few days. Most species in the swamp forest, in contrast, can tolerate more than 50 days of continual flooding (Godfrey 1980).

Swamp forests are either left unfarmed or are permanently drained, so processes of succession are not well known. In early successional stages, rushes and sedges are more common in swampy areas than in drier alluvial forests. On the other hand, early woody succession is similar to that in the alluvial forest. Oaks, American elm, and shagbark hickory ultimately claim the canopy. Exclusive swamp forest species include the overcup oak, swamp chestnut oak, swamp white oak, pin oak, and swamp Spanish oak. The understory may include sweetgum, sycamore, box elder, river birch, maples, and green ash. In fact, the swamp forest canopy may be virtually identical to that of the alluvial forest, while the understory may be very different (Godfrey 1980).

Fauna

Mammals identified from faunal remains at Mississippian sites in the region include white-tailed deer, raccoon, cottontail rabbit, opossum, woodchuck, striped skunk, gray squirrel, fox squirrel, chipmunk, mouse, cotton rat, muskrat, beaver, gray fox, bobcat, and black bear (Golley 1962; Reitz 1985; Scott 1985; Shapiro 1983).

Exploited birds include turkey, turkey vulture, mourning dove, and passenger pigeon (Reitz 1985; Scott 1985; Shapiro 1983).

Fish recovered from sites along the Oconee and other piedmont rivers include longnose gar, pike, spotted sucker, redhorse, white catfish, channel catfish, snail bullhead, yellow bullhead, bowfin, sunfish, largemouth bass, black crappie, and freshwater drum (Reitz 1985; Scott 1985; Shapiro 1983).

Reptiles and amphibians found at Mississippian sites in the Oconee and Savannah valleys include snapping turtles, mud turtles, musk turtles, cooters and sliders, softshell turtles, spiny softshell turtles, box turtles, various non-poisonous snakes, pit vipers, frogs, and toads (Reitz 1985; Scott 1985; Shapiro 1983).

Invertebrates recovered from Mississippian sites in the Oconee Valley include river mussels, smaller bivalves, and aquatic gastropods (Rudolph 1983).

The game one can expect to find at any given location will depend partly on the stage of succession. Animals likely to live in or to visit an old field during the first few seasons after abandonment include many different snakes, quail, various songbirds and raptors, many rodents, cottontail rabbits, weasels, skunks, gray and red foxes, and opossums (Godfrey 1980).

Over time as the old field changes into a forest, the faunal community will show a transition to those typical of the forest. The mammals will include the pine vole, several mice and shrews, both fox species, white-tailed deer, cottontail, and opossum. Squirrels become more common as the trees become larger (Godfrey 1980).

The growing forest is the favorite habitat of the box turtle. Hawks and various other birds, opossums, skunks, bats, weasels, gray foxes, gray squirrels, white-footed mice, golden mice, and white-tailed deer are also common (Godfrey

1980).

The game inhabiting the mature forest is about the same as that living in the growing forest (Godfrey 1980).

In wetter habitats, especially streamside and swamp forests, one is more likely to find soft-shell turtles, snapping turtles, snakes, raccoons, opossums, gray foxes, white-tailed deer, bobcats, rodents, minks, river otters, beavers, and cottontail rabbits.

CHAPTER 6

CHANGES IN SETTLEMENT AND SUBSISTENCE

I have argued up to this point that by exploring the temporal aspects of population change in the Oconee Valley, one may understand how population growth affected Mississippian economic behavior. Chapters 3 and 4 addressed the dating of Mississippian sites in the Lake Oconee area. Chapter 5 summarized the various resources available to the inhabitants of the valley. I will now use this information to test the hypotheses proposed in Chapter 2.

Proposition 1: Through time the Mississippian society in the Oconee Valley experienced periods of significant population growth.

As I have mentioned previously, I analyzed 602 surface collections from Mississippian sites in the reservoir area. I also had chronological information from 13 excavated sites. As a result of the analysis presented in Chapter 4, I identified 24 definite and seven possible Etowah culture sites, seven definite and 12 possible Savannah culture sites, 164 definite and 58 possible Duvall phase sites, 417 definite and 58 possible Dyar phase sites, and 97 definite and 208 possible Bell phase sites (Figure 11).

I was unable to analyze collections from 406 sites. In the absence of data to the contrary, I will assume for the Lamar culture sites (Duvall, Dyar, and Bell phases) that the proportions of different components in the unanalyzed collections are roughly the same as the proportions in the analyzed collections. Because the

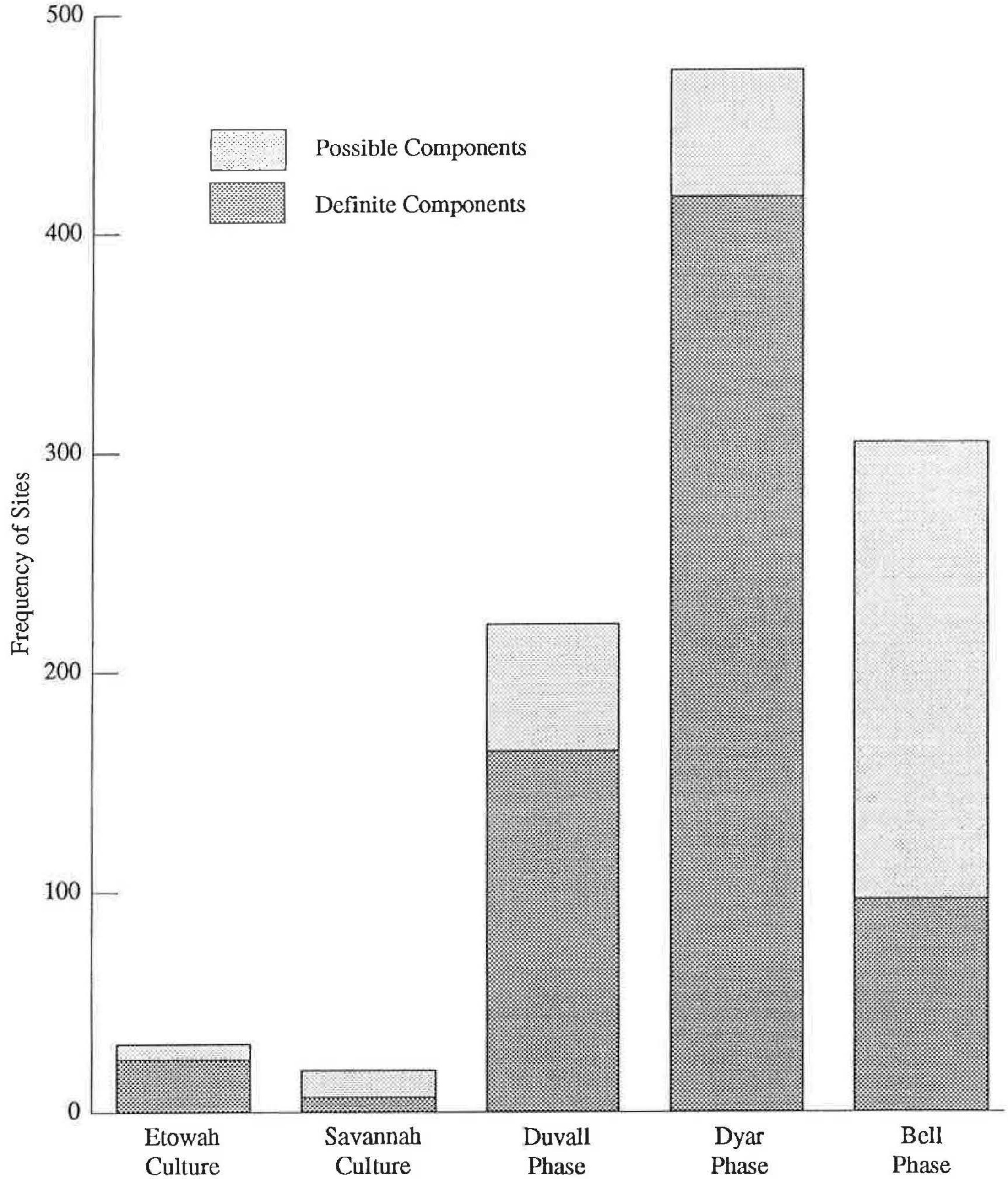


Figure 11. Frequency of Identified Sites by Phase

number of unanalyzed collections is 67.4 percent of the number of analyzed sites, I increased the number of Duvall, Dyar, and Bell phase components by this percentage. Etowah and Savannah components were so rare, that I made an extra effort to identify all sites that the survey teams or earlier analysts had identified as Etowah, Savannah, or early Mississippian. I believe that all the Etowah and Savannah sites in the collections have been identified and that the frequencies of sites for these two cultures need not be increased. Figure 12 illustrates the changes in site frequency when unanalyzed sites are taken into consideration.

The histogram in Figure 12 does not reflect either the actual density of sites at any given time or the actual population in the valley. To do so, one must estimate the number of sites occupied simultaneously by factoring in variation in the temporal duration of each phase.

To estimate the number of sites occupied simultaneously, I calculated the number of sites per 25 years, a span of time roughly equal to a generation. The durations of the phases are: Etowah culture, A.D. 1000-1200, 200 years, eight 25-year periods; Savannah culture, A.D. 1200-1350, 150 years, six 25-year periods; Duvall phase, A.D. 1350-1450, 100 years, four 25-year periods; Dyar phase, A.D. 1450-1600, 150 years, six 25-year periods; and Bell phase, A.D. 1600-1650, 50 years, two 25-year periods.

Calculating the number of sites per 25-year period has a significant effect on how site frequencies changed through time (Figure 13). The most pronounced changes occur because the Dyar phase is longer than either the preceding Duvall phase or the succeeding Bell phase. Compared to the trends shown in Figure 12,

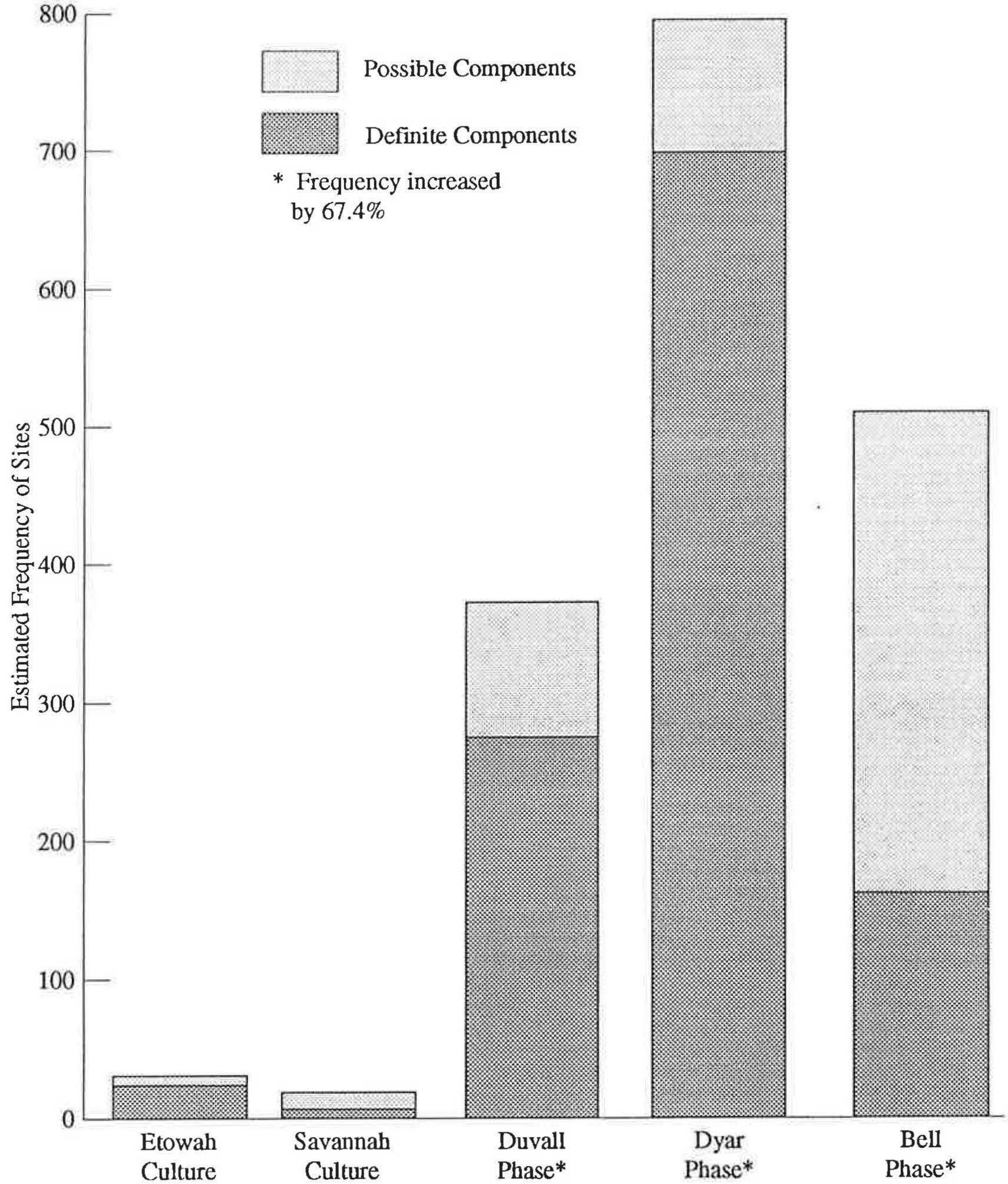


Figure 12. Estimated Frequency of Identified Sites Corrected for Unanalyzed Samples

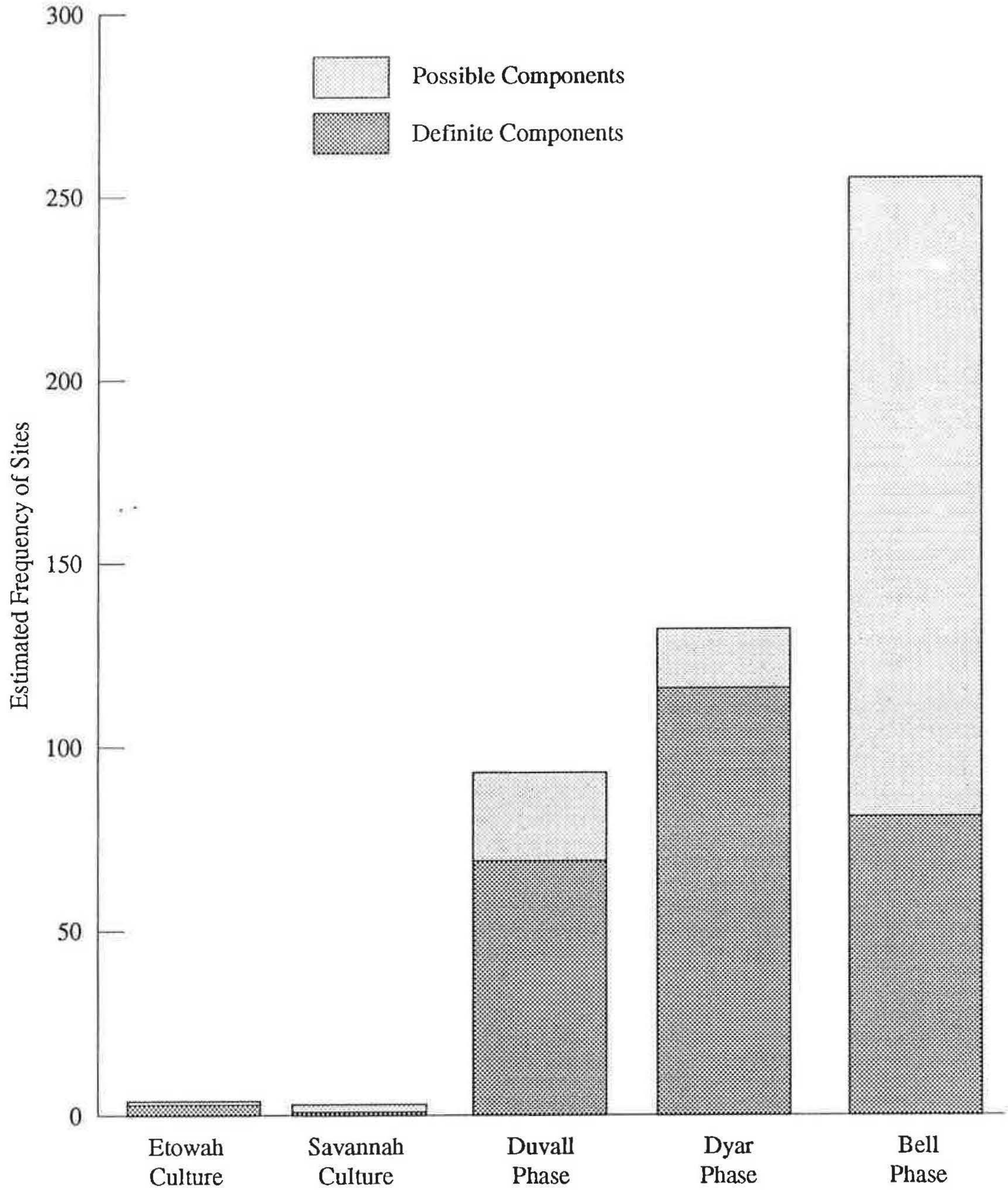


Figure 13. Estimated Frequency of Analyzed and Unanalyzed Sites per 25-year Period

Figure 13 still reveals a striking increase in the numbers of sites following the Savannah culture, but there is no longer as dramatic a change in site frequency following the Duvall phase. After the Dyar phase there is either a drop in the number of sites (if only definite Bell phase components are considered) or a pronounced increase (if both definite and possible Bell components are considered).

Kowalewski and Hatch (1991) report an upsurge in the number of sites during the late Dyar and early Bell phases outside the reservoir, following several hundred years of low population density. They argue that "...we are probably dealing with a population, numbering in the low tens of thousands and living dispersed in nonriverine and riverine settings, that grew for about 40 years after de Soto's visit [A.D. 1540-1580] (1991:12)." Unfortunately, the ceramic data presented in Chapter 4 are unsuitable for distinguishing later Dyar phase sites from earlier Dyar phase sites or from Iron Horse phase sites, so confirming Kowalewski and Hatch's (1991) conclusions is not possible at this time.

Figure 13 suggests that definite Bell phase sites are less common than definite Dyar phase sites. If one includes the possible components, however, there is an increase in site frequency during the Bell phase. Many of the sites classified as possibly Bell phase may actually be either late Dyar phase or Bell phase, so the increase may correspond to the change in population and site dispersal that Kowalewski and Hatch (1991) propose.

Figures 14 through 23 illustrate the distributions of definite and possible sites of different phases in the Lake Oconee project area. Figure 24 shows the

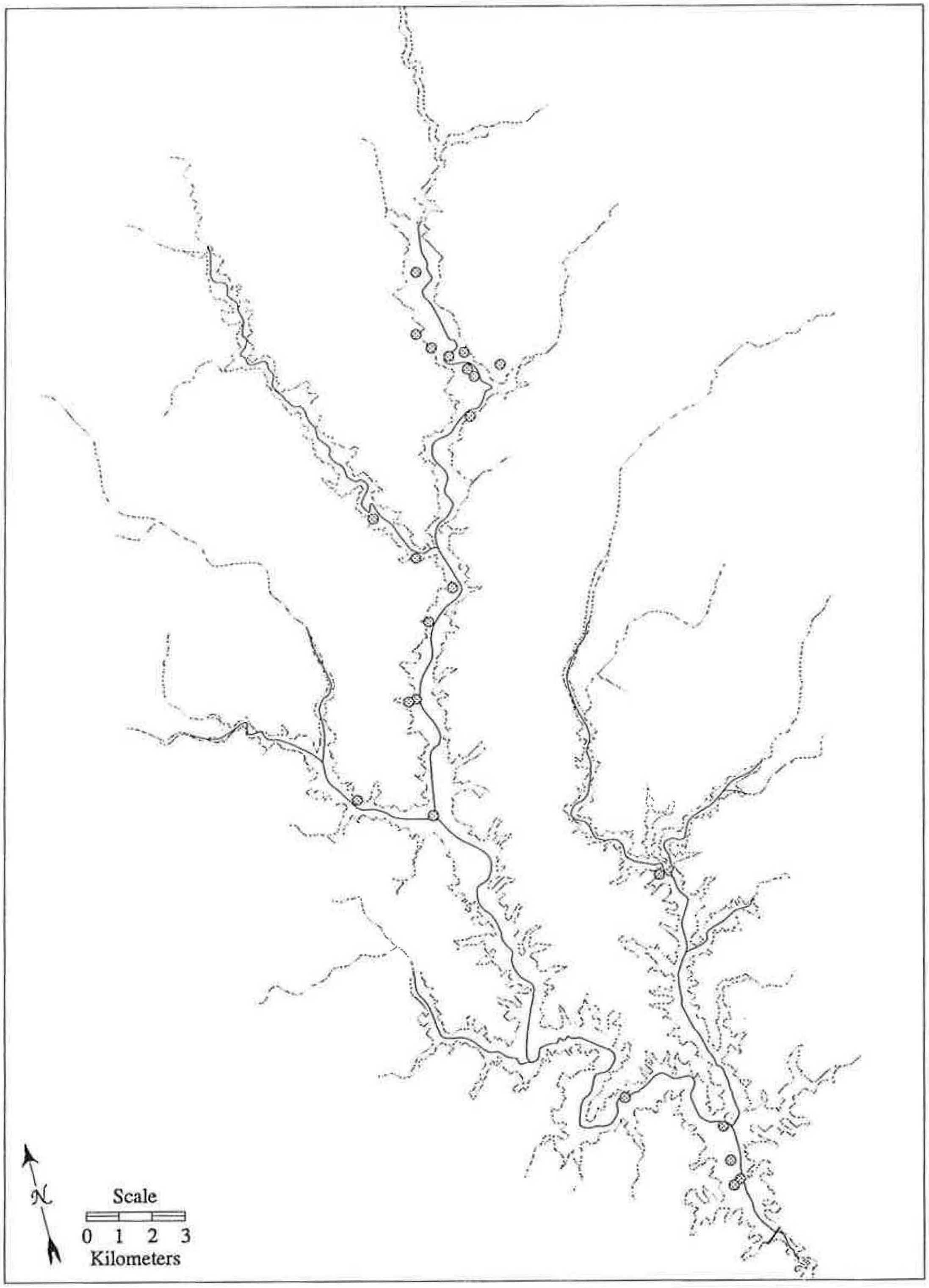


Figure 14. Definite Etowah Culture Components in the Lake Oconee Area

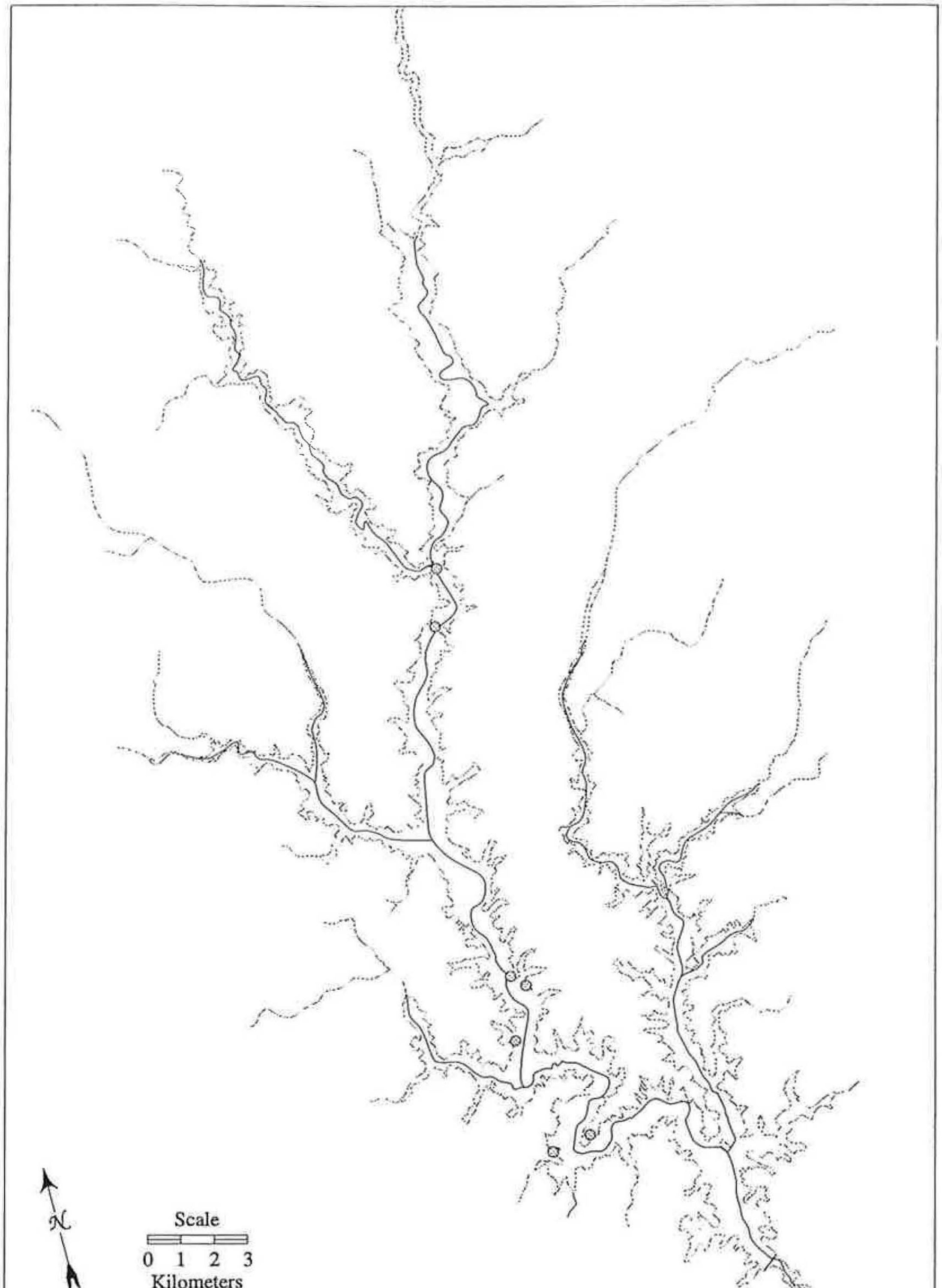


Figure 15. Possible Etowah Culture Components in the Lake Oconee Area

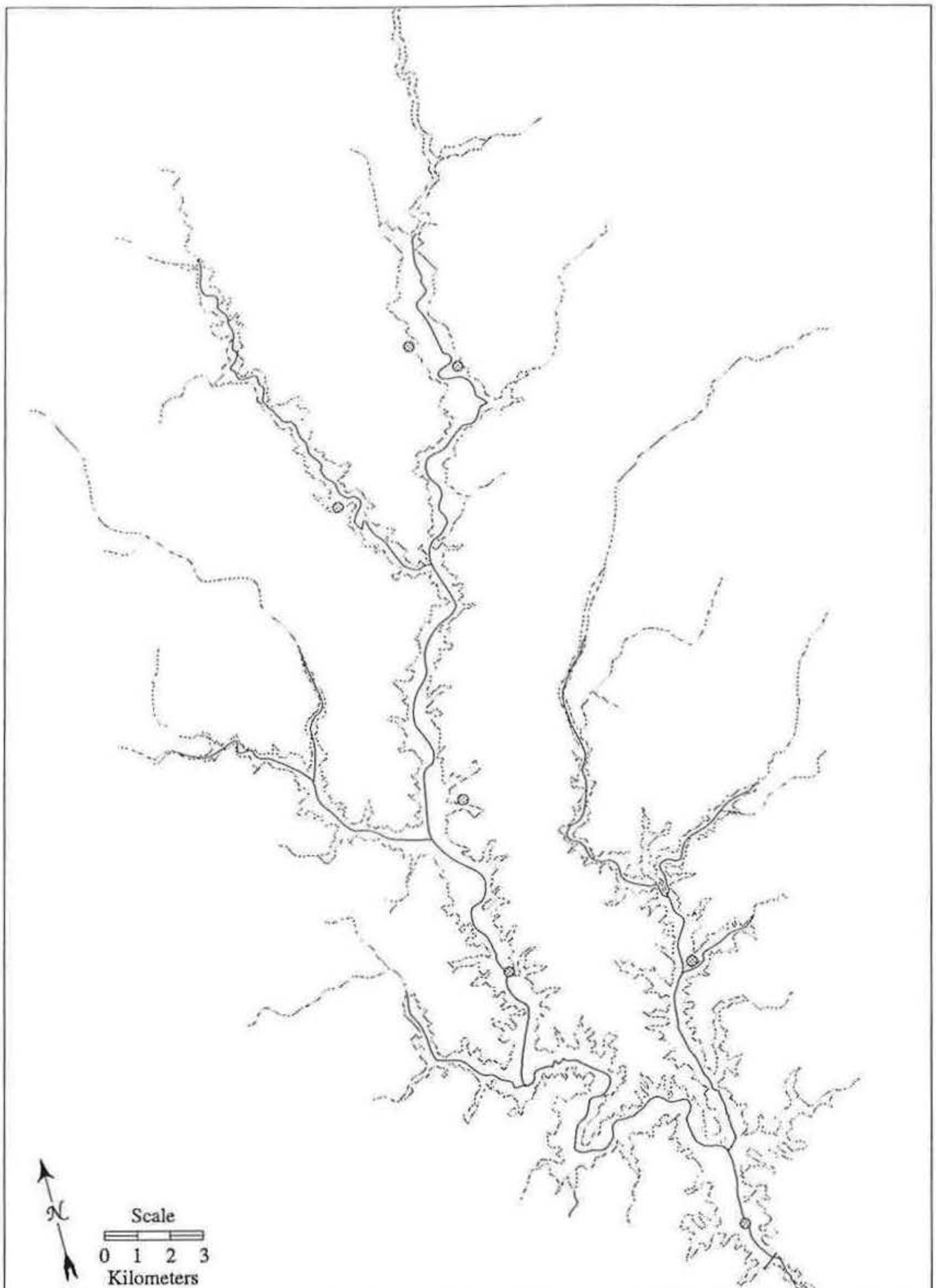


Figure 16. Definite Savannah Culture Components in the Lake Oconee Area

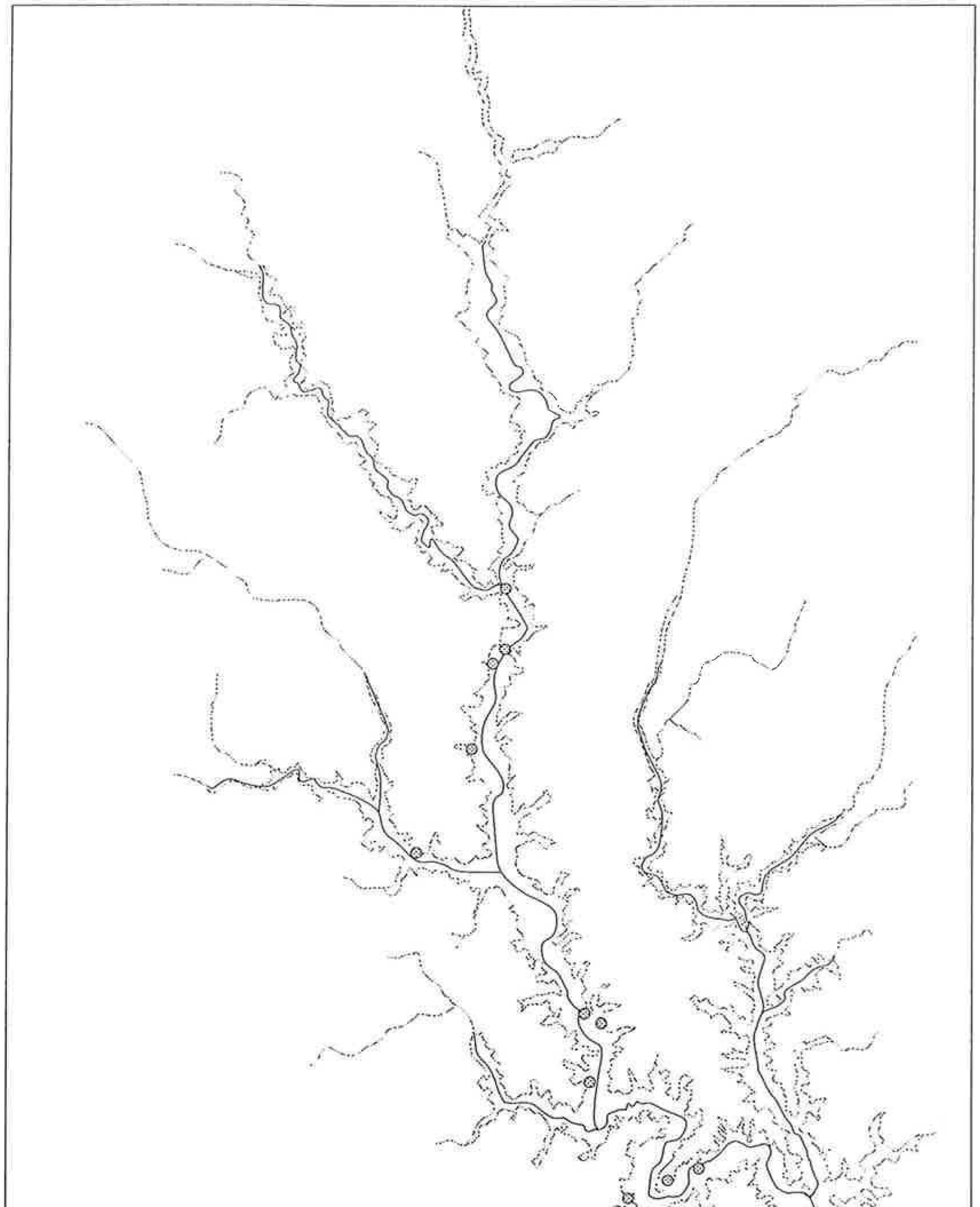


Figure 17. Possible Savannah Culture Components in the Lake Oconee Area

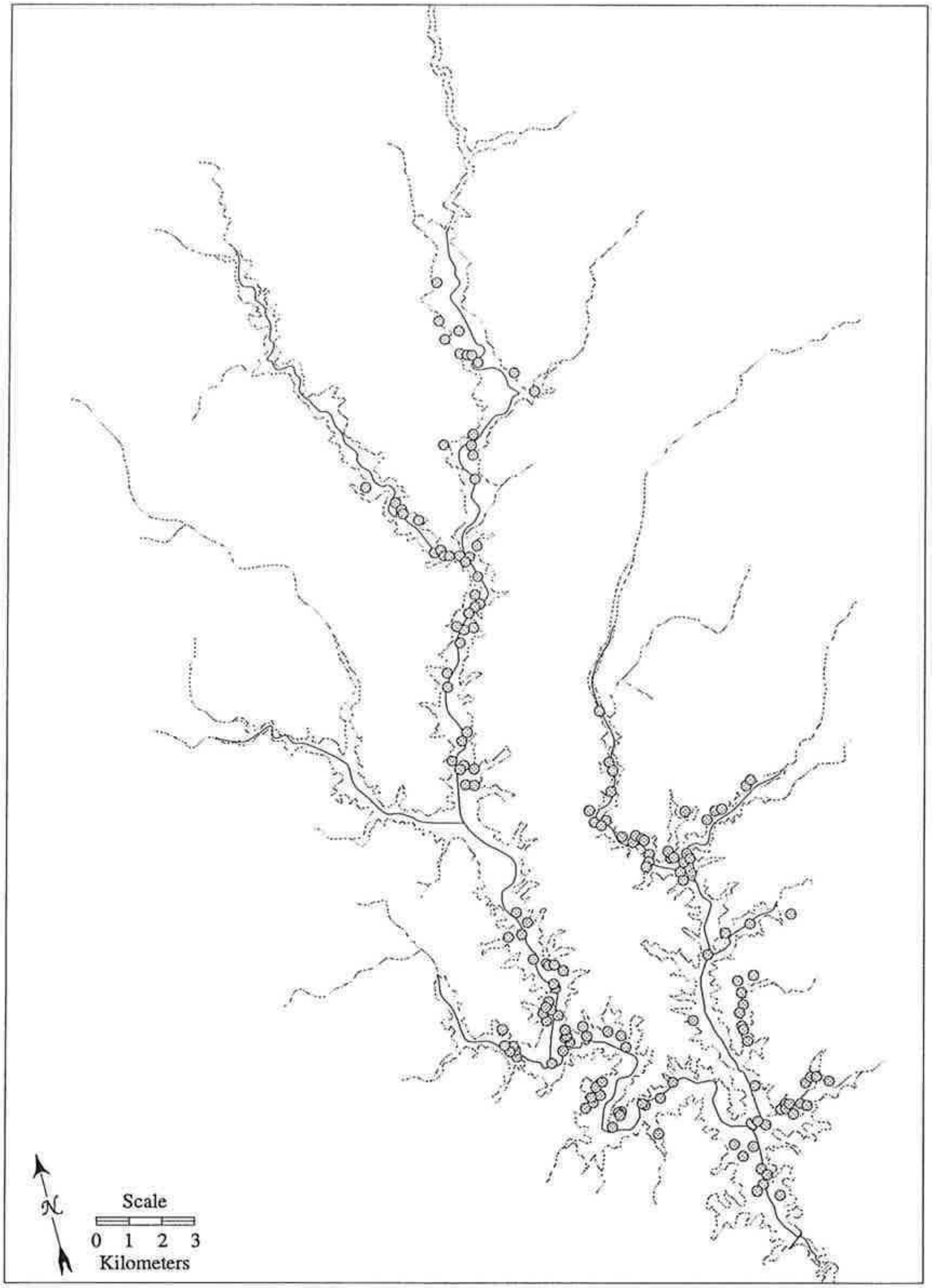


Figure 18. Definite Duvall Phase Components in the Lake Oconee Area

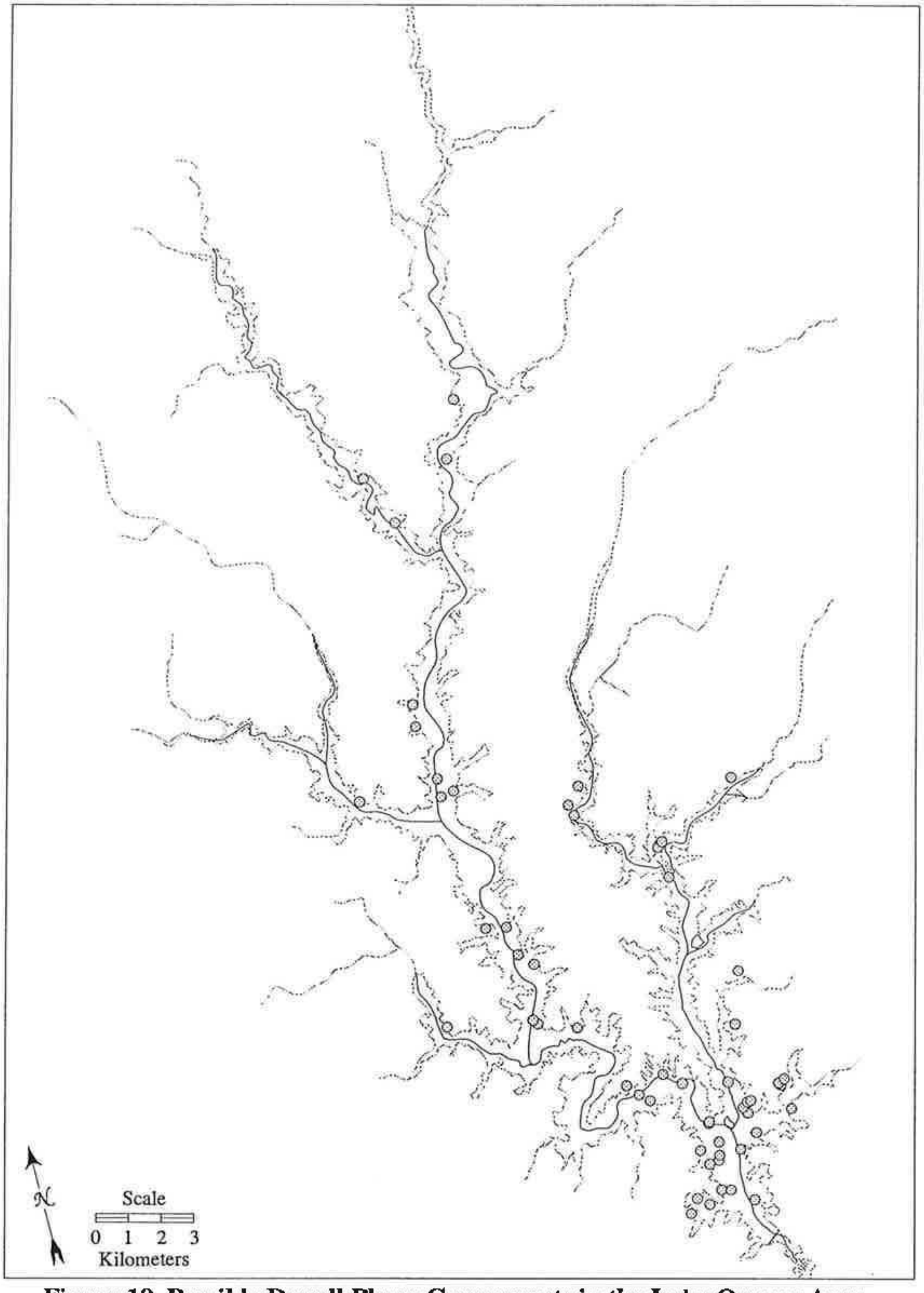


Figure 19. Possible Duvall Phase Components in the Lake Oconee Area

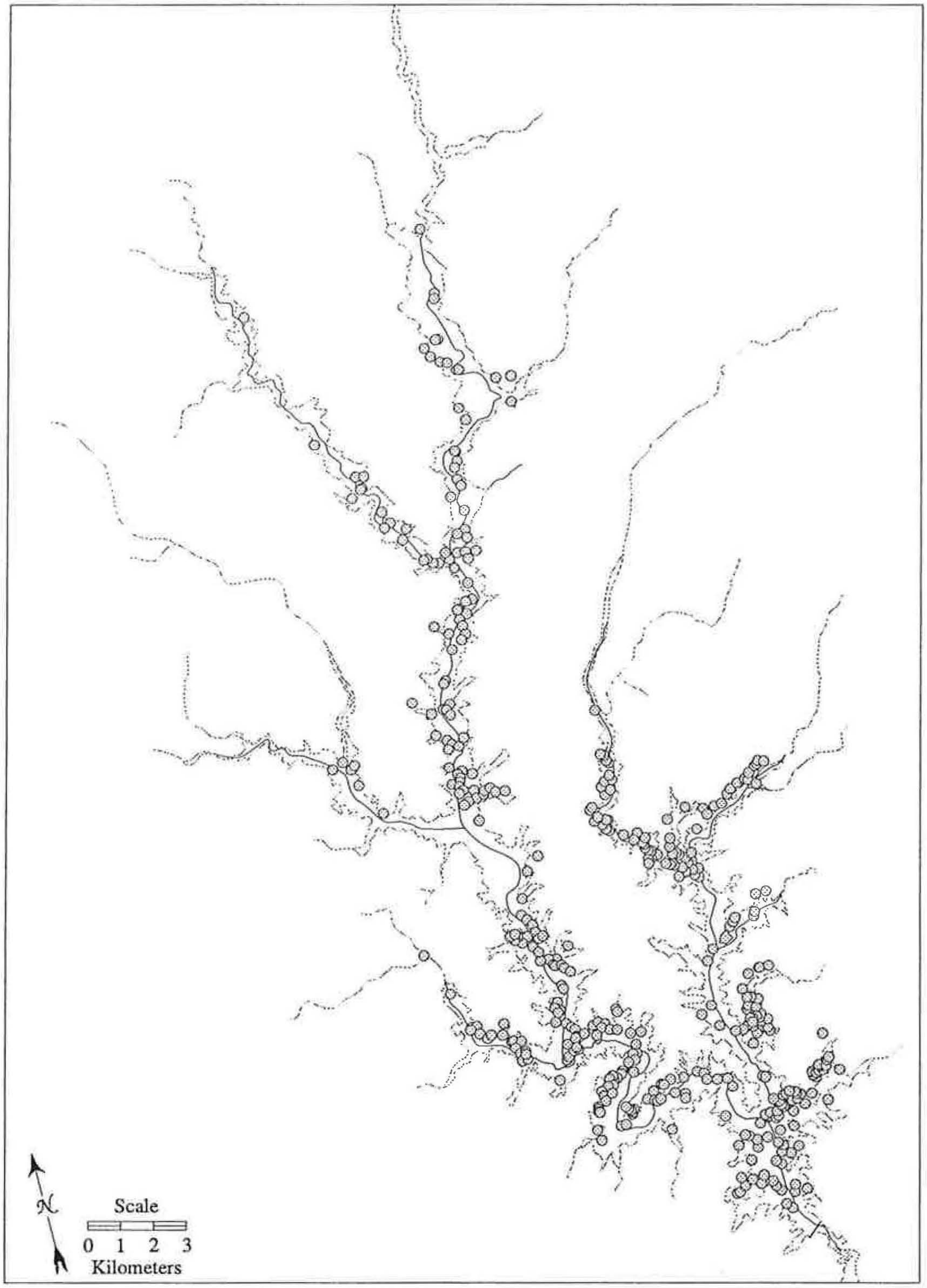


Figure 20. Definite Dyar Phase Components in the Lake Oconee Area

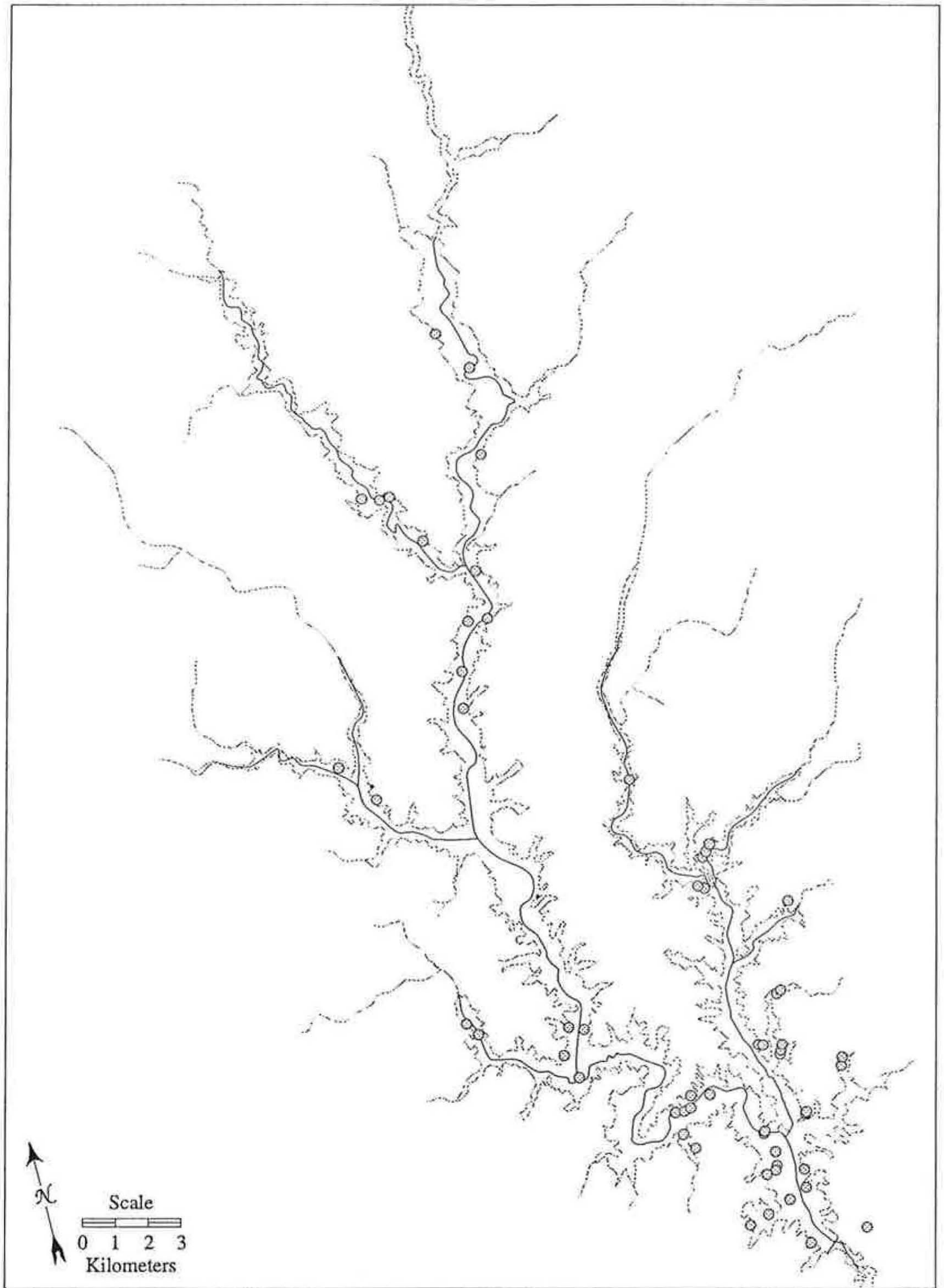


Figure 21. Possible Dyar Phase Components in the Lake Oconee Area

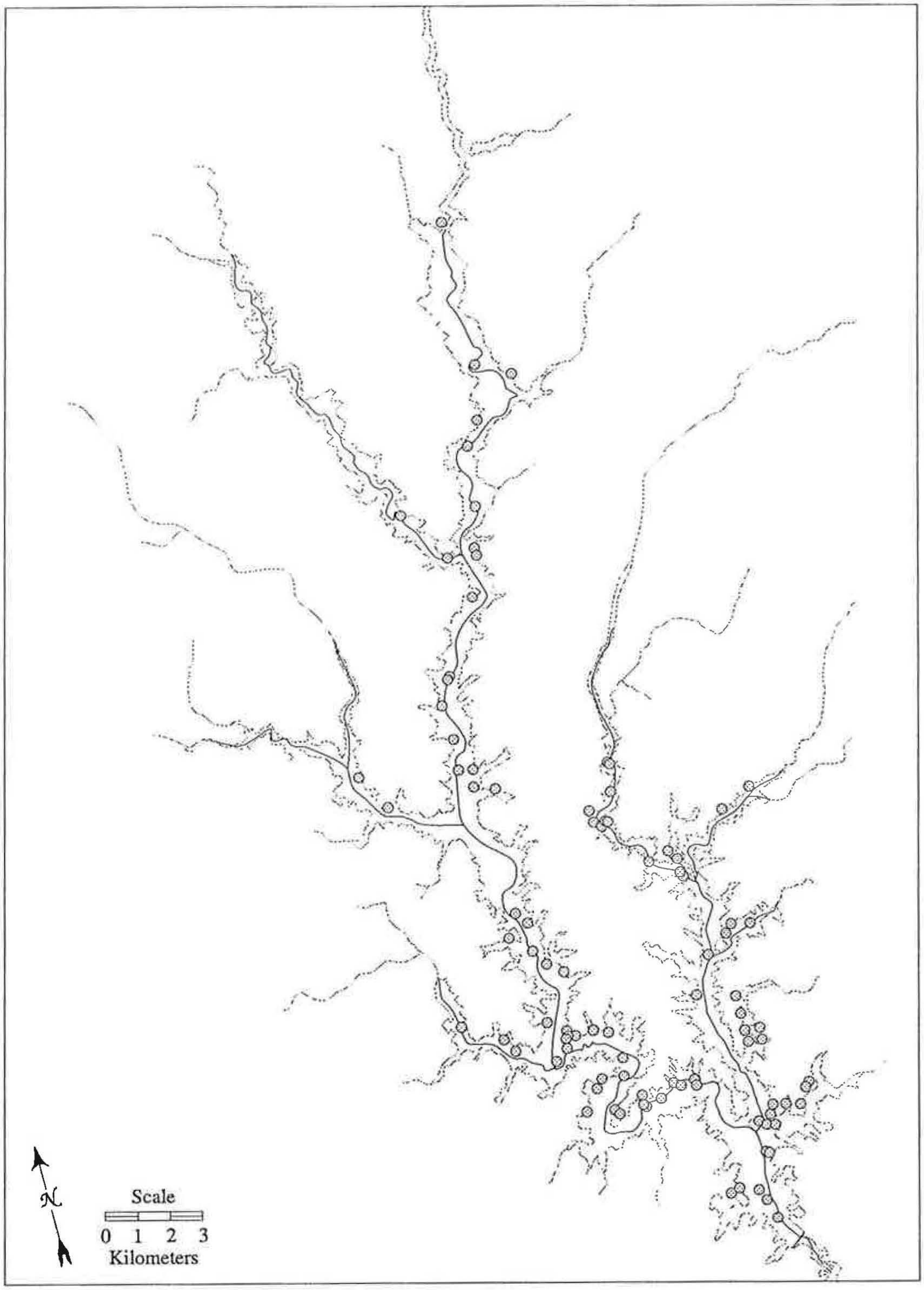


Figure 22. Definite Bell Phase Components in the Lake Oconee Area

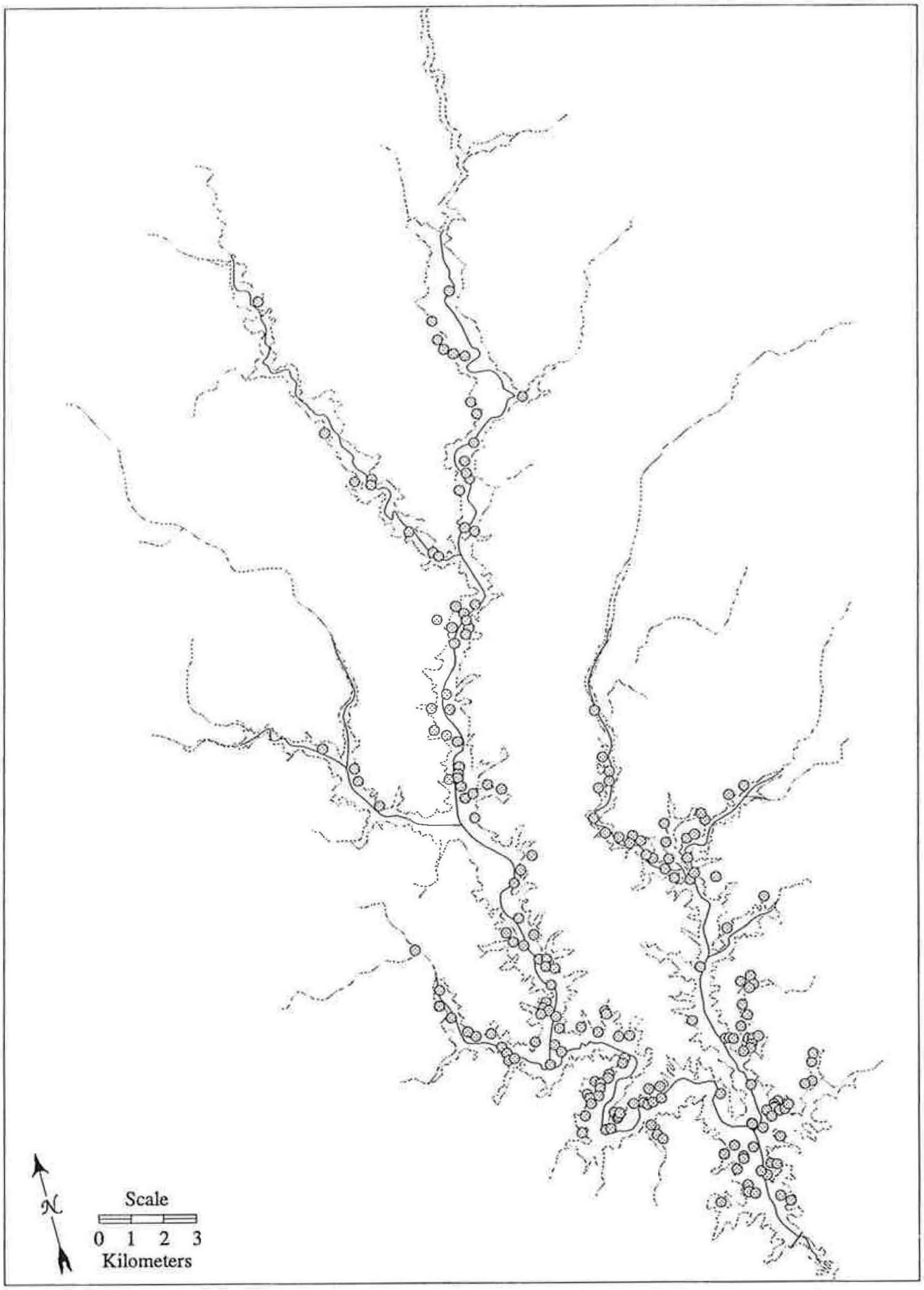


Figure 23. Possible Bell Phase Components in the Lake Oconee Area

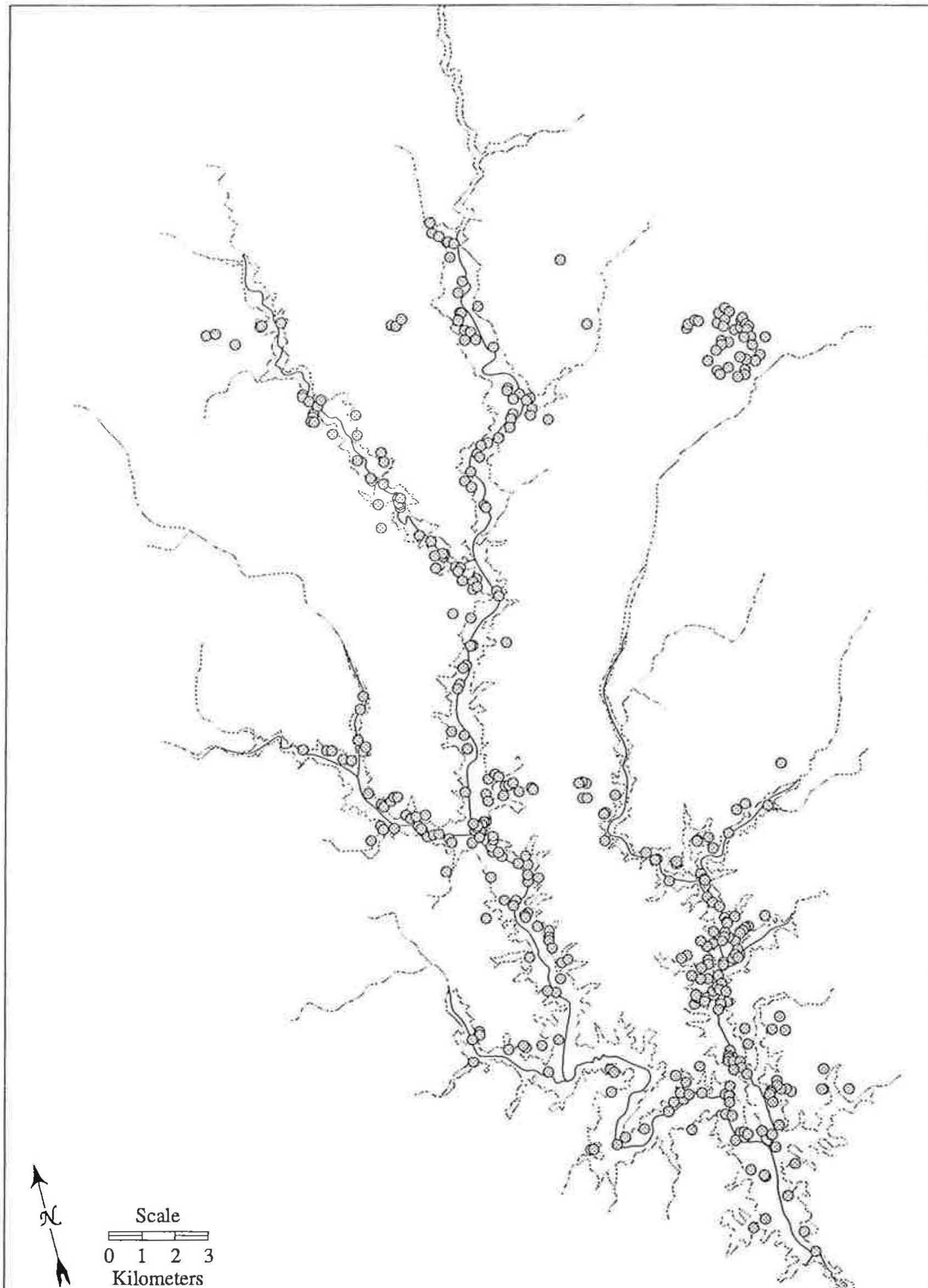


Figure 24. Unanalyzed Mississippian Collections in the Lake Oconee Area

distribution of unanalyzed Mississippian sites.

As Figures 13 through 23 show, there were indeed periods of dramatic increase in site density and presumably population size in the Oconee River valley, not only along the main river but also along its tributaries. During the Etowah occupation there were very few sites in the project area. Later, the area was virtually abandoned; not only are Savannah culture sites rare, but diagnostic artifacts on the sites usually consist of only one or two sherds. There was a substantial increase in site frequency during the Duvall phase. In fact, the number of sites per 25-year period may have increased 20- to 90-fold. This increased population was maintained into the Dyar phase. Rudolph and Blanton (1980) argued that the number of sites increased manyfold during the late Lamar occupation, but evidence for this is no longer strong. It is more likely that, depending on the correct assignment of possible Duvall and Dyar phase ceramics, a 25 to 90 percent increase in site frequency occurred during the Dyar phase. Evidence for what followed the Dyar phase is unclear. The number of sites within the reservoir boundaries may have dropped 30 to 60 percent during the Bell phase. However, there is also evidence that the number of sites per 25-year period may have increased by as much as 120 percent.

In summary, there may have been two periods of rapid population growth in the reservoir area, one definite period of growth during the fourteenth and early fifteenth century Duvall phase and another possible period of growth during the later Dyar phase and early Bell phase of the mid- to late sixteenth century.

If human population is an independent variable that can cause economic change (Boserup 1965), then the most pronounced periods of change in settlement and subsistence should have occurred during the Duvall phase and at the end of the Dyar phase and the beginning of the Bell phase.

Hypothesis 1: An increase in population density was associated with an intensification of habitat use.

In Chapter 2 I discussed Earle's (1980) and Christenson's (1980) models about temporal changes in the mixture of different strategies in a subsistence economy, and, in particular, the nature of intensification and diversification. Both authors note that during periods of population growth, diversification of resource use is more likely to be undertaken in hunting and gathering while intensification of resource production is more likely to be attempted in agriculture. Most of my data come from site locations rather than from excavated deposits, so in testing Hypothesis 1 and its subsidiary hypotheses, I will emphasize exploitation of habitats rather than the exploitation of specific plants or animals.

Hypothesis 1a: An increase in population density was associated with increased exploitation of river shoals.

Shapiro (1983) noted that the best alluvial soils along the Oconee River did not occur next to the best fishing areas. Along many other rivers in the Southeast, levee ridges--the best locations for farming--can be found next to oxbow lakes--the best source of protein. On the Oconee and on some other piedmont streams, shoals, which are an excellent source of protein, rarely occur next to levee ridges or broad bottomlands. This pattern, as Shapiro (1983) pointed out, required some changes from the settlement pattern predicted by Smith's (1978) model of the Mississippian adaptive niche. Shapiro (1983) suggested that the environmental constraints of the Oconee Valley led to site specialization during the Mississippi period.

Shapiro supported his argument with data from three sites in the Oconee Valley. The Dyar site (Ge5) was a mound center in the broad bottomlands of the Oconee over 30 kilometers from the nearest large shoals. The Ogeltree site (Ge153) and Ge175 were smaller Lamar sites located near shoals.

Following an analysis of faunal remains, Shapiro (1983) estimated that the greatest proportion of edible meat at the Dyar site was contributed by white-tailed deer. Faunal remains from Ge175, on the other hand, showed a heavy emphasis on aquatic turtles and fish. The Ogeltree site had fewer fish and more small terrestrial game than the other two sites. Also, both the Ogeltree site and Ge175 contained many more bivalve shells than Dyar. Shapiro (1983) concluded that Ge175 was a specialized site used for the exploitation of animals that could not be obtained efficiently from Dyar and other sites located far upriver. Not only were shoals an important source of protein, but the distribution of shoals contributed to site specialization within the Mississippian settlement pattern along the Oconee River.

Shapiro (1983) did not discuss whether the economic importance of shoals and broad bottomlands might have changed through time. To examine this possibility, I compared the frequency of different components near these two habitats (Figure 25). I defined a *northern bottomland zone* as the area within 1000 meters of the Oconee River or a few of its small unnamed tributaries that lay north of the mouth of the Apalachee River and below the northern edge of the reservoir, a distance of about 15.8 river kilometers. Eighty-four Mississippian sites were found in this zone and most were located within the floodplain, on low terraces, or on the lower portions of ridge slopes overlooking the bottomlands. I defined a *southern shoal zone* to include sites within 250 meters of the Oconee River in the area where the most frequent and largest shoals occurred. This zone lay between UTM easting 294,300 and easting 298,500 (a distance of 7.5 river kilometers). Sixty-one sites were located within this zone, some on narrow strips of floodplain next to the river, some on islands, and others on steep slopes overlooking the river channel.

Even though there are fewer Mississippian sites in the southern shoal zone than in the northern bottomland zone, the density of sites is far greater. There are approximately 2.7 sites per square kilometer in the northern zone and 16.3 sites per square kilometer in the southern zone.

Table 11 measures the statistical independence between the frequency of sites of a particular phase and habitat zone. A chi-square test shows that the two variables are statistically independent. Table 12 and Figure 26, however, compare the intensity of habitat use during different phases by considering the density of sites per 25-year period. During each phase, except for the Savannah culture Scull Shoals phase, the density of sites was four to ten times greater in the southern shoal zone than in the northern bottomland zone. Furthermore, while the

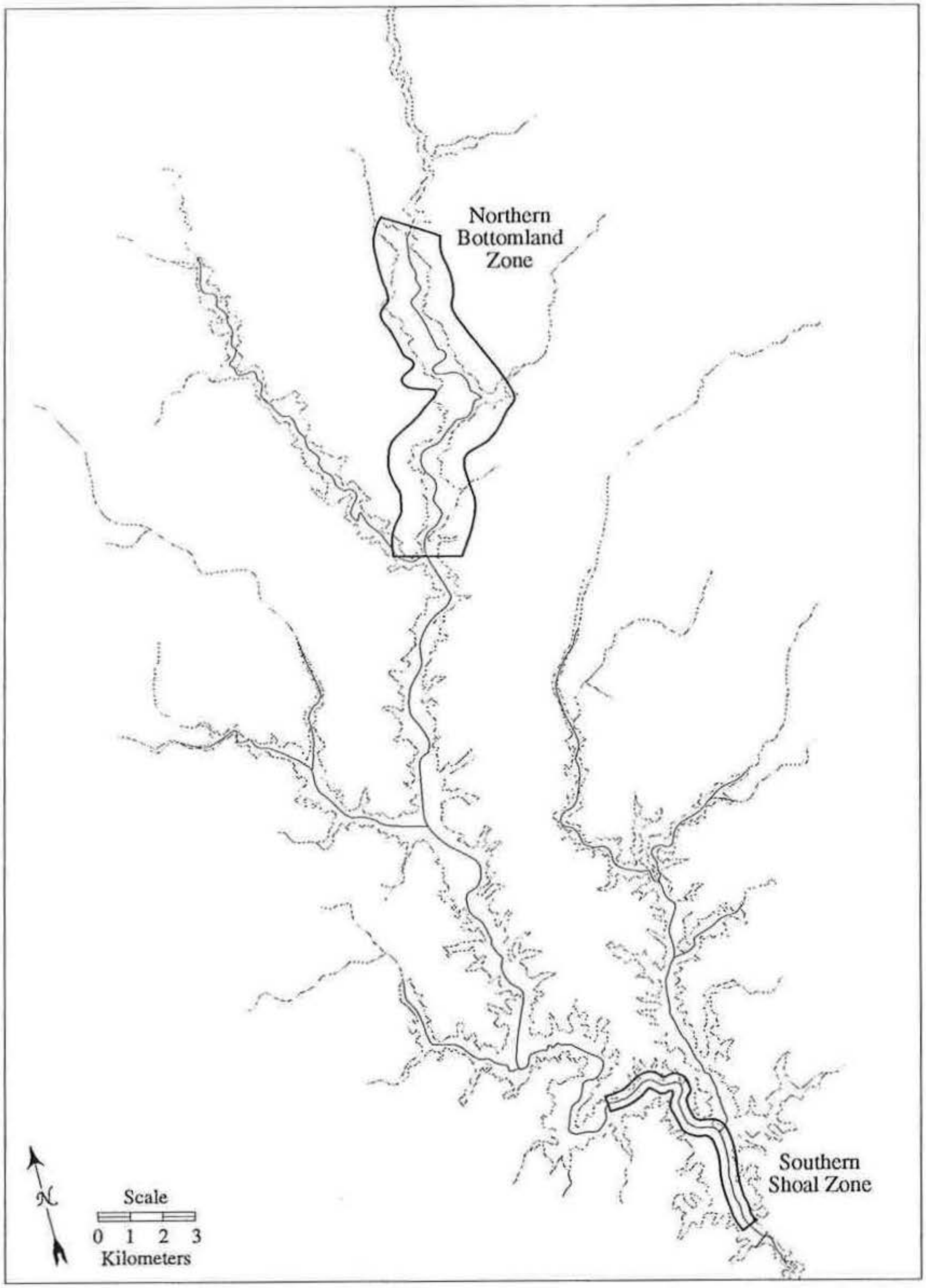


Figure 25. Locations of Northern Bottomland Zone and Southern Shoal Zone

Table 11

Association of Habitat Zone with Phase
(Expected Frequencies in Parentheses)

HABITAT ZONE

DEFINITE COMPONENTS	Northern Bottomland Zone	Southern Shoal Zone	
Etowah	8 (7.0)	4 (5.0)	12
Savannah	2 (1.2)	0 (0.8)	2
Duvall	15 (12.8)	7 (9.2)	22
Dyar	28 (30.3)	24 (21.7)	52
Bell	7 (8.7)	8 (6.3)	15
	60	43	103

$x^2 = 3.78$, d.f. $= 4$, $0.25 < p < 0.50$

Table 12

Intensity of Habitat Use During Various Phases

NORTHERN BOTTOMLAND ZONE

	Number of Sites(N)	Area (km^2)	Number of 25-Year Periods	N/km^2/25-Year Period
Etowah	8	31.6	8	0.03
Savannah	2	31.6	6	0.01
Duvall	15	31.6	4	0.12
Dyar	28	31.6	6	0.15
Bell	7	31.6	2	0.11

SOUTHERN SHOAL ZONE

	Number of Sites(N)	Area (km^2)	Number of 25-Year Periods	N/km^2/25-Year Period
Etowah	4	3.75	8	0.13
Savannah	0	3.75	6	0.00
Duvall	7	3.75	4	0.47
Dyar	24	3.75	6	1.07
Bell	8	3.75	2	1.07

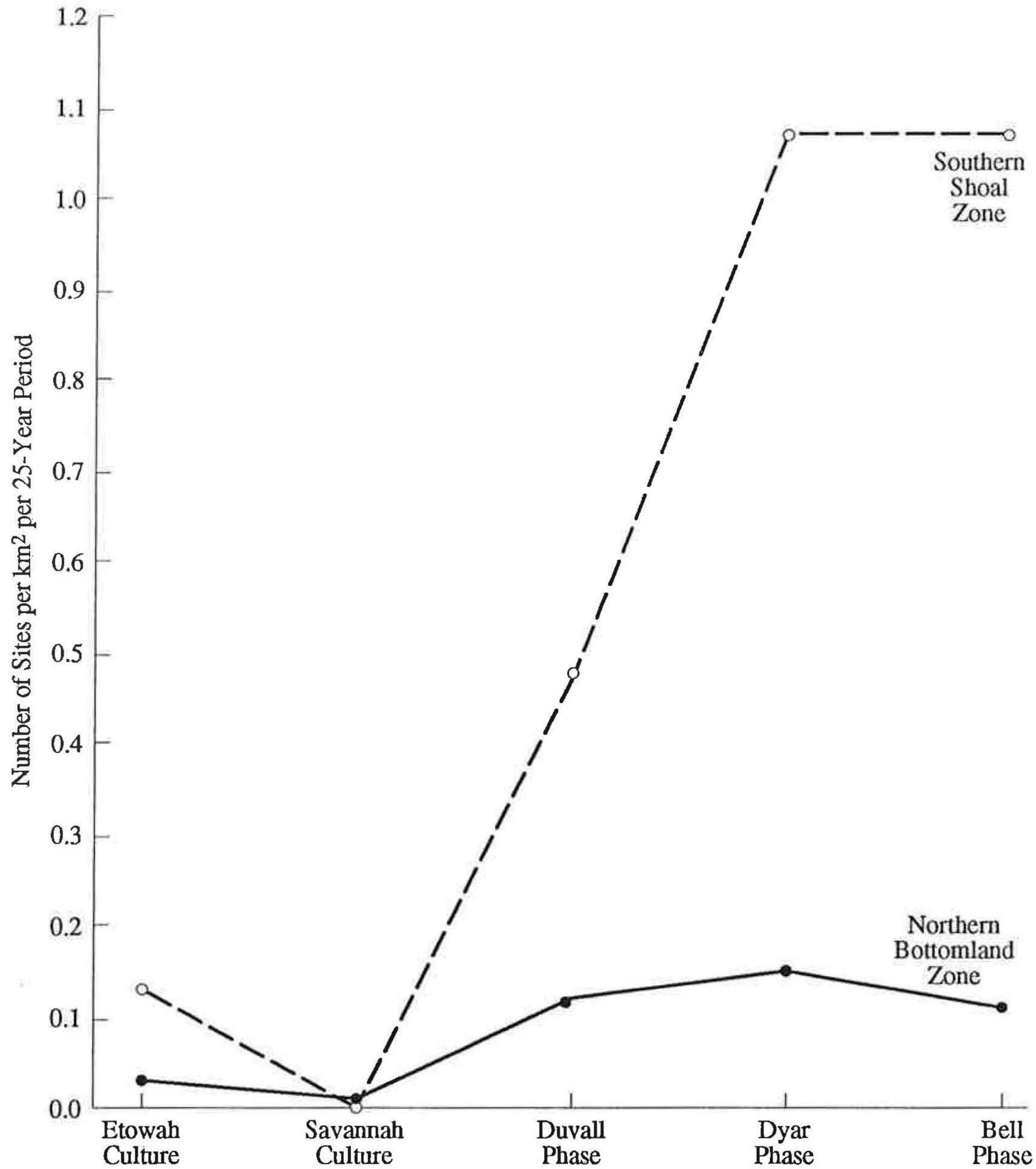


Figure 26. Temporal Variation in Bottomland and Shoal Settlement

density of sites in the bottomland zone rose at the beginning of the Duvall phase and stayed roughly the same during the Dyar and Bell phases, the density of sites in the shoal zone increased rapidly during both the Duvall and Dyar phases and stayed high during the Bell phase. This pattern suggests that while the intensity of bottomland use remained more or less the same after the initial Lamar settlement of the area, the intensity of shoal use increased as site density and population throughout the project area increased.

These inferences do not prove or disprove Shapiro's claim that the sites along shoals were specialized; they may very well have been. However, they do suggest that the relative importance of broad floodplains and shoals as locations for use or settlement changed over time.

Eleven years ago, I argued that the formation of shell middens in the Oconee Valley was almost exclusively a late Lamar phenomenon and that overpopulation was a reasonable explanation for the increased exploitation of river mussels, a resource most abundant near shoals (Rudolph 1983).

Figure 27 illustrates the distribution within the reservoir of shell middens and other sites with shell. Because of the distribution of shoals, most of these sites are clustered in the southernmost portion of the reservoir. Table 13 measures the statistical independence between phase and the presence or absence of shell on sites. Since the shell itself was not dated, a small quantity of shell on the surface of some multi-component sites might have been deposited during any one of several phases. In these cases, I have assumed that shell was present during each phase.

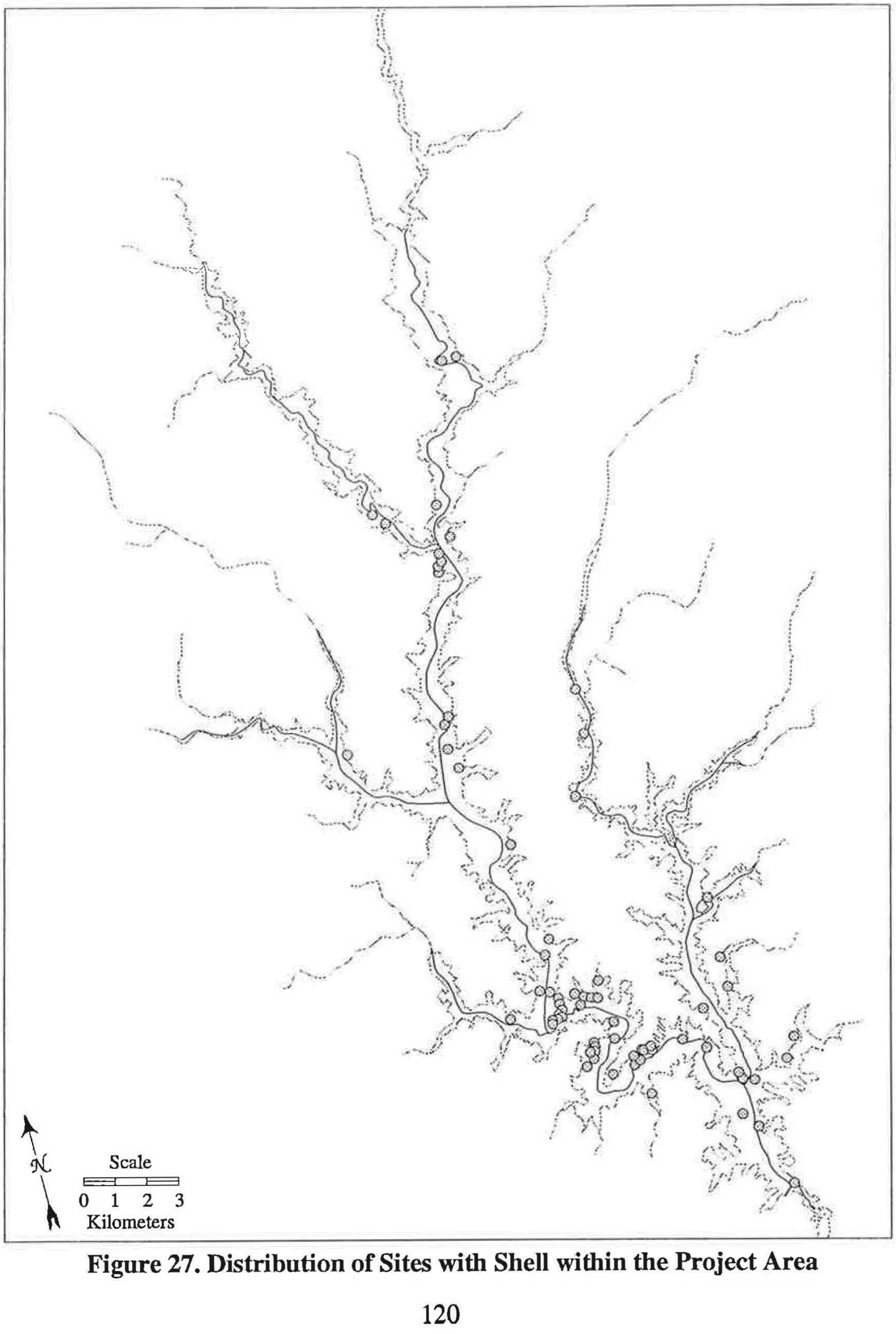


Figure 27. Distribution of Sites with Shell within the Project Area

Table 13

Association of Shell with Phase
(Expected Frequencies in Parentheses)

DEFINITE COMPONENTS	SITES: Sites with Shell	Sites without Shell	
Etowah	2 (3.8)	22 (20.2)	24
Savannah	1 (1.1)	6 (5.9)	7
Duvall	30 (25.7)	134 (138.3)	164
Dyar	53 (65.3)	364 (351.7)	417
Bell	25 (15.2)	72 (81.8)	97
	111	598	709

$x^2 = 12.1$, d.f. $= 4$, $0.01 < p < 0.025$

Goodman and Kruskal's $Tau_{row} = 0.017$

$Tau_{col} = 0.007$

Table 13 shows that most of the sites with shell are indeed late Mississippian, as I proposed previously (Rudolph 1983), but the trend is not as pronounced as I once thought. There is a statistically significant relationship, but the standardized residuals indicate that only one of the cells contributes a significant amount to the total chi-square value: there are more Bell phase sites with shell than expected. However, the strength of association--Goodman and Kruskal's tau for both rows and columns--is extremely low, suggesting that the pattern is not so strong that it can be used to predict the presence or absence of shell on a site.

As one of several measures of predictive association, Goodman and Kruskal's tau has a particular advantage--straightforward interpretation. Tau is the proportional reduction in the probability of predictive error offered by specifying marginal totals for either rows or columns (Winkler and Hays 1975). When the numbers of rows and columns differ, tau must be calculated separately for both. In this case, one might ask, "Does knowledge of the phase represented at a site significantly improve our ability to predict whether or not there is shell at the site?" Table 13 shows that our predictive error decreases by less than two percent, not much of an improvement.

Because shell may have been exploited throughout the duration of the Mississippian occupation in the Oconee Valley, it is apparent that the conclusion I reached during the earlier study (Rudolph 1983) can no longer be supported. The principal reason that shell-bearing sites were more common during the late Lamar phases was because sites in general were more common.

The evidence presented above suggests that Hypothesis 1a can be supported, but with caution. The importance of shoals relative to floodplain habitat increased through time. Shoals were evidently exploited during all phases, but there was an increased tendency toward the exploitation of shoal resources during periods of rapid population growth. However, during these periods, the importance of shellfish as a resource, in contrast to fish, turtles, small mammals, and other game, may not have changed.

Hypothesis 1b: An increase in population density was associated with increased resource procurement in upland areas.

Testing Hypothesis 1b requires, first, determining from the site distributions that there is indeed proportionately greater settlement within upland locations during certain phases. Mississippian sites in the area occur on a variety of landforms that were classified as ridge top, ridge slope, terrace, levee, and floodplain. These categories can be combined into upland areas (ridge top and ridge slope) and bottomland areas (terrace, levee, and floodplain). Of 994 Mississippian sites, 132 were on ridge tops (12.3 percent), 612 were on ridge slopes (61.6 percent), 91 were on terraces (9.2 percent), 64 were on levees (6.4 percent), and 95 were on floodplains (9.6 percent). The smaller proportion of sites in the bottomlands may be in part related to the extent to which historic alluviation buried archaeological and historic remains (Trimble 1969), but it is likely that the thorough surface and subsurface surveys in the reservoir identified most bottomland sites.

Table 14 tests the statistical independence between phase and landform. In

Table 14

Association of Landform and Phase
(Expected Frequencies in Parentheses)

LANDFORM

DEFINITE COMPONENT	Ridge top	Ridge Slope	Terrace	Levee	Floodplain	
Etowah	2 (1.8)	7 (14.7)	1 (2.3)	4 (1.8)	8 (1.6)	22
Duvall	9 (13.6)	104 (104.9)	22 (17.2)	17 (13.1)	10 (12.1)	162
Dyar	35 (34.9)	284 (276.5)	42 (44.2)	28 (33.4)	26 (31.1)	415
Bell	4 (8.1)	68 (64.0)	9 (10.2)	7 (7.7)	8 (7.2)	96
	50	463	74	56	52	695

$x^2 = 42.3$, d.f. $= 12$, $p < 0.001$

Goodman and Kruskal's $Tau_{row} = 0.016$
$Tau_{col} = 0.009$

particular, the standardized residuals show that Etowah sites tend to be more common than expected on floodplains and less common than expected on ridge slopes. These patterns suggest only limited settlement differences among the phases, and the strength of predictive association is, once again, very weak. This means that one can not predict the phase of a site from its location or the location of a site from the phase.

If one collapses various landform categories (Table 15), the reader will find that of all the analyzed Mississippian sites in the reservoir, 74.8 percent occur in upland riverine (ridge top and ridge slope) locations and 25.2 percent occur in bottomland (levee, floodplain, and terrace) locations. During the Etowah occupation, 41 percent of the sites were in upland settings; during Duvall, 70 percent; during Dyar, 77 percent; and during the Bell phase, 75 percent. Standardized residuals show only that there are more Etowah sites than expected in bottomlands. Yet again, the strength of association is very low.

The strengths of association in both Tables 14 and 15 are weak. The patterns revealed may be statistically significant, but they are not so strong that one can confidently predict the age of a site knowing only its location. Nonetheless, there does seem to be a general trend through time in which settlement shifted from bottomland locations to upland locations. This is illustrated in Figure 28, which shows the frequency of sites per 25-year period in both major landform groups. The frequency of sites in upland areas increases dramatically during the Duvall and Dyar phases, but drops during the Bell phase. However, the proportion of upland to bottomland sites increases rapidly during the

Table 15

Association Between Major Landform Category and Phase
(Expected Frequencies in Parentheses)

DEFINITE COMPONENT	MAJOR LANDFORM CATEGORIES: Upland	Bottomland	
Etowah	9 (16.2)	13 (5.8)	22
Duvall	113 (119.6)	49 (42.4)	162
Dyar	319 (306.3)	96 (108.7)	415
Bell	72 (70.9)	24 (25.1)	96
	513	182	695

$x^2 = 15.5$, d.f. $= 3$, $0.001 < p < 0.005$

Goodman and Kruskal's $Tau_{row} = 0.022$

$Tau_{col} = 0.005$

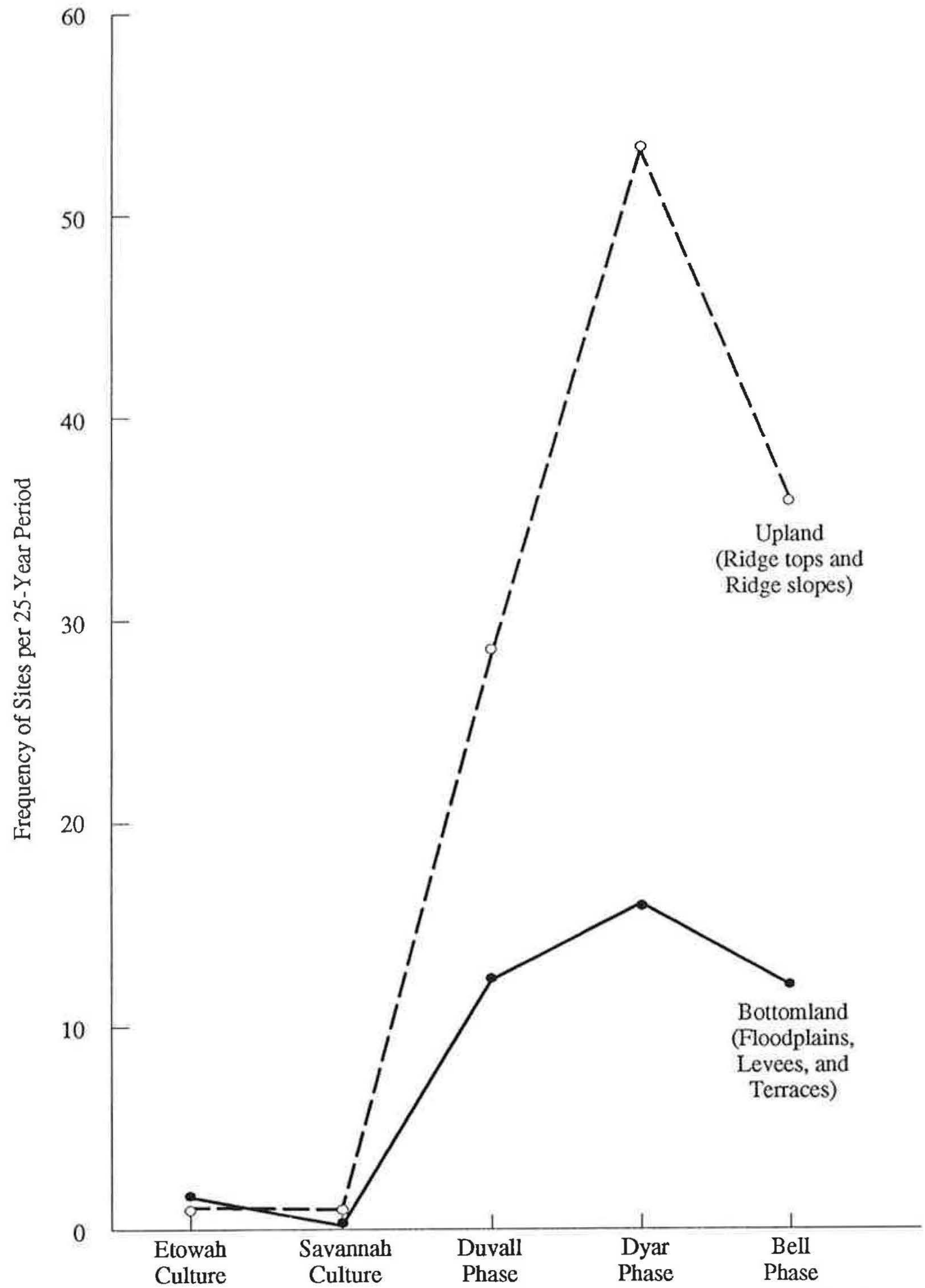


Figure 28. Frequency of Sites in Upland and Bottomland Habitats per 25-Year Period by Phase

Duvall phase, slows during the Dyar phase, and changes hardly at all during the Bell phase. This pattern corresponds to the approximate changes in overall site density shown in Figure 13.

Archaeologists have often assumed that during the Mississippi period upland areas near river valleys were used primarily for hunting while the bottomlands were used for farming and other activities. Kowalewski and Hatch (1991) correctly point out that there are many resources besides game in upland areas of piedmont Georgia, including soils suitable for agriculture. It is not clear, however, how important hunting may have been in upland areas compared to other parts of the Oconee watershed.

One source of information about which areas may have been used for hunting is the distribution of projectile points, those found on sites with Mississippian pottery and those found as isolated artifacts presumably lost or discarded by the hunter.

The Wallace Reservoir survey teams found exactly 100 Mississippian triangular projectile points on 72 different sites (Figure 29). This is a very small number of points given the 1008 Mississippian sites in the project area. The scarcity of projectile points suggests that perhaps raw material other than chert or quartz--such as cane--may also have been used to manufacture these tools. It is unlikely that collections by amateurs could account for this scarcity because much of the reservoir was heavily vegetated for years and because projectile points from other prehistoric periods are not as rare.

Tables 16 and 17 summarize some of the environmental variables

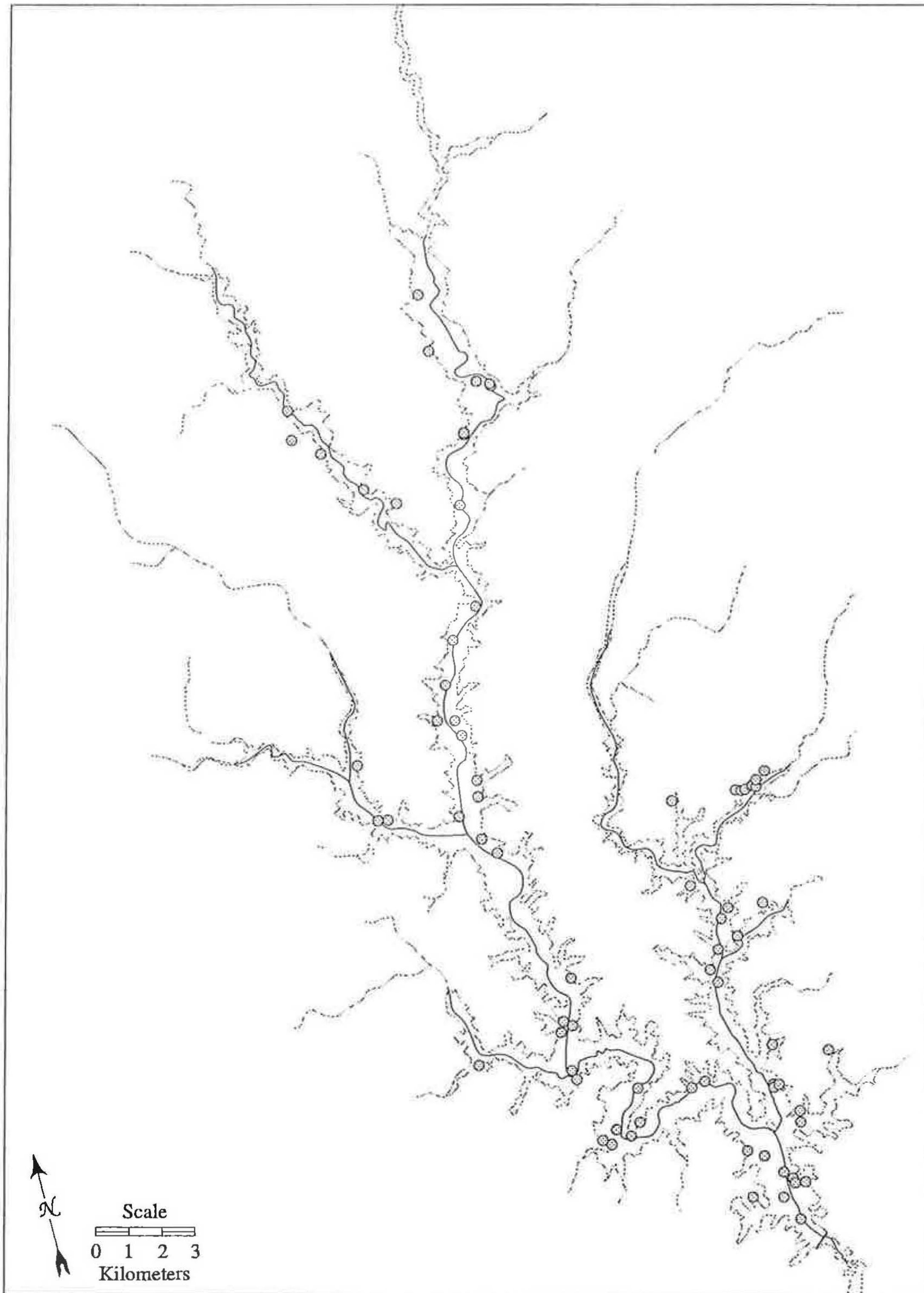


Figure 29. Distribution of Mississippian Projectile Points in the Lake Oconee Area

Table 16

Environmental Variables Associated with Projectile Points

	Isolated Projectile Points	*Sites with Projectile Points and Pottery*
N =	38	34
Slope (%)	Mean = 2.7 S.D. = 3.1	Mean = 2.6 S.D. = 2.0
Distance to Water (m)	Mean = 85.7 S.D. = 88.5	Mean = 62.6 S.D. = 53.7
Elevation above Water (m)	Mean = 4.8 S.D. = 4.0	Mean = 6.0 S.D. = 5.3

Table 17

Association of Projectile Points with Landform
(Expected Frequencies in Parentheses)

LANDFORM	SITES: Isolated Projectile Point	SITES: Projectile Point with Pottery	
Ridgetop/Ridge slope	23 (25.2)	24 (21.8)	47
Terrace	4 (3.2)	2 (2.8)	6
Floodplain/Levee	11 (9.6)	7 (8.4)	18
	38	33	71

$x^2 = 1.26$, d.f. $= 2$, $0.50 < p < 0.75$

associated with the distribution of projectile points. Isolated projectile points are on the average about 86 meters from the nearest source of water, although the standard deviation is high. This is roughly equal to the mean distance to water for a random sample of 300 Mississippian sites in the reservoir and considerably less than the mean distance to water for 300 random non-site locations in the reservoir. The majority of sites with projectile points are found on ridge tops and ridge slopes. However, Table 17 indicates that approximately the same proportion of both classes of site occur in floodplain, terrace, and levee locations rather than on ridge tops and ridge slopes. Given the distribution and low frequency of Mississippian projectile points, hunting was probably not a principal reason for locating sites in upland areas.

Unfortunately, isolated projectile points can not be assigned to a specific phase. Furthermore, only eight ceramic sites with projectile points can be assigned to a single phase; all the rest are multi-component. Six of these single component sites are Dyar phase and two are Duvall phase.

Hypothesis 1b can be supported for there is some evidence from the reservoir for increased use of upland zones. However, the pattern is weak. Furthermore, it is evident that the change through time was not predominantly associated with hunting, since sites with projectile points are relatively uncommon compared to sites without projectile points and are proportionately more frequent in bottomland locations than in upland locations.

Hypothesis 2: An increase in population density led to a shift from floodplain horticulture to a mixed strategy of short-fallow floodplain and upland long-fallow horticulture.

Through excavations at several locations, Hatch has demonstrated that upland Mississippian sites near the Oconee River are often small single-family homesteads where farming was an important activity. This is partly because, as Kowalewski and Hatch (1991) have argued, soils in the Piedmont uplands can be as productive as bottomland soils along the Oconee River. Therefore, it is reasonable to ask whether the importance of farming in the uplands changed through time.

The occupation or reuse of a site is related to the intensity of protein production, the intensity of energy production, the time it takes for the local environment to recover from exploitation, and the patchiness of the environment. If soils around a village were farmed heavily until they were no longer able to provide adequate crops, then the village may have been temporarily abandoned if alternative locations were available. Once the local soils had recovered, it is possible that people would have returned to this location.

With floodplain horticulture, field locations should have been relatively stable because they were frequently replenished by the sediments deposited during late winter and early spring floods. Such renewal would not have occurred outside the floodplain; once a field in the uplands was cleared and cultivated, its natural fertility would have declined gradually until it could no longer sustain a crop. The field might then have been abandoned for another.

Habitation sites located near fields might have been occupied as long as the fields were productive. If fields in floodplains were productive longer than those on ridge tops and ridge slopes, then habitation sites near floodplain fields might have been occupied longer than habitation sites near upland fields. A shift toward increased reliance on long-fallow swidden farming should therefore be revealed archaeologically by the frequency of site reoccupation in various habitats.

It is difficult to detect evidence of brief periods of abandonment and reoccupation from the pottery alone because the length of a site's occupation may have been much less than the length of a phase, which in the Oconee Valley lasts from 50 to 150 years. In other words, a site could have been occupied and abandoned repeatedly without there being a dramatic stylistic change in the jars and bowls used by the village residents. I will use the length of a phase as the minimum span of time for an occupation and will assume that if a site has no pottery diagnostic of that phase, then it was abandoned. If a site does have pottery of a particular phase, then I will assume that it was occupied throughout the phase and was not abandoned during that time.

The frequencies of single component and reoccupied sites are presented in Table 18. Only definite components are discussed.

There were 467 Mississippian sites for which at least one definite component was identified. Among these were 24 definite Etowah components (5.1 percent), seven definite Savannah components (1.5 percent), 164 definite Duvall components (35.1 percent), 417 definite Dyar components (89.3 percent), and 97 definite Bell components (20.8 percent).

Table 19 presents the proportions and frequencies of various categories of multi-component sites. For example, three of the Bell phase sites, or 3.1 percent,

Table 18
Definite Components at Sites in the Wallace Reservoir

	PHASES					
	Etowah	Savannah	Duvall	Dyar	Bell	SITES (N)
	*	*	*	*	*	0
	*	*	*	*		1
	*	*	*		*	0
	*	*	*			0
	*	*		*	*	0
	*	*		*		0
	*	*			*	0
	*	*				1
	*		*	*	*	2
	*		*	*		2
	*		*		*	0
	*		*			2
	*			*	*	0
	*			*		7
	*				*	1
	*					8
		*	*	*	*	0
		*	*	*		0
		*	*		*	0
		*	*			0
		*		*	*	0
		*		*		0
		*			*	0
		*				5
			*	*	*	49
			*	*		81
			*		*	1
			*			26
				*	*	38
				*		237
					*	6
						103*
Definite Components	(24)	(7)	(164)	(417)	(97)	

Note: * Includes sites with no pottery, or no definite diagnostic pottery.

Table 19

Frequencies and Proportions of Different Categories of Multicomponent Sites

	Etowah	Savannah	Duvall	Dyar	Bell	N
Etowah	8 (33.3%)*	2 (8.3%)	7 (29.2%)	12 (50.0%)	3 (12.5%)	24
Savannah	2 (28.6%)	5 (71.4%)*	1 (14.3%)	1 (14.3%)	1 (14.3%)	7
Duvall	7 (29.2%)	1 (0.6%)	26 (15.9%)*	135 (82.3%)	52 (31.7%)	164
Dyar	12 (50.0%)	1 (0.2%)	135 (32.4%)	237 (56.8%)*	89 (21.3%)	417
Bell	3 (3.1%)	1 (1.0%)	52 (53.6%)	89 (91.8%)	6 (6.2%)*	97

Note: * Single component sites.

also have Etowah components. Six Bell phase sites, or 6.2 percent, are single component.

In Table 20 I tabulate the various continuous occupations. Each level is a subset of the preceding level. In other words, the category *Bell* includes all Bell phase sites, the category *Bell-Dyar* includes all sites that were occupied continuously from the Dyar phase to the Bell phase, and the category *Bell-Dyar-Duvall* includes sites that were occupied throughout the Lamar period.

The frequency of reoccupation is directly related to the relative site densities of the different periods. It is unlikely that Duvall phase groups would have reoccupied Mississippian sites simply because there were so few Etowah and Savannah sites. The opposite applies to the Bell phase. There are many more definite Dyar sites than Bell sites, so one can assume that most Dyar sites would not be reoccupied and that a relatively high proportion of Bell sites would be found on top of Dyar sites.

Table 21 shows the statistical independence between reoccupation and landform by phase. Savannah period sites are so rare that reoccupation of Etowah sites by Savannah inhabitants (Table 21, a) and reoccupation of Savannah sites by the Duvall phase population (Table 21, b) are of little concern. During the Dyar phase, statistical independence is demonstrated in that upland Duvall sites are as likely to be reoccupied as bottomland Duvall sites (Table 21, c). During the Bell phase the samples are again statistically independent (Table 21, d). Based on the frequency of reoccupation, there is no evidence for greater reoccupation in bottomlands than in uplands at any time during the Mississippian occupation in the

Table 20

Continuous Occupations in the Project Area

	N
Bell	97
Bell-Dyar	89
Bell-Dyar-Duvall	51
Bell-Dyar-Duvall-Savannah	0
Bell-Dyar-Duvall-Savannah-Etowah	0
Dyar	417
Dyar-Duvall	135
Dyar-Duvall-Savannah	1
Dyar-Duvall-Savannah-Etowah	1
Duvall	164
Duvall-Savannah	1
Duvall-Savannah-Etowah	1
Savannah	7
Savannah-Etowah	2
Etowah	24

Table 21

Association of Reoccupation and Landform by Phase
(Expected Frequencies in Parentheses)

	Upland	Bottom land	
Savannah no Etowah	4 (4.3)	1 (0.7)	5
Savannah, Etowah	2 (1.7)	0 (0.3)	2
	6	1	7

A. Fisher Exact Test, $p > 0.05$

	Upland	Bottom land	
Duvall, no Savannah	112 (112.3)	49 (48.7)	161
Duvall, Savannah	1 (0.7)	0 (0.3)	1
	113	49	162

B. $X^2 = 0.432$, d.f. $= 1$, $p > 0.5$

	Upland	Bottom land	
Dyar no Duvall	222 (216.0)	59 (65.0)	281
Dyar, Duvall	97 (103.0)	37 (31.0)	134
	319	96	415

C. $X^2 = 2.23$, d.f. $= 1$, $p > 0.1$

	Upland	Bottom land	
Bell, no Dyar	6 (6.0)	2 (2.0)	8
Bell, Dyar	66 (66.0)	22 (22.0)	88
	72	24	96

D. $X^2 = 0$, d.f. $= 1$, $p > 0.995$

Oconee Valley.

Limited evidence presented above and data recently collected by others suggest that the uplands were used for farming in addition to other activities and that the intensity of upland resource use might have increased through time. However, there is no reason to believe at this time that the relative importance of floodplain farming and upland swidden farming changed during periods of population growth following the Savannah period. It seems likely that during the Duvall, Dyar, and Bell phases both resource areas may have been used for farming.

CHAPTER 7

CONCLUSIONS

Summary

I demonstrated in Chapters 4 and 6 that there may have been two episodes of rapid population growth during the Mississippi period occupation of the Oconee River valley. One of these occurred during the Duvall phase of the fourteenth and early fifteenth centuries. The second episode is less convincing, the data being contradictory, but it may have taken place near the end of the Dyar phase and the beginning of the Bell phase in the mid- to late sixteenth century.

Changes in human population size, density, or distribution can lead to changes in a subsistence economy--which crops are grown, where they are grown, which wild plants and animals are exploited, and how far people must travel to get food. I argued that the periods of most rapid population growth in the project area should correspond to the periods of the most pronounced changes in settlement and subsistence. In fact, it is evident from the previous chapter that while there were changes in site distribution during these periods of growth, the changes were much more subtle than one might have expected. Over five or six centuries, site density in the Lake Oconee area increased dramatically from only a handful of sites to hundreds, but the underlying settlement pattern stayed more or less the same.

There were exceptions. For example, the relative importance of areas near shoals to areas near broad floodplains as settlement locations increased during some periods. Broad bottomlands may have been the best locations for farming. Shoals along the Oconee River were the best places to obtain fish, mussels, small mammals, and turtles. These species were undoubtedly exploited throughout the Mississippian occupation, but it appears from the frequency of site locations near shoals that there was a greater emphasis placed on shoal resources during periods of rapid population growth. On the other hand, the relative frequency of shell middens does not appear to have changed over time, which suggests that the attraction of near-shoal locations may not have been tied to the availability of shellfish. Other factors, perhaps the importance of other aquatic foods or perhaps conflicts between political centers, may have drawn people to the southern part of the reservoir where shoals happened to be more common than to the north.

There is also evidence--admittedly weak--that the use of upland resources increased over time. Southeastern archaeologists often assume that Mississippian populations used upland areas primarily for hunting. However, in the Oconee Valley, upland areas were probably used for a variety of activities. Most upland sites in the project area are like sites nearer the river in having surface assemblages consisting primarily of sherds. Excavated upland sites have houses, features, burials, and a wide range of faunal remains. Projectile points, an indication of hunting, are uncommon throughout the Oconee Valley during the Mississippi period and are found more frequently in bottomland locations than in upland areas. This suggests that while hunting may have occurred in upland areas, there is no evidence that it was the predominant activity. It appears more likely that the uplands were used for farming, most probably long-fallow swidden farming. After the Etowah occupation, the frequency of sites in the uplands increased, but it does not appear from the available evidence that the relative importance of floodplain farming and upland swidden farming changed over time.

Mississippian Settlement in the Oconee Valley

The Mississippi period in the Oconee River valley was a time of rapidly changing population and the rise and fall of various political centers. But in some respects, the Mississippian subsistence strategy may have changed very little.

During the Etowah occupation (A.D. 1000-1200) there were only a few villages and hamlets in the portion of the Oconee Valley that was eventually flooded by the Wallace Reservoir. These sites were perhaps occupied by no more than a few hundred people at any one time. While most later Mississippian sites in the Oconee Valley are found on ridge slopes, there was some tendency for Etowah sites to occur more often on floodplains. With so few people in the area, there would have been no shortage of excellent locations for settlement.

The initial Etowah Armor phase occupation in the Wallace Reservoir had very few sites and apparently no political center, or at least no center with a platform mound. The Cold Springs site (Ge10) was one of the few Armor phase sites identified. Somewhat later, during the Stillhouse phase, there was a single small political center (Dyar - Ge5), at least one village without a mound (Ge162), and several very small sites that may have been hamlets.

During the succeeding Savannah culture (A.D. 1200-1350), there were still fewer sites. In fact, this portion of the Oconee Valley may have been abandoned for a century and a half, since each of the Savannah sites may actually be a late Etowah site. On the few likely Savannah sites, diagnostic sherds are infrequent, suggesting that the sites were either very small hamlets or specialized activity locations. The reasons for the abandonment are not known, but the scarcity of sites is all the more intriguing in light of the presence of one Savannah period mound center, the Scull Shoals site, only a few kilometers north of the reservoir and of another center, the Shinholser site, far to the south below the fall line. We may be seeing in the Wallace area evidence of a vacant quarter lying between two less-than-amicable political groups, one centered at Scull Shoals and the other centered at Shinholser.

During the Duvall phase (A.D. 1350-1450), the number of sites increased significantly. In fact, the possible number of sites per 25-year period may have increased 20- to 90-fold over the Etowah and Savannah cultures. Given the near abandonment during the preceding 150 years, it seems likely that the Duvall phase represents a period of immigration or colonization from a neighboring river valley or from another location within the Oconee Valley.

The Duvall phase is represented by at least two mound centers--Dyar (Ge5) in the Wallace Reservoir and Shoulderbone (Hk1), a few kilometers southeast of Wallace Dam. The settlement pattern could fit that proposed by Bruce Smith (1978) for the Mississippian adaptive niche with the only modifications being those suggested by Shapiro (1983). In other words, there would have been small occupations in the broad bottomlands where floodplain farming was practiced, and there would have been a number of specialized sites near shoals where farming was less feasible but where a variety of fauna could provide abundant protein. Shapiro developed his model using excavated data from the next phase--Iron Horse--but dating sites of this phase using only surface collections is very difficult. In this dissertation Iron Horse phase sites have been assigned to the Dyar phase.

Dyar phase (A.D. 1450-1600) mound centers in the Oconee Valley include Scull Shoals, Dyar, possibly another small site (Ge35) within the reservoir, and Shinholser.

Data from Lake Oconee are unclear, but research by others suggests that after the middle of the sixteenth century (late Dyar phase and early Bell phase), site density increased rapidly. It is likely that a 25 to 90 percent increase in site frequency occurred, depending on the correct assignment of possible Duvall and possible Dyar phase sites. Also, the ceramic collections seem to be larger from Dyar phase sites than from Duvall phase sites, which suggests that villages and hamlets were not only more common than before but also larger.

Kowalewski and Hatch (1991) suggest that the change in site density may be partly a result of population growth and partly a consequence of the dispersal of the population into smaller, briefly occupied sites in the uplands surrounding the Oconee River. The data presented in Chapter 6 indicate, however, that compared to sites of other Lamar phases, Dyar phase sites are not more frequent than expected on ridge slopes or less frequent than expected on floodplains, terraces, and levees. On the other hand, Dyar phase collections tend to contain more sherds than Bell phase collections. If sherd frequency is an indication of a site's population, then this pattern may support Kowalewski and Hatch's (1991) argument about population dispersal during the late Lamar occupation.

Despite the increase in the number of sites, there does not seem to be an increase in the exploitation of the Oconee River floodplain in the northern part of the reservoir. Instead, we see more sites near shoals, along narrow segments of river valleys, and in small stream valleys. Why were these narrower valleys selected? Even though there may have been advantages in increasing maize production in the broad floodplains along the Oconee, there were also increased risks. In this part of the state, major floods along the Oconee most often occur in late winter and early spring, but can occur at any time during the year, including late spring or summer. If maize and other cultivated foods were produced in small stream valleys in addition to the main valley, the localized pattern of spring and summer thunderstorms might have decreased the probability that most of the food supply could have been destroyed at one time by a single large flood on the Oconee River itself.

Finally, during the late Lamar Bell phase (A.D. 1600-1650), there appears on the surface to be a significant decrease in the number of sites in the reservoir, perhaps by as much as 30 to 60 percent. However, because of the difficulty in distinguishing some Dyar and Bell phase components within the reservoir, there is also evidence that the number of sites may have increased by as much as 120 percent. Data collected during surveys of upland areas outside the reservoir boundaries suggest that there was a general trend through time in which settlement gradually shifted from bottomland locations to upland locations.

Some of the mound centers in the project area were used as late as A.D. 1540, when de Soto's forces marched through the region, but it is unlikely that their political role continued to the beginning of the Bell phase. There are no known Bell phase centers, although some of the larger villages may have served this function (James Hatch, personal communication 1992). It appears that the average number of sherds found at Bell phase sites is less than the average for Dyar phase sites. Archaeologists may be witnessing a period of political disintegration following the arrival of de Soto and the collapse of the Dyar phase chiefdom. The decline of centralized authority may have led to population dispersal.

In summary, the overall trend in the Oconee Valley was from a very small population with no center and perhaps the simplest of local Mississippian economies (early Etowah Armor phase); to a small scale version of a simple ranked society (late Etowah Stillhouse phase); to a period of abandonment perhaps tied to the presence of competing chiefdoms (Savannah culture); to a period in which population growth and the need to intensify production in a less than ideal environment led to increased use of shoal and upland resources (Duvall and Dyar phases); to a time when the political organization declined and the population dispersed (late Dyar and Bell phases).

Future Research

The previous discussion is based on a mixture of fact, inference, and speculation. Additional research on Mississippi period economic behavior in the Oconee Valley will require addressing a variety of broad questions.

Archaeologists need a much better idea of the range of sites in the Oconee Valley, and especially of the surface manifestations of the different classes of sites. I have assumed in my analysis that most sites, including very small sites, were used for habitation, but this assumption needs to be demonstrated through excavation. Many of the smaller sites may have been specialized for farming, hunting, collecting plants, fishing, gathering shellfish, and other activities with no evidence of habitation.

The Wallace Reservoir area has a well dated ceramic sequence, but even this sequence is inadequate for dating most surface collections because they have very few sherds or because they are mixed. Ultimately, for archaeologists in Georgia to steer away from broad temporal generalizations, there is no substitute for having numerous radiocarbon dates from many different sites.

In recent years, most research and most excavations in the Oconee Valley have focused on late Dyar and early Bell phase sites. The Iron Horse and Duvall phases, not to mention the Etowah and Savannah cultures, have received very little attention. This will have to change if we are to get a clear picture of how Mississippian economic behavior evolved.

More information is needed on the nature of long-fallow swidden farming versus short-fallow floodplain horticulture in the region. Can archaeologists detect differences among sites at which these different farming systems were practiced? Is there any solid data to suggest that the relative importance of the two systems changed through time?

Finally, there is increasing evidence from elsewhere in Georgia that the events in the Oconee Valley may not have been typical for the Piedmont as a whole. Archaeologists have seen evidence of periodic abandonment in other valleys, but these episodes do not always occur at the same time. In some valleys, political organization seems to have been far more elaborate than that along the Oconee River. Elsewhere, settlement seems to be concentrated in villages and mound centers, not in small hamlets. Population density also seems to have differed from one drainage to another. Exploring this diversity will require many years and considerable effort by archaeologists who have a long-term commitment toward understanding the late prehistory of the eastern U.S.

This research will have to be based on solid survey data. Too often, archaeologists have assumed that there were increases in population or pronounced changes in settlement when the data are too few to support these assumptions. Even with excellent data, such as that recovered during the Wallace Reservoir Mitigation Survey, answers to basic questions about Mississippian settlement and subsistence prove exceptionally difficult to answer.

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APPENDIX A

SITES, COMPONENTS, AND SHERD FREQUENCIES

Appendix A

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
							SHERD FREQUENCIES							
Ge0005	Y	D		D	D	D	1	2	0	82	24	85	31	1
Ge0010	N	D	D				0	0	0	0	0	0	0	0
Ge0018	Y						0	0	0	0	0	0	0	0
Ge0020	Y				D		0	0	0	0	0	1	0	0
Ge0021	N						0	0	0	0	0	0	0	0
Ge0024	Y						0	0	0	0	0	0	0	0
Ge0025	Y			D			0	0	0	2	0	0	0	0
Ge0028	Y				D		0	0	0	0	0	1	0	0
Ge0030	Y	P	P	D	P		0	2	0	1	1	0	0	0
Ge0031	Y			D	D	D	0	0	0	2	0	4	0	1
Ge0033	Y			D	D		0	0	0	2	0	2	0	0
Ge0034	Y			D	D	P	0	0	0	1	2	7	4	0
Ge0035	Y				D	D	0	0	0	0	0	7	1	2
Ge0038	Y				P	P	0	0	0	0	0	0	1	0
Ge0039	Y			P	D	P	0	0	0	0	1	4	1	0
Ge0040	Y			D	D	D	0	0	0	1	0	6	1	1
Ge0042	N						0	0	0	0	0	0	0	0
Ge0044	Y				D	P	0	0	0	0	0	3	1	0
Ge0045	Y				D	P	0	0	0	0	0	2	1	0
Ge0046	Y			D	D	D	0	0	0	5	2	25	16	2

Note: * D = Definite component; P = Possible component.

Appendix A

		COMPONENT *					SHERD FREQUENCIES							
Site	Analyzed	ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
Ge0047	Y				D	P	0	0	0	0	0	1	1	0
Ge0048	Y				D	P	0	0	0	0	0	1	1	0
Ge0055	Y			D			0	0	0	1	0	0	0	0
Ge0057	N						0	0	0	0	0	0	0	0
Ge0062	Y			D	D	D	0	0	0	3	1	18	2	5
Ge0063	N						0	0	0	0	0	0	0	0
Ge0064	N						0	0	0	0	0	0	0	0
Ge0065	N						0	0	0	0	0	0	0	0
Ge0068	N						0	0	0	0	0	0	0	0
Ge0069	N						0	0	0	0	0	0	0	0
Ge0079	N						0	0	0	0	0	0	0	0
Ge0080	N						0	0	0	0	0	0	0	0
Ge0081	N						0	0	0	0	0	0	0	0
Ge0086	N						0	0	0	0	0	0	0	0
Ge0087	N						0	0	0	0	0	0	0	0
Ge0089	N						0	0	0	0	0	0	0	0
Ge0095	N						0	0	0	0	0	0	0	0
Ge0099	N						0	0	0	0	0	0	0	0
Ge0100	N						0	0	0	0	0	0	0	0
Ge0101	Y				D		0	0	0	0	0	3	0	0

Note: * D = Definite component; P = Possible component.

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Site	*Analyzed*	COMPONENT * *ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
									SHERD FREQUENCIES					
Ge0102	Y						0	0	0	0	0	0	0	0
Ge0103	N						0	0	0	0	0	0	0	0
Ge0104	N						0	0	0	0	0	0	0	0
Ge0105	Y				P	P	0	0	0	0	0	0	1	0
Ge0106	Y				D	P	0	0	0	0	0	2	1	0
Ge0107	Y				D		0	0	0	0	0	1	0	0
Ge0108	N						0	0	0	0	0	0	0	0
Ge0109	Y				D	P	0	0	0	0	0	1	1	0
Ge0112	N						0	0	0	0	0	0	0	0
Ge0116	N						0	0	0	0	0	0	0	0
Ge0117	Y				D		0	0	0	0	0	1	0	0
Ge0118	Y			P	D	P	0	0	0	0	1	1	1	0
Ge0121	Y				D	D	0	0	0	0	0	3	0	1
Ge0122	N						0	0	0	0	0	0	0	0
Ge0123	N						0	0	0	0	0	0	0	0
Ge0124	Y				D		0	0	0	0	0	1	0	0
Ge0126	Y				D	P	0	0	0	0	0	4	1	0
Ge0130	Y				D	P	0	0	0	0	0	1	1	0
Ge0131	Y				P	P	0	0	0	0	0	0	2	0
Ge0132	Y			D	D	P	0	0	0	4	2	25	3	0

Note: * D = Definite component; P = Possible component.

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		COMPONENT *							SHERD FREQUENCIES					
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
Ge0135	Y				P	P	0	0	0	0	0	0	1	0
Ge0136	N						0	0	0	0	0	0	0	0
Ge0137	Y		D				0	0	1	0	0	0	0	0
Ge0138	Y			D			0	0	0	1	0	0	0	0
Ge0139	Y			D	D	D	0	0	0	1	0	2	0	1
Ge0146	Y	P	P	D	D	P	0	1	0	2	0	8	2	0
Ge0147	Y				D	P	0	0	0	0	0	3	1	0
Ge0148	Y						0	0	0	0	0	0	0	0
Ge0149	Y			D	D	D	0	0	0	1	1	30	17	1
Ge0150	N						0	0	0	0	0	0	0	0
Ge0153	Y				D		0	0	0	0	0	2	0	0
Ge0154	N						0	0	0	0	0	0	0	0
Ge0155	N						0	0	0	0	0	0	0	0
Ge0157	Y						0	0	0	0	0	0	0	0
Ge0159	Y						0	0	0	0	0	0	0	0
Ge0160	Y	D			D		3	0	0	0	0	4	0	0
Ge0162	N	D					0	0	0	0	0	0	0	0
Ge0163	Y				D	P	0	0	0	0	0	2	1	0
Ge0164	Y				P	P	0	0	0	0	0	0	1	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	SHERD FREQUENCIES Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
Ge0167	N						0	0	0	0	0	0	0	0
Ge0169	Y			D	D	P	0	0	0	1	1	5	1	0
Ge0171	Y				D		0	0	0	0	0	2	0	0
Ge0172	Y				D		0	0	0	0	0	1	0	0
Ge0175	N						0	0	0	0	0	0	0	0
Ge0176	Y				D	P	0	0	0	0	0	2	2	0
Ge0177	Y				D		0	0	0	0	0	1	0	0
Ge0178	N						0	0	0	0	0	0	0	0
Ge0180	Y	D	P	D	D	P	1	1	0	1	0	4	2	0
Ge0181	Y	D			D		1	0	0	0	0	3	0	0
Ge0182	Y						0	0	0	0	0	0	0	0
Ge0183	N						0	0	0	0	0	0	0	0
Ge0184	N						0	0	0	0	0	0	0	0
Ge0186	Y						0	0	0	0	0	0	0	0
Ge0187	Y				D	P	0	0	0	0	0	4	3	0
Ge0188	Y				P	P	0	0	0	0	0	0	1	0
Ge0189	Y			D	D	D	0	0	0	2	0	2	0	1
Ge0190	Y	D		D			3	0	0	1	0	0	0	0
Ge0193	N						0	0	0	0	0	0	0	0
Ge0194	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	SHERD FREQUENCIES Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
Ge0200	N						0	0	0	0	0	0	0	0
Ge0216	Y				D		0	0	0	0	0	1	0	0
Ge0217	Y				D	P	0	0	0	0	0	5	3	0
Ge0218	N						0	0	0	0	0	0	0	0
Ge0219	N						0	0	0	0	0	0	0	0
Ge0220	N						0	0	0	0	0	0	0	0
Ge0221	N						0	0	0	0	0	0	0	0
Ge0222	N						0	0	0	0	0	0	0	0
Ge0223	N						0	0	0	0	0	0	0	0
Ge0224	Y			D	D	D	0	0	0	2	0	7	1	3
Ge0225	Y				D		0	0	0	0	0	5	0	0
Ge0226	N						0	0	0	0	0	0	0	0
Ge0227	Y				D	P	0	0	0	0	0	15	1	0
Ge0228	Y			D	D	D	0	0	0	4	0	18	8	3
Ge0229	Y			P	D		0	0	0	0	2	1	0	0
Ge0230	Y				D		0	0	0	0	0	1	0	0
Ge0231	Y				D	P	0	0	0	0	0	5	4	0
Ge0232	Y		D				0	0	1	0	0	0	0	0
Ge0233	Y	P	P	P	D	P	0	1	0	0	1	8	3	0
Ge0234	Y			D	D	D	0	0	0	1	0	12	5	5

Note: * D = Definite component; P = Possible component.

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		COMPONENT *					SHERD FREQUENCIES							
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
Ge0235	Y			D	D	P	0	0	0	7	0	13	2	0
Ge0236	Y						0	0	0	0	0	0	0	0
Ge0237	Y				D	P	0	0	0	0	0	2	1	0
Ge0238	Y						0	0	0	0	0	0	0	0
Ge0239	Y				D		0	0	0	0	0	2	0	0
Ge0241	Y						0	0	0	0	0	0	0	0
Ge0242	Y						0	0	0	0	0	0	0	0
Ge0243	Y			D	D		0	0	0	1	0	1	0	0
Ge0244	Y	P	P	P	D	P	0	2	0	0	4	10	2	0
Ge0245	Y						0	0	0	0	0	0	0	0
Ge0246	Y						0	0	0	0	0	0	0	0
Ge0247	Y			D	D	D	0	0	0	2	0	4	4	1
Ge0250	Y			P	D	P	0	0	0	0	1	4	2	0
Ge0251	Y			D	D	D	0	0	0	7	1	22	12	4
Ge0252	Y			D	D	P	0	0	0	1	1	6	1	0
Ge0253	Y			D	D	D	0	0	0	2	0	12	10	1
Ge0254	Y				D	D	0	0	0	0	0	8	0	1
Ge0256	Y			D	P	P	0	0	0	1	0	0	1	0
Ge0257	Y				D		0	0	0	0	0	2	0	0
Ge0258	Y				D	P	0	0	0	0	0	3	1	0

Note: * D = Definite component; P = Possible component.

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		COMPONENT *						SHERD FREQUENCIES							
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
Ge0259	Y			D	D	D	0	0	0	1	0	5	1	1
Ge0261	Y				D		0	0	0	0	0	1	0	0
Ge0262	Y						0	0	0	0	0	0	0	0
Ge0264	Y				D		0	0	0	0	0	2	0	0
Ge0265	N						0	0	0	0	0	0	0	0
Ge0266	Y			P	D	P	0	0	0	0	2	10	1	0
Ge0267	Y			P	D	P	0	0	0	0	1	8	7	0
Ge0269	Y			D	D	D	0	0	0	2	2	10	9	6
Ge0270	Y			D	D		0	0	0	3	0	4	0	0
Ge0271	Y			D	D	D	0	0	0	1	0	8	0	2
Ge0272	Y			D	D		0	0	0	1	0	2	0	0
Ge0273	Y			D	D	P	0	0	0	3	0	3	8	0
Ge0274	Y				D	P	0	0	0	0	0	3	1	0
Ge0277	Y				D	P	0	0	0	0	0	1	1	0
Ge0281	Y				D	D	0	0	0	0	0	3	1	1
Ge0282	Y				D	P	0	0	0	0	0	6	1	0
Ge0283	Y				D		0	0	0	0	0	8	0	0
Ge0285	Y				D		0	0	0	0	0	1	0	0
Ge0286	Y			D	D	P	0	0	0	1	0	5	2	0
Ge0287	Y			D			0	0	0	1	0	0	0	0

Note: * D = Definite component; P = Possible component.

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		COMPONENT *					SHERD FREQUENCIES							
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
Ge0288	Y			D	D	P	0	0	0	1	0	9	1	0
Ge0289	Y			D	D	P	0	0	0	4	1	20	1	0
Ge0290	Y						0	0	0	0	0	0	0	0
Ge0291	Y				D	P	0	0	0	0	0	1	2	0
Ge0292	Y			D	D	P	0	0	0	1	1	3	1	0
Ge0293	Y			P	D		0	0	0	0	1	2	0	0
Ge0294	Y				D	P	0	0	0	0	0	3	1	0
Ge0295	Y				D	P	0	0	0	0	0	2	1	0
Ge0296	Y			D	D	D	0	0	0	1	0	15	5	1
Ge0297	Y			D	D	P	0	0	0	1	0	14	5	0
Ge0298	Y						0	0	0	0	0	0	0	0
Ge0300	Y			D	D	D	0	0	0	2	0	11	1	1
Ge0301	Y				D		0	0	0	0	0	2	0	0
Ge0302	Y				D	P	0	0	0	0	0	2	2	0
Ge0303	Y		D				0	0	1	0	0	0	0	0
Ge0304	Y				D	P	0	0	0	0	0	1	2	0
Ge0305	Y				D	D	0	0	0	0	0	1	1	1
Ge0306	Y				D		0	0	0	0	0	1	0	0
Ge0307	Y			D	D	D	0	0	0	8	1	7	5	1
Ge0308	Y			D	D	D	0	0	0	1	0	10	2	1

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	ET	SA	DU	DY	BE	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
		COMPONENT *					SHERD FREQUENCIES							
Ge0309	Y				D		0	0	0	0	0	2	0	0
Ge0310	Y			D	D	D	0	0	0	1	0	9	1	2
Ge0312	Y			D	D	D	0	0	0	1	0	4	2	1
Ge0313	Y			P	D		0	0	0	0	1	5	0	0
Ge0314	N						0	0	0	0	0	0	0	0
Ge0315	N						0	0	0	0	0	0	0	0
Ge0318	Y			D	D	P	0	0	0	3	0	3	2	0
Ge0319	Y			D	D	P	0	0	0	1	0	14	1	0
Ge0320	Y				D		0	0	0	0	0	2	0	0
Ge0321	Y				D		0	0	0	0	0	1	0	0
Ge0322	N						0	0	0	0	0	0	0	0
Ge0323	Y				D		0	0	0	0	0	1	0	0
Ge0324	Y			D	P	P	0	0	0	1	0	0	1	0
Ge0326	Y						0	0	0	0	0	0	0	0
Ge0328	Y				D		0	0	0	0	0	1	0	0
Ge0329	Y			D	D	D	0	0	0	4	0	31	14	2
Ge0330	Y				D		0	0	0	0	0	3	0	0
Ge0331	Y			D	D		0	0	0	4	0	2	0	0
Ge0333	Y				D		0	0	0	0	0	1	0	0
Ge0334	Y				D		0	0	0	0	0	5	0	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
		COMPONENT *					SHERD FREQUENCIES							
Ge0335	Y				D	P	0	0	0	0	0	1	3	0
Ge0336	Y				D		0	0	0	0	0	2	0	0
Ge0337	Y			D	D	D	0	0	0	1	0	2	2	1
Ge0338	Y	D		D	P		1	0	0	1	4	0	0	0
Ge0339	Y						0	0	0	0	0	0	0	0
Ge0340	Y				D		0	0	0	0	0	1	0	0
Ge0341	Y				P	P	0	0	0	0	0	0	1	0
Ge0342	Y				D	D	0	0	0	0	0	2	2	1
Ge0343	Y			D	D		0	0	0	3	0	2	0	0
Ge0345	Y			D	D	D	0	0	0	2	1	8	2	1
Ge0346	Y			P	P		0	0	0	0	1	0	0	0
Ge0347	Y				D	P	0	0	0	0	0	8	2	0
Ge0349	Y						0	0	0	0	0	0	0	0
Ge0350	Y				D	P	0	0	0	0	0	9	2	0
Ge0351	Y				D		0	0	0	0	0	2	0	0
Ge0354	Y				D	P	0	0	0	0	0	2	1	0
Ge0355	Y				D		0	0	0	0	0	1	0	0
Ge0357	Y			D	D	P	0	0	0	2	0	16	1	0
Ge0359	Y			D	D		0	0	0	1	0	1	0	0
Ge0360	Y				D		0	0	0	0	0	2	0	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	SHERD FREQUENCIES Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
Ge0361	Y				D		0	0	0	0	0	2	0	0
Ge0362	Y				D		0	0	0	0	0	6	0	0
Ge0364	Y				D		0	0	0	0	0	3	0	0
Ge0365	Y			P	D		0	0	0	0	1	2	0	0
Ge0366	Y				D	D	0	0	0	0	0	1	0	1
Ge0367	Y				D		0	0	0	0	0	1	0	0
Ge0369	Y			D	D	D	0	0	0	2	1	9	4	1
Ge0370	Y			D	D		0	0	0	1	0	2	0	0
Ge0372	Y			D	D	P	0	0	0	6	1	4	7	0
Ge0373	Y						0	0	0	0	0	0	0	0
Ge0375	Y			D	D		0	0	0	1	0	1	0	0
Ge0376	Y			P	D	P	0	0	0	0	1	6	1	0
Ge0377	Y						0	0	0	0	0	0	0	0
Ge0378	Y				D	D	0	0	0	0	0	8	1	3
Ge0380	Y						0	0	0	0	0	0	0	0
Ge0381	Y				D		0	0	0	0	0	2	0	0
Ge0382	Y				P	P	0	0	0	0	0	0	1	0
Ge0387	Y			D			0	0	0	1	0	0	0	0
Ge0388	Y			D	D	P	0	0	0	3	0	3	1	0
Ge0389	Y			P	P		0	0	0	0	3	0	0	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
							SHERD FREQUENCIES							
Ge0390	Y				D	P	0	0	0	0	0	12	3	0
Ge0391	Y				D	P	0	0	0	0	0	1	1	0
Ge0392	Y				D		0	0	0	0	0	3	0	0
Ge0394	Y				D		0	0	0	0	0	3	0	0
Ge0395	Y			D	D	P	0	0	0	1	1	13	4	0
Ge0398	Y				D	D	0	0	0	0	0	7	1	1
Ge0399	Y				D	P	0	0	0	0	0	1	1	0
Ge0400	N						0	0	0	0	0	0	0	0
Ge0407	Y			P	P		0	0	0	0	1	0	0	0
Ge0409	Y				D		0	0	0	0	0	1	0	0
Ge0411	Y			P	D	P	0	0	0	0	1	6	2	0
Ge0413	Y			P	D	D	0	0	0	0	1	7	1	1
Ge0415	Y				P	P	0	0	0	0	0	0	1	0
Ge0416	Y			P	D	P	0	0	0	0	1	4	1	0
Ge0417	Y				P	P	0	0	0	0	0	0	1	0
Ge0418	Y			D	D	P	0	0	0	2	0	6	2	0
Ge0419	Y				D	P	0	0	0	0	0	1	3	0
Ge0421	Y				D		0	0	0	0	0	2	0	0
Ge0422	Y			D	D	D	0	0	0	2	2	13	3	1
Ge0423	Y			D	D	P	0	0	0	2	1	12	2	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
							SHERD FREQUENCIES							
Ge0424	Y			D	D	P	0	0	0	1	0	2	2	0
Ge0425	Y						0	0	0	0	0	0	0	0
Ge0426	Y			D	D	D	0	0	0	3	3	39	1	2
Ge0427	Y			D			0	0	0	1	0	0	0	0
Ge0428	Y						0	0	0	0	0	0	0	0
Ge0429	Y						0	0	0	0	0	0	0	0
Ge0430	Y			P	D		0	0	0	0	1	4	0	0
Ge0434	Y			D	D	P	0	0	0	2	1	9	2	0
Ge0436	Y				D		0	0	0	0	0	1	0	0
Ge0437	Y			D	D		0	0	0	2	0	3	0	0
Ge0438	Y				D	P	0	0	0	0	0	1	4	0
Ge0439	Y			D	D		0	0	0	1	0	1	0	0
Ge0440	Y				D		0	0	0	0	0	2	0	0
Ge0441	Y			P	D	D	0	0	0	0	4	22	13	4
Ge0442	Y			D	D	P	0	0	0	11	1	7	3	0
Ge0443	Y				D		0	0	0	0	0	1	0	0
Ge0444	Y			P	D		0	0	0	0	1	4	0	0
Ge0445	Y			P	D	D	0	0	0	0	1	11	5	4
Ge0446	Y						0	0	0	0	0	0	0	0
Ge0449	Y						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
		COMPONENT *					SHERD FREQUENCIES							
Ge0450	Y			D	D		0	0	0	1	0	1	0	0
Ge0453	Y				D		0	0	0	0	0	3	0	0
Ge0457	Y			D	D	D	0	0	0	8	1	17	5	1
Ge0458	Y						0	0	0	0	0	0	0	0
Ge0459	Y				D	D	0	0	0	0	0	3	5	1
Ge0460	Y				P	P	0	0	0	0	0	0	1	0
Ge0461	Y				P	P	0	0	0	0	0	0	2	0
Ge0463	Y				D		0	0	0	0	0	1	0	0
Ge0464	Y						0	0	0	0	0	0	0	0
Ge0465	Y				D		0	0	0	0	0	2	0	0
Ge0467	Y			P	D	P	0	0	0	0	1	13	1	0
Ge0468	Y				D		0	0	0	0	0	1	0	0
Ge0469	Y			P	D	P	0	0	0	0	1	11	1	0
Ge0470	Y						0	0	0	0	0	0	0	0
Ge0472	Y					D	0	0	0	0	0	0	0	1
Ge0475	Y						0	0	0	0	0	0	0	0
Ge0476	Y						0	0	0	0	0	0	0	0
Ge0478	Y			P	D	P	0	0	0	0	1	2	1	0
Ge0479	Y						0	0	0	0	0	0	0	0
Ge0483	Y				D		0	0	0	0	0	1	0	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
		COMPONENT *					SHERD FREQUENCIES							
Ge0484	Y						0	0	0	0	0	0	0	0
Ge0485	Y				D	P	0	0	0	0	0	1	2	0
Ge0489	Y			P	D	D	0	0	0	0	1	3	1	1
Ge0490	Y			D			0	0	0	2	0	0	0	0
Ge0492	Y					D	0	0	0	0	0	0	0	1
Ge0494	Y				D		0	0	0	0	0	1	0	0
Ge0495	Y						0	0	0	0	0	0	0	0
Ge0496	Y						0	0	0	0	0	0	0	0
Ge0498	Y				D		0	0	0	0	0	1	0	0
Ge0499	Y			D	D	P	0	0	0	1	0	1	1	0
Ge0502	Y			P	D		0	0	0	0	1	10	0	0
Ge0504	Y			D	D	P	0	0	0	1	2	4	5	0
Ge0505	Y				D	D	0	0	0	0	0	3	2	1
Ge0506	Y			D			0	0	0	1	0	0	0	0
Ge0507	Y						0	0	0	0	0	0	0	0
Ge0508	Y						0	0	0	0	0	0	0	0
Ge0509	Y				D	P	0	0	0	0	0	7	1	0
Ge0511	Y				D		0	0	0	0	0	2	0	0
Ge0512	Y			D	D	D	0	0	0	4	0	13	2	2
Ge0513	Y			D	D	D	0	0	0	1	0	1	0	1

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
		COMPONENT *					SHERD FREQUENCIES							
Ge0517	Y				D		0	0	0	0	0	2	0	0
Ge0520	Y			D	D	P	0	0	0	17	3	21	9	0
Ge0521	Y						0	0	0	0	0	0	0	0
Ge0522	Y						0	0	0	0	0	0	0	0
Ge0527	Y				D	P	0	0	0	0	0	1	1	0
Ge0529	Y				D		0	0	0	0	0	1	0	0
Ge0531	Y			D	D	D	0	0	0	2	2	24	9	2
Ge0533	Y			D	D	P	0	0	0	4	0	14	4	0
Ge0539	Y						0	0	0	0	0	0	0	0
Ge0540	Y				D	P	0	0	0	0	0	5	2	0
Ge0541	Y				D	P	0	0	0	0	0	9	3	0
Ge0550	Y			D	D	D	0	0	0	8	12	88	14	3
Ge0551	Y			D	D	P	0	0	0	1	1	3	2	0
Ge0552	Y				D	P	0	0	0	0	0	4	1	0
Ge0561	Y				D	P	0	0	0	0	0	4	1	0
Ge0564	Y						0	0	0	0	0	0	0	0
Ge0569	Y				D	D	0	0	0	0	0	4	1	1
Ge0571	Y						0	0	0	0	0	0	0	0
Ge0573	Y						0	0	0	0	0	0	0	0
Ge0579	Y			P	D		0	0	0	0	1	2	0	0

Note: * D = Definite component; P = Possible component.

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		COMPONENT *						SHERD FREQUENCIES							
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
Ge0582	Y			D	D		0	0	0	1	0	1	0	0
Ge0583	Y				D	P	0	0	0	0	0	3	1	0
Ge0584	Y			P	D		0	0	0	0	1	1	0	0
Ge0587	Y						0	0	0	0	0	0	0	0
Ge0589	Y				P	P	0	0	0	0	0	0	1	0
Ge0591	Y				P	P	0	0	0	0	0	0	1	0
Ge0592	Y				D	P	0	0	0	0	0	3	2	0
Ge0593	Y			D			0	0	0	1	0	0	0	0
Ge0595	Y						0	0	0	0	0	0	0	0
Ge0596	Y				D	D	0	0	0	0	0	3	0	2
Ge0599	Y			D			0	0	0	1	0	0	0	0
Ge0602	Y			D	D	P	0	0	0	1	0	2	1	0
Ge0604	Y				D		0	0	0	0	0	1	0	0
Ge0605	Y				D		0	0	0	0	0	1	0	0
Ge0608	Y				D		0	0	0	0	0	1	0	0
Ge0609	Y			D	D	P	0	0	0	1	0	17	7	0
Ge0613	Y				D		0	0	0	0	0	2	0	0
Ge0614	Y				D		0	0	0	0	0	2	0	0
Ge0615	Y			D	D	D	0	0	0	5	0	24	5	2
Ge0616	Y				D		0	0	0	0	0	2	0	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	SHERD FREQUENCIES: Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
Ge0617	Y				D	P	0	0	0	0	0	1	1	0
Ge0618	Y				D		0	0	0	0	0	2	0	0
Ge0619	Y				D		0	0	0	0	0	1	0	0
Ge0620	Y				D		0	0	0	0	0	3	0	0
Ge0622	Y			P	D	D	0	0	0	0	1	1	0	1
Ge0629	Y				D	P	0	0	0	0	0	1	2	0
Ge0630	Y				D	D	0	0	0	0	0	2	0	1
Ge0633	Y				P	P	0	0	0	0	0	0	1	0
Ge0635	Y			D	D	D	0	0	0	1	0	7	2	2
Ge0637	Y				P	P	0	0	0	0	0	0	2	0
Ge0638	Y				P	P	0	0	0	0	0	0	1	0
Ge0639	Y				P	P	0	0	0	0	0	0	1	0
Ge0640	Y				D		0	0	0	0	0	5	0	0
Ge0642	Y				D		0	0	0	0	0	1	0	0
Ge0645	Y				D		0	0	0	0	0	1	0	0
Ge0646	Y			P	D	P	0	0	0	0	1	1	1	0
Ge0658	Y				D		0	0	0	0	0	3	0	0
Ge0659	Y				P	P	0	0	0	0	0	0	1	0
Ge0660	Y						0	0	0	0	0	0	0	0
Ge0664	Y			D	D	D	0	0	0	3	0	5	1	2

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	*Definite Etowah*	*Possibly Etowah or Savannah*	SHERD FREQUENCIES *Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
Ge0665	Y						0	0	0	0	0	0	0	0
Ge0666	Y				D	D	0	0	0	0	0	1	1	1
Ge0667	Y				D	P	0	0	0	0	0	1	1	0
Ge0668	Y			D	D	D	0	0	0	2	0	16	2	3
Ge0669	N						0	0	0	0	0	0	0	0
Ge0671	N						0	0	0	0	0	0	0	0
Ge0672	N						0	0	0	0	0	0	0	0
Ge0674	N		D				0	0	0	0	0	0	0	0
Ge0675	Y			D	D		0	0	0	1	1	3	0	0
Ge0676	N						0	0	0	0	0	0	0	0
Ge0677	N						0	0	0	0	0	0	0	0
Ge0682	N						0	0	0	0	0	0	0	0
Ge0683	N						0	0	0	0	0	0	0	0
Ge0684	N						0	0	0	0	0	0	0	0
Ge0685	N						0	0	0	0	0	0	0	0
Ge0686	N						0	0	0	0	0	0	0	0
Ge0690	N						0	0	0	0	0	0	0	0
Ge0691	Y						0	0	0	0	0	0	0	0
Ge0693	N						0	0	0	0	0	0	0	0
Ge0695	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
							SHERD FREQUENCIES							
Ge0698	N						0	0	0	0	0	0	0	0
Ge0699	N						0	0	0	0	0	0	0	0
Ge0700	N						0	0	0	0	0	0	0	0
Ge0703	Y			D	D	D	0	0	0	4	0	21	12	2
Ge0704	N						0	0	0	0	0	0	0	0
Ge0705	N						0	0	0	0	0	0	0	0
Ge0706	Y						0	0	0	0	0	0	0	0
Ge0708	Y			D	D		0	0	0	1	0	1	0	0
Ge0715	N						0	0	0	0	0	0	0	0
Ge0721	Y			D			0	0	0	1	0	0	0	0
Ge0726	N						0	0	0	0	0	0	0	0
Ge0731	Y				D		0	0	0	0	0	1	0	0
Ge0733	N						0	0	0	0	0	0	0	0
Ge0734	N						0	0	0	0	0	0	0	0
Ge0736	N						0	0	0	0	0	0	0	0
Ge0738	N						0	0	0	0	0	0	0	0
Ge0739	Y				D		0	0	0	0	0	2	0	0
Ge0740	N						0	0	0	0	0	0	0	0
Ge0742	N						0	0	0	0	0	0	0	0
Ge0744	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	SHERD FREQUENCIES Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
Ge0745	N						0	0	0	0	0	0	0	0
Ge0751	N						0	0	0	0	0	0	0	0
Ge0752	Y			D	D	D	0	0	0	9	1	7	4	1
Ge0753	Y			D			0	0	0	1	0	0	0	0
Ge0754	Y			D	D		0	0	0	3	0	3	0	0
Ge0756	Y			P	P		0	0	0	0	1	0	0	0
Ge0758	Y				P	P	0	0	0	0	0	0	2	0
Ge0760	Y			D	D		0	0	0	1	1	2	0	0
Ge0763	Y				D	P	0	0	0	0	0	5	2	0
Ge0765	Y			D			0	0	0	1	0	0	0	0
Ge0766	Y			D	D	P	0	0	0	2	0	4	2	0
Ge0768	Y				D		0	0	0	0	0	3	0	0
Ge0769	Y			D			0	0	0	1	0	0	0	0
Ge0772	Y				D	P	0	0	0	0	0	1	1	0
Ge0773	Y						0	0	0	0	0	0	0	0
Ge0774	Y				D		0	0	0	0	0	1	0	0
Ge0775	Y				D		0	0	0	0	0	1	0	0
Ge0776	Y				D	D	0	0	0	0	0	8	2	1
Ge0777	Y						0	0	0	0	0	0	0	0
Ge0778	Y				D	P	0	0	0	0	0	2	1	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
							SHERD FREQUENCIES							
Ge0781	Y					D	0	0	0	0	0	0	0	1
Ge0783	Y				D	D	0	0	0	0	0	2	1	1
Ge0786	Y				D		0	0	0	0	0	1	0	0
Ge0790	Y				D	P	0	0	0	0	0	3	5	0
Ge0794	Y				D		0	0	0	0	0	2	0	0
Ge0795	Y				D	P	0	0	0	0	0	6	1	0
Ge0796	Y				D		0	0	0	0	0	1	0	0
Ge0798	Y			D	D	P	0	0	0	3	1	9	2	0
Ge0800	Y				D	D	0	0	0	0	0	4	0	1
Ge0802	Y			P	D	P	0	0	0	0	1	5	2	0
Ge0803	Y			D	D		0	0	0	2	0	2	0	0
Ge0804	Y			D	D		0	0	0	1	0	1	0	0
Ge0806	Y				D	P	0	0	0	0	0	2	1	0
Ge0810	Y			P	D	P	0	0	0	0	1	1	1	0
Ge0812	Y				D	P	0	0	0	0	0	1	2	0
Ge0813	Y	D		D	D	P	2	0	0	2	1	3	2	0
Ge0814	Y			D	D		0	0	0	2	1	3	0	0
Ge0815	Y			D	P	P	0	0	0	2	0	0	2	0
Ge0816	Y				D	P	0	0	0	0	0	3	1	0
Ge0817	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
							SHERD FREQUENCIES							
Ge0818	Y	D	D	D	D	P	2	3	1	2	0	2	1	0
Ge0819	N						0	0	0	0	0	0	0	0
Ge0820	Y			D	D		0	0	0	1	0	1	0	0
Ge0821	Y			D	P	P	0	0	0	1	0	0	1	0
Ge0822	Y						0	0	0	0	0	0	0	0
Ge0825	Y			D	P	P	0	0	0	1	0	0	1	0
Ge0826	Y			D	D		0	0	0	2	0	2	0	0
Ge0827	Y			D	D	P	0	0	0	4	3	3	4	0
Ge0831	Y	P	P	D	D	P	0	1	0	7	0	19	6	0
Ge0835	Y				D	P	0	0	0	0	0	3	1	0
Ge0838	Y				D	P	0	0	0	0	0	3	1	0
Ge0839	Y			D			0	0	0	1	0	0	0	0
Ge0840	N						0	0	0	0	0	0	0	0
Ge0841	Y			D	D	P	0	0	0	2	0	5	2	0
Ge0842	Y			D			0	0	0	1	0	0	0	0
Ge0843	Y			D			0	0	0	1	0	0	0	0
Ge0845	Y				P	P	0	0	0	0	0	0	1	0
Ge0846	Y				D	P	0	0	0	0	0	2	2	0
Ge0852	Y						0	0	0	0	0	0	0	0
Ge0853	N	D					0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
							SHERD FREQUENCIES							
Ge0857	N						0	0	0	0	0	0	0	0
Ge0858	N						0	0	0	0	0	0	0	0
Ge0862	N						0	0	0	0	0	0	0	0
Ge0863	N						0	0	0	0	0	0	0	0
Ge0867	N						0	0	0	0	0	0	0	0
Ge0869	N						0	0	0	0	0	0	0	0
Ge0870	Y			P	D	P	0	0	0	0	1	1	1	0
Ge0872	Y			P	D		0	0	0	0	1	3	0	0
Ge0873	Y				D	P	0	0	0	0	0	1	1	0
Ge0874	N						0	0	0	0	0	0	0	0
Ge0875	N						0	0	0	0	0	0	0	0
Ge0877	N						0	0	0	0	0	0	0	0
Ge0878	N						0	0	0	0	0	0	0	0
Ge0879	N						0	0	0	0	0	0	0	0
Ge0880	N						0	0	0	0	0	0	0	0
Ge0881	N						0	0	0	0	0	0	0	0
Ge0882	N						0	0	0	0	0	0	0	0
Ge0883	N						0	0	0	0	0	0	0	0
Ge0884	Y						0	0	0	0	0	0	0	0
Ge0885	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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									SHERD FREQUENCIES					
		COMPONENT *						*Possibly Etowah or*			*Possibly Duvall or*		*Possibly Dyar or*	
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Savannah*	*Definite Savannah*	*Definite Duvall*	*Dyar*	*Definite Dyar*	*Bell*	*Definite Bell*
Ge0886	N						0	0	0	0	0	0	0	0
Ge0888	Y						0	0	0	0	0	0	0	0
Ge0892	N						0	0	0	0	0	0	0	0
Ge0894	N						0	0	0	0	0	0	0	0
Ge0895	N						0	0	0	0	0	0	0	0
Ge0899	N						0	0	0	0	0	0	0	0
Ge0901	N						0	0	0	0	0	0	0	0
Ge0904	N						0	0	0	0	0	0	0	0
Ge0906	N						0	0	0	0	0	0	0	0
Ge0907	N						0	0	0	0	0	0	0	0
Ge0908	N						0	0	0	0	0	0	0	0
Ge0912	N						0	0	0	0	0	0	0	0
Ge0916	N						0	0	0	0	0	0	0	0
Ge0919	N						0	0	0	0	0	0	0	0
Ge0920	Y						0	0	0	0	0	0	0	0
Ge0921	N						0	0	0	0	0	0	0	0
Ge0922	N						0	0	0	0	0	0	0	0
Ge0923	N						0	0	0	0	0	0	0	0
Ge0924	N						0	0	0	0	0	0	0	0
Ge0925	N					D	0	0	0	0	0	0	0	1

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
Ge0930	N						0	0	0	0	0	0	0	0
Ge0931	N						0	0	0	0	0	0	0	0
Ge0932	N						0	0	0	0	0	0	0	0
Ge0934	N						0	0	0	0	0	0	0	0
Ge0935	Y						0	0	0	0	0	0	0	0
Ge0936	N						0	0	0	0	0	0	0	0
Ge0937	N						0	0	0	0	0	0	0	0
Ge0938	N						0	0	0	0	0	0	0	0
Ge0940	Y						0	0	0	0	0	0	0	0
Ge0941	N						0	0	0	0	0	0	0	0
Ge0944	N						0	0	0	0	0	0	0	0
Ge0945	N						0	0	0	0	0	0	0	0
Ge0946	Y						0	0	0	0	0	0	0	0
Ge0948	N						0	0	0	0	0	0	0	0
Ge0952	N						0	0	0	0	0	0	0	0
Ge0953	Y						0	0	0	0	0	0	0	0
Ge0954	N						0	0	0	0	0	0	0	0
Ge0955	N						0	0	0	0	0	0	0	0
Ge0957	N						0	0	0	0	0	0	0	0
Ge0958	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
		COMPONENT *					SHERD FREQUENCIES							
Ge0959	N						0	0	0	0	0	0	0	0
Ge0960	N						0	0	0	0	0	0	0	0
Ge0961	N						0	0	0	0	0	0	0	0
Ge0962	N						0	0	0	0	0	0	0	0
Ge0975	N						0	0	0	0	0	0	0	0
Ge0977	N						0	0	0	0	0	0	0	0
Ge0978	N						0	0	0	0	0	0	0	0
Ge0979	N						0	0	0	0	0	0	0	0
Ge0984	N						0	0	0	0	0	0	0	0
Ge0985	N						0	0	0	0	0	0	0	0
Ge0986	N						0	0	0	0	0	0	0	0
Ge0987	N						0	0	0	0	0	0	0	0
Ge0988	N						0	0	0	0	0	0	0	0
Ge0989	Y				D	P	0	0	0	0	0	3	2	0
Ge0990	N						0	0	0	0	0	0	0	0
Ge0991	Y						0	0	0	0	0	0	0	0
Ge0993	N						0	0	0	0	0	0	0	0
Ge0995	N						0	0	0	0	0	0	0	0
Ge0997	N						0	0	0	0	0	0	0	0
Ge0999	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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							SHERD FREQUENCIES							
		COMPONENT *												
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
Ge1001	N						0	0	0	0	0	0	0	0
Ge1003	N						0	0	0	0	0	0	0	0
Ge1005	N						0	0	0	0	0	0	0	0
Ge1008	N						0	0	0	0	0	0	0	0
Ge1010	N						0	0	0	0	0	0	0	0
Ge1011	N						0	0	0	0	0	0	0	0
Ge1014	N						0	0	0	0	0	0	0	0
Ge1016	N						0	0	0	0	0	0	0	0
Ge1017	N						0	0	0	0	0	0	0	0
Ge1018	N						0	0	0	0	0	0	0	0
Ge1019	N						0	0	0	0	0	0	0	0
Ge1020	N						0	0	0	0	0	0	0	0
Ge1021	N						0	0	0	0	0	0	0	0
Ge1022	N						0	0	0	0	0	0	0	0
Ge1025	N						0	0	0	0	0	0	0	0
Ge1030	N						0	0	0	0	0	0	0	0
Ge1031	N						0	0	0	0	0	0	0	0
Ge1032	N						0	0	0	0	0	0	0	0
Ge1033	N						0	0	0	0	0	0	0	0
Ge1035	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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		COMPONENT *					SHERD FREQUENCIES							
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
Ge1036	N						0	0	0	0	0	0	0	0
Ge1037	N						0	0	0	0	0	0	0	0
Ge1043	N						0	0	0	0	0	0	0	0
Ge1044	N						0	0	0	0	0	0	0	0
Ge1045	N						0	0	0	0	0	0	0	0
Ge1047	N						0	0	0	0	0	0	0	0
Ge1048	N						0	0	0	0	0	0	0	0
Ge1050	N						0	0	0	0	0	0	0	0
Ge1052	N						0	0	0	0	0	0	0	0
Ge1053	N						0	0	0	0	0	0	0	0
Ge1056	N						0	0	0	0	0	0	0	0
Ge1057	N						0	0	0	0	0	0	0	0
Ge1058	N						0	0	0	0	0	0	0	0
Ge1059	N						0	0	0	0	0	0	0	0
Ge1060	N						0	0	0	0	0	0	0	0
Ge1061	N						0	0	0	0	0	0	0	0
Ge1062	N						0	0	0	0	0	0	0	0
Ge1063	N						0	0	0	0	0	0	0	0
Ge1065	N						0	0	0	0	0	0	0	0
Ge1067	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
							SHERD FREQUENCIES							
Ge1068	N						0	0	0	0	0	0	0	0
Ge1069	N						0	0	0	0	0	0	0	0
Ge1070	N						0	0	0	0	0	0	0	0
Ge1071	N						0	0	0	0	0	0	0	0
Ge1072	N						0	0	0	0	0	0	0	0
Ge1073	N						0	0	0	0	0	0	0	0
Ge1074	N						0	0	0	0	0	0	0	0
Ge1075	N						0	0	0	0	0	0	0	0
Ge1076	N						0	0	0	0	0	0	0	0
Hn0103	N						0	0	0	0	0	0	0	0
Hn0110	Y				D	P	0	0	0	0	0	1	1	0
M0028	Y			D	D	D	0	0	0	4	1	1	1	1
M0029	N						0	0	0	0	0	0	0	0
M0030	N						0	0	0	0	0	0	0	0
M0031	N						0	0	0	0	0	0	0	0
M0043	N		D				0	0	0	0	0	0	0	0
M0044	Y			D	D		0	0	0	2	0	2	0	0
M0047	Y				D	P	0	0	0	0	0	1	2	0
M0048	N						0	0	0	0	0	0	0	0
M0049	Y				P	P	0	0	0	0	0	0	1	0

Note: * D = Definite component; P = Possible component.

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		COMPONENT *							SHERD FREQUENCIES						
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
M0056	N						0	0	0	0	0	0	0	0
M0058	Y				D		0	0	0	0	0	1	0	0
M0067	N						0	0	0	0	0	0	0	0
M0068	N						0	0	0	0	0	0	0	0
M0073	N						0	0	0	0	0	0	0	0
M0089	Y				D		0	0	0	0	0	1	0	0
M0090	Y						0	0	0	0	0	0	0	0
M0091	N						0	0	0	0	0	0	0	0
M0093	Y				D	D	0	0	0	0	0	1	2	1
M0094	Y				D	P	0	0	0	0	0	4	4	0
M0095	Y						0	0	0	0	0	0	0	0
M0097	N						0	0	0	0	0	0	0	0
M0098	Y				P	P	0	0	0	0	0	0	1	0
M0104	Y						0	0	0	0	0	0	0	0
M0110	Y				D		0	0	0	0	0	2	0	0
M0111	Y						0	0	0	0	0	0	0	0
M0112	Y			D	D	D	0	0	0	2	0	4	5	1
M0113	Y				P	P	0	0	0	0	0	0	2	0
M0115	Y				D		0	0	0	0	0	4	0	0
M0116	Y				P	P	0	0	0	0	0	0	3	0

Note: * D = Definite component; P = Possible component.

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		COMPONENT *							SHERD FREQUENCIES						
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
M0117	Y				D		0	0	0	0	0	1	0	0
M0119	Y			D	D		0	0	0	2	0	1	0	0
M0123	Y			D	D		0	0	0	1	2	1	0	0
M0128	Y				D		0	0	0	0	0	2	0	0
M0129	Y				D		0	0	0	0	0	1	0	0
M0131	Y			D	D	D	0	0	0	1	0	6	1	1
M0132	Y						0	0	0	0	0	0	0	0
M0133	Y	D			D		1	0	0	0	0	1	0	0
M0139	Y				D	P	0	0	0	0	0	2	1	0
M0142	Y				D		0	0	0	0	0	2	0	0
M0143	Y				D	P	0	0	0	0	0	3	3	0
M0144	Y				D		0	0	0	0	0	2	0	0
M0147	Y	D	P	P	D	P	1	1	0	0	1	1	1	0
M0148	Y						0	0	0	0	0	0	0	0
M0149	N						0	0	0	0	0	0	0	0
M0150	N						0	0	0	0	0	0	0	0
M0151	Y				D	P	0	0	0	0	0	1	1	0
M0152	Y				D		0	0	0	0	0	2	0	0
M0154	Y			P	D	P	0	0	0	0	1	3	1	0
M0155	Y	D				D	3	0	0	0	0	0	0	1

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	SHERD FREQUENCIES Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
M0157	N						0	0	0	0	0	0	0	0
M0159	N						0	0	0	0	0	0	0	0
M0160	N						0	0	0	0	0	0	0	0
M0161	Y						0	0	0	0	0	0	0	0
M0164	N						0	0	0	0	0	0	0	0
M0165	Y				D		0	0	0	0	0	1	0	0
M0166	N						0	0	0	0	0	0	0	0
M0168	N						0	0	0	0	0	0	0	0
M0170	N						0	0	0	0	0	0	0	0
M0171	N						0	0	0	0	0	0	0	0
M0174	N						0	0	0	0	0	0	0	0
M0178	N	D					0	0	0	0	0	0	0	0
M0179	N						0	0	0	0	0	0	0	0
M0180	N						0	0	0	0	0	0	0	0
M0185	N						0	0	0	0	0	0	0	0
M0187	N	D					0	0	0	0	0	0	0	0
M0189	N						0	0	0	0	0	0	0	0
M0191	N						0	0	0	0	0	0	0	0
M0192	N						0	0	0	0	0	0	0	0
M0193	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
							SHERD FREQUENCIES							
M0198	N						0	0	0	0	0	0	0	0
M0199	N						0	0	0	0	0	0	0	0
M0205	N						0	0	0	0	0	0	0	0
M0206	N						0	0	0	0	0	0	0	0
M0207	N						0	0	0	0	0	0	0	0
M0209	N						0	0	0	0	0	0	0	0
M0211	N						0	0	0	0	0	0	0	0
M0212	N						0	0	0	0	0	0	0	0
M0214	Y						0	0	0	0	0	0	0	0
M0215	N						0	0	0	0	0	0	0	0
M0220	N						0	0	0	0	0	0	0	0
M0221	N						0	0	0	0	0	0	0	0
M0222	N						0	0	0	0	0	0	0	0
Pm0106	Y						0	0	0	0	0	0	0	0
Pm0107	Y			P	D		0	0	0	0	1	12	0	0
Pm0110	N						0	0	0	0	0	0	0	0
Pm0111	N						0	0	0	0	0	0	0	0
Pm0113	Y	D	P	P	D	P	1	1	0	0	1	8	2	0
Pm0115	N						0	0	0	0	0	0	0	0
Pm0116	Y			D	D	P	0	0	0	2	0	7	4	0

<u>Note</u>: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
							SHERD FREQUENCIES							
Pm0117	N						0	0	0	0	0	0	0	0
Pm0118	N						0	0	0	0	0	0	0	0
Pm0119	Y			D	D	P	0	0	0	5	4	61	14	0
Pm0120	Y			D	D	P	0	0	0	1	2	38	14	0
Pm0125	N						0	0	0	0	0	0	0	0
Pm0126	Y			D	D	P	0	0	0	3	0	9	4	0
Pm0129	Y						0	0	0	0	0	0	0	0
Pm0131	N						0	0	0	0	0	0	0	0
Pm0132	N						0	0	0	0	0	0	0	0
Pm0140	N						0	0	0	0	0	0	0	0
Pm0141	N						0	0	0	0	0	0	0	0
Pm0143	Y	D	P		D	P	1	1	0	0	0	2	2	0
Pm0145	N						0	0	0	0	0	0	0	0
Pm0199	Y						0	0	0	0	0	0	0	0
Pm0200	Y				P	P	0	0	0	0	0	0	1	0
Pm0201	N	D					0	0	0	0	0	0	0	0
Pm0202	Y			D	D	P	0	0	0	1	0	10	1	0
Pm0203	N						0	0	0	0	0	0	0	0
Pm0205	Y						0	0	0	0	0	0	0	0
Pm0206	Y			D	D	D	0	0	0	2	0	15	3	1

Note: * D = Definite component; P = Possible component.

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		COMPONENT *					SHERD FREQUENCIES							
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
Pm0207	Y			D	P	D	0	0	0	1	1	0	1	1
Pm0208	N						0	0	0	0	0	0	0	0
Pm0209	Y			D	D	D	0	0	0	1	3	3	1	1
Pm0211	N						0	0	0	0	0	0	0	0
Pm0213	Y			P	D		0	0	0	0	1	1	0	0
Pm0215	N						0	0	0	0	0	0	0	0
Pm0217	Y				D		0	0	0	0	0	5	0	0
Pm0220	N				D		0	0	0	0	0	1	0	0
Pm0221	Y	D	P	D	D	D	2	1	0	7	2	32	7	1
Pm0222	N						0	0	0	0	0	0	0	0
Pm0223	Y				D		0	0	0	0	0	1	0	0
Pm0225	Y				D	P	0	0	0	0	0	4	1	0
Pm0226	N						0	0	0	0	0	0	0	0
Pm0236	N						0	0	0	0	0	0	0	0
Pm0247	Y				D		0	0	0	0	0	2	0	0
Pm0248	Y				D	D	0	0	0	0	0	8	1	1
Pm0250	Y			D	D	D	0	0	0	7	6	87	18	9
Pm0251	Y				D	P	0	0	0	0	0	8	3	0
Pm0253	Y			P	P		0	0	0	0	1	0	0	0
Pm0256	Y			P	P	P	0	0	0	0	2	0	2	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
		COMPONENT *					SHERD FREQUENCIES							
Pm0258	Y				D		0	0	0	0	0	1	0	0
Pm0259	Y				D	D	0	0	0	0	0	2	1	1
Pm0260	Y				D	P	0	0	0	0	0	12	5	0
Pm0261	Y			D	D	P	0	0	0	1	1	2	1	0
Pm0265	Y				D	P	0	0	0	0	0	2	1	0
Pm0268	Y			D	D	P	0	0	0	11	0	33	5	0
Pm0269	Y				D	D	0	0	0	0	0	7	1	1
Pm0273	Y				D		0	0	0	0	0	2	0	0
Pm0275	Y			P	P		0	0	0	0	1	0	0	0
Pm0283	Y			P	P		0	0	0	0	1	0	0	0
Pm0284	Y				D		0	0	0	0	0	1	0	0
Pm0285	Y			P	D	P	0	0	0	0	2	13	4	0
Pm0286	Y						0	0	0	0	0	0	0	0
Pm0287	Y			P	P		0	0	0	0	1	0	0	0
Pm0291	Y			P	P		0	0	0	0	1	0	0	0
Pm0295	Y				D	D	0	0	0	0	0	11	2	1
Pm0296	Y				D	D	0	0	0	0	0	12	7	1
Pm0298	Y			P	P	P	0	0	0	0	2	0	2	0
Pm0300	Y						0	0	0	0	0	0	0	0
Pm0301	Y			P	D	P	0	0	0	0	1	5	5	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
							SHERD FREQUENCIES							
Pm0309	Y				D		0	0	0	0	0	1	0	0
Pm0313	Y			P	P		0	0	0	0	2	0	0	0
Pm0315	Y				D		0	0	0	0	0	1	0	0
Pm0316	Y			D	D	P	0	0	0	3	1	15	2	0
Pm0328	Y			P	P		0	0	0	0	1	0	0	0
Pm0329	Y			P	P		0	0	0	0	4	0	0	0
Pm0330	N						0	0	0	0	0	0	0	0
Pm0333	Y				D		0	0	0	0	0	2	0	0
Pm0341	Y						0	0	0	0	0	0	0	0
Pm0346	Y				D	D	0	0	0	0	0	3	2	1
Pm0351	Y				P	D	0	0	0	0	0	0	1	1
Pm0355	Y			P	D		0	0	0	0	1	1	0	0
Pm0356	Y				D		0	0	0	0	0	2	0	0
Pm0358	Y	D		P	D	P	1	0	0	0	1	2	1	0
Pm0361	Y				P	P	0	0	0	0	0	0	1	0
Pm0364	Y			D	D	P	0	0	0	2	1	17	2	0
Pm0365	Y				P	P	0	0	0	0	0	0	2	0
Pm0366	Y				P	P	0	0	0	0	0	0	1	0
Pm0369	Y				D	D	0	0	0	0	0	2	0	1
Pm0370	Y				D	P	0	0	0	0	0	6	2	0

Note: * D = Definite component; P = Possible component.

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		COMPONENT *						SHERD FREQUENCIES							
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
Pm0371	Y			D	D	D	0	0	0	2	0	20	6	1
Pm0375	Y				P	P	0	0	0	0	0	0	2	0
Pm0383	Y				D	P	0	0	0	0	0	1	1	0
Pm0385	Y				D		0	0	0	0	0	2	0	0
Pm0386	Y						0	0	0	0	0	0	0	0
Pm0389	Y	P	P		D	P	0	1	0	0	0	4	1	0
Pm0390	Y				D	P	0	0	0	0	0	11	8	0
Pm0391	Y				D		0	0	0	0	0	1	0	0
Pm0392	Y						0	0	0	0	0	0	0	0
Pm0393	Y				D	D	0	0	0	0	0	9	0	1
Pm0395	Y			D	D		0	0	0	4	1	13	0	0
Pm0396	Y			D	D	P	0	0	0	1	0	17	5	0
Pm0397	Y			D	D	P	0	0	0	2	0	7	2	0
Pm0400	Y				D	P	0	0	0	0	0	1	1	0
Pm0401	Y				D	P	0	0	0	0	0	8	1	0
Pm0403	Y						0	0	0	0	0	0	0	0
Pm0404	Y				D	P	0	0	0	0	0	3	3	0
Pm0405	Y			D	D	P	0	0	0	1	0	4	1	0
Pm0407	Y			D	D	D	0	0	0	4	0	20	5	1
Pm0409	Y				D	P	0	0	0	0	0	8	3	0

Note: * D = Definite component; P = Possible component.

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		COMPONENT *							SHERD FREQUENCIES					
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
Pm0410	Y				D	D	0	0	0	0	0	2	4	1
Pm0412	Y				D		0	0	0	0	0	1	0	0
Pm0413	Y				D	P	0	0	0	0	0	13	1	0
Pm0417	Y				D	P	0	0	0	0	0	1	1	0
Pm0418	Y				D		0	0	0	0	0	1	0	0
Pm0419	Y				D	D	0	0	0	0	0	34	15	3
Pm0421	Y				D	P	0	0	0	0	0	6	4	0
Pm0422	Y			D	D		0	0	0	1	0	12	0	0
Pm0426	N						0	0	0	0	0	0	0	0
Pm0429	Y				D	D	0	0	0	0	0	5	2	1
Pm0430	Y						0	0	0	0	0	0	0	0
Pm0433	Y				D		0	0	0	0	0	2	0	0
Pm0436	Y			D	P	P	0	0	0	1	1	0	2	0
Pm0439	Y			D	D	P	0	0	0	1	1	21	4	0
Pm0442	Y				D	P	0	0	0	0	0	8	3	0
Pm0443	Y				D		0	0	0	0	0	1	0	0
Pm0444	Y				D		0	0	0	0	0	1	0	0
Pm0445	Y				D		0	0	0	0	0	2	0	0
Pm0448	Y						0	0	0	0	0	0	0	0
Pm0451	Y				P	P	0	0	0	0	0	0	2	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	SHERD FREQUENCIES Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
Pm0452	Y						0	0	0	0	0	0	0	0
Pm0455	Y				P	P	0	0	0	0	0	0	1	0
Pm0461	Y				D		0	0	0	0	0	1	0	0
Pm0462	Y				D		0	0	0	0	0	2	0	0
Pm0465	Y				D	D	0	0	0	0	0	12	1	1
Pm0466	Y			P	D	P	0	0	0	0	1	3	1	0
Pm0467	Y				D	P	0	0	0	0	0	2	1	0
Pm0469	Y				D		0	0	0	0	0	3	0	0
Pm0471	Y				D	P	0	0	0	0	0	12	2	0
Pm0472	Y				D		0	0	0	0	0	1	0	0
Pm0473	Y			D			0	0	0	1	0	0	0	0
Pm0476	Y				D		0	0	0	0	0	2	0	0
Pm0483	Y	P	P	D	D	D	0	1	0	2	3	23	10	2
Pm0484	Y			D	P	P	0	0	0	1	0	0	1	0
Pm0489	Y				D		0	0	0	0	0	1	0	0
Pm0490	Y			D	D	P	0	0	0	1	1	6	4	0
Pm0491	Y			D	D	P	0	0	0	4	1	11	1	0
Pm0492	Y			D	D	P	0	0	0	5	1	16	4	0
Pm0494	Y			D	D		0	0	0	1	1	4	0	0
Pm0499	Y				D	P	0	0	0	0	0	2	1	0

Note: * D = Definite component; P = Possible component.

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		COMPONENT *						SHERD FREQUENCIES							
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
Pm0500	Y				D	P	0	0	0	0	0	1	2	0
Pm0501	Y			D	D		0	0	0	1	0	7	0	0
Pm0502	Y						0	0	0	0	0	0	0	0
Pm0503	Y				D	D	0	0	0	0	0	4	2	1
Pm0504	Y			D	D	D	0	0	0	2	0	9	1	3
Pm0506	Y				D		0	0	0	0	0	4	0	0
Pm0508	Y			P	D	P	0	0	0	0	1	2	1	0
Pm0509	Y				D		0	0	0	0	0	1	0	0
Pm0511	Y			D	D		0	0	0	1	0	3	0	0
Pm0513	Y						0	0	0	0	0	0	0	0
Pm0517	Y				D	D	0	0	0	0	0	8	4	1
Pm0520	Y						0	0	0	0	0	0	0	0
Pm0522	Y				P	P	0	0	0	0	0	0	1	0
Pm0524	Y				D	P	0	0	0	0	0	2	2	0
Pm0527	Y						0	0	0	0	0	0	0	0
Pm0528	Y					D	0	0	0	0	0	0	0	1
Pm0535	N						0	0	0	0	0	0	0	0
Pm0536	N						0	0	0	0	0	0	0	0
Pm0537	N						0	0	0	0	0	0	0	0
Pm0538	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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								SHERD FREQUENCIES					
		COMPONENT *					*Definite*	*Possibly Etowah or*	*Definite*	*Definite*	*Possibly Duvall or*	*Definite*	*Possibly Dyar or*	*Definite*
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Etowah*	*Savannah*	*Savannah*	*Duvall*	*Dyar*	*Dyar*	*Bell*	*Bell*
Pm0540	N						0	0	0	0	0	0	0	0
Pm0542	N						0	0	0	0	0	0	0	0
Pm0544	N						0	0	0	0	0	0	0	0
Pm0548	N						0	0	0	0	0	0	0	0
Pm0550	N						0	0	0	0	0	0	0	0
Pm0551	N						0	0	0	0	0	0	0	0
Pm0553	Y						0	0	0	0	0	0	0	0
Pm0554	N						0	0	0	0	0	0	0	0
Pm0555	N						0	0	0	0	0	0	0	0
Pm0556	N						0	0	0	0	0	0	0	0
Pm0557	N						0	0	0	0	0	0	0	0
Pm0560	N						0	0	0	0	0	0	0	0
Pm0567	N						0	0	0	0	0	0	0	0
Pm0572	N						0	0	0	0	0	0	0	0
Pm0577	N						0	0	0	0	0	0	0	0
Pm0578	N						0	0	0	0	0	0	0	0
Pm0580	N						0	0	0	0	0	0	0	0
Pm0586	N						0	0	0	0	0	0	0	0
Pm0587	N						0	0	0	0	0	0	0	0
Pm0588	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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		COMPONENT *					SHERD FREQUENCIES							
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
Pm0591	Y			P	D		0	0	0	0	2	4	0	0
Pm0593	N						0	0	0	0	0	0	0	0
Pm0595	N						0	0	0	0	0	0	0	0
Pm0596	N						0	0	0	0	0	0	0	0
Pm0599	N						0	0	0	0	0	0	0	0
Pm0600	N						0	0	0	0	0	0	0	0
Pm0601	N						0	0	0	0	0	0	0	0
Artifact Occurrences														
AO-x0014	N						0	0	0	0	0	0	0	0
AO-x0065	Y						0	0	0	0	0	0	0	0
AO-x0083	N						0	0	0	0	0	0	0	0
AO-x0139	N						0	0	0	0	0	0	0	0
AO-x0143	N						0	0	0	0	0	0	0	0
AO-x0146	N						0	0	0	0	0	0	0	0
AO-x0149	Y						0	0	0	0	0	0	0	0
AO-x0168	N						0	0	0	0	0	0	0	0
AO-x0204	N						0	0	0	0	0	0	0	0
AO-x0232	N						0	0	0	0	0	0	0	0
AO-x0233	Y						0	0	0	0	0	0	0	0
AO-x0242	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	COMPONENT * ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
							SHERD FREQUENCIES							
AO-x0253	N						0	0	0	0	0	0	0	0
AO-x0256	N						0	0	0	0	0	0	0	0
AO-x0260	N						0	0	0	0	0	0	0	0
AO-x0275	N						0	0	0	0	0	0	0	0
AO-x0298	N						0	0	0	0	0	0	0	0
AO-x0299	N						0	0	0	0	0	0	0	0
AO-x0305	N						0	0	0	0	0	0	0	0
AO-x0355	N						0	0	0	0	0	0	0	0
AO-x0360	N						0	0	0	0	0	0	0	0
AO-x0363	N						0	0	0	0	0	0	0	0
AO-x0365	N						0	0	0	0	0	0	0	0
AO-x0402	N						0	0	0	0	0	0	0	0
AO-x0403	N						0	0	0	0	0	0	0	0
AO-x0408	Y						0	0	0	0	0	0	0	0
AO-x0424	N						0	0	0	0	0	0	0	0
AO-x0440	N						0	0	0	0	0	0	0	0
AO-x0453	N						0	0	0	0	0	0	0	0
AO-x0461	N						0	0	0	0	0	0	0	0
AO-x0484	N						0	0	0	0	0	0	0	0
AO-x0485	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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		COMPONENT *						SHERD FREQUENCIES							
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
AO-x0486	N						0	0	0	0	0	0	0	0
AO-x0502	N						0	0	0	0	0	0	0	0
AO-x0512	N						0	0	0	0	0	0	0	0
AO-x0517	N						0	0	0	0	0	0	0	0
AO-x0536	N						0	0	0	0	0	0	0	0
AO-x0537	N						0	0	0	0	0	0	0	0
AO-x0544	N						0	0	0	0	0	0	0	0
AO-x0547	Y						0	0	0	0	0	0	0	0
AO-x0549	N						0	0	0	0	0	0	0	0
AO-x0556	N						0	0	0	0	0	0	0	0
AO-x0564	N						0	0	0	0	0	0	0	0
AO-x0570	N						0	0	0	0	0	0	0	0
AO-x0588	N						0	0	0	0	0	0	0	0
AO-x0609	N						0	0	0	0	0	0	0	0
AO-x0611	N						0	0	0	0	0	0	0	0
AO-x0612	N						0	0	0	0	0	0	0	0
AO-x0688	N						0	0	0	0	0	0	0	0
AO-x0689	N						0	0	0	0	0	0	0	0
AO-x0700	N						0	0	0	0	0	0	0	0
AO-x0725	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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Site	Analyzed	ET	SA	DU	DY	BE	Definite Etowah	Possibly Etowah or Savannah	Definite Savannah	Definite Duvall	Possibly Duvall or Dyar	Definite Dyar	Possibly Dyar or Bell	Definite Bell
		COMPONENT *					SHERD FREQUENCIES							
AO-x0728	Y						0	0	0	0	0	0	0	0
AO-x0769	N						0	0	0	0	0	0	0	0
AO-x0785	N						0	0	0	0	0	0	0	0
AO-x0814	Y						0	0	0	0	0	0	0	0
AO-x0820	N						0	0	0	0	0	0	0	0
AO-z0001	N						0	0	0	0	0	0	0	0
AO-z0026	N						0	0	0	0	0	0	0	0
AO-z0029	N						0	0	0	0	0	0	0	0
AO-z0034	N						0	0	0	0	0	0	0	0
AO-z0045	Y						0	0	0	0	0	0	0	0
AO-z0053	N						0	0	0	0	0	0	0	0
AO-z0072	N						0	0	0	0	0	0	0	0
AO-z0083	N						0	0	0	0	0	0	0	0
AO-z0090	Y						0	0	0	0	0	0	0	0
AO-z0103	N						0	0	0	0	0	0	0	0
AO-z0106	N						0	0	0	0	0	0	0	0
AO-z0116	N						0	0	0	0	0	0	0	0
AO-z0120	N						0	0	0	0	0	0	0	0
AO-z0135	N						0	0	0	0	0	0	0	0
AO-z0136	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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		COMPONENT *						SHERD FREQUENCIES							
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
AO-z0140	N						0	0	0	0	0	0	0	0
AO-z0188	N						0	0	0	0	0	0	0	0
AO-z0198	N						0	0	0	0	0	0	0	0
AO-z0204	N						0	0	0	0	0	0	0	0
AO-z0205	N	D					0	0	0	0	0	0	0	0
AO-z0209	N						0	0	0	0	0	0	0	0
AO-z0236	N						0	0	0	0	0	0	0	0
AO-z0238	N						0	0	0	0	0	0	0	0
AO-z0245	N	D					0	0	0	0	0	0	0	0
AO-z0283	N						0	0	0	0	0	0	0	0
AO-z0284	N						0	0	0	0	0	0	0	0
AO-z0285	N						0	0	0	0	0	0	0	0
AO-z0301	N						0	0	0	0	0	0	0	0
AO-z0302	N						0	0	0	0	0	0	0	0
AO-z0341	N						0	0	0	0	0	0	0	0
AO-z0346	N						0	0	0	0	0	0	0	0
AO-z0360	N						0	0	0	0	0	0	0	0
AO-z0361	N						0	0	0	0	0	0	0	0
AO-z0367	N	D					0	0	0	0	0	0	0	0
AO-z0375	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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Site	*Analyzed*	COMPONENT * *ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	SHERD FREQUENCIES *Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
AO-z0389	N						0	0	0	0	0	0	0	0
AO-z0415	N						0	0	0	0	0	0	0	0
AO-z0423	N						0	0	0	0	0	0	0	0
AO-z0424	Y						0	0	0	0	0	0	0	0
AO-z0439	Y						0	0	0	0	0	0	0	0
AO-z0441	N						0	0	0	0	0	0	0	0
AO-z0445	N						0	0	0	0	0	0	0	0
AO-z0465	N						0	0	0	0	0	0	0	0
AO-z0476	N						0	0	0	0	0	0	0	0
AO-z0492	Y						0	0	0	0	0	0	0	0
AO-z0493	N						0	0	0	0	0	0	0	0
AO-z0504	N						0	0	0	0	0	0	0	0
AO-z0506	N						0	0	0	0	0	0	0	0
AO-z0521	N						0	0	0	0	0	0	0	0
AO-z0523	N						0	0	0	0	0	0	0	0
AO-z0546	N						0	0	0	0	0	0	0	0
AO-z0568	N						0	0	0	0	0	0	0	0
AO-z0575	N						0	0	0	0	0	0	0	0
AO-z0584	N						0	0	0	0	0	0	0	0
AO-z0588	N						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.

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		COMPONENT *						SHERD FREQUENCIES						
Site	*Analyzed*	*ET*	*SA*	*DU*	*DY*	*BE*	*Definite Etowah*	*Possibly Etowah or Savannah*	*Definite Savannah*	*Definite Duvall*	*Possibly Duvall or Dyar*	*Definite Dyar*	*Possibly Dyar or Bell*	*Definite Bell*
AO-z0592	N						0	0	0	0	0	0	0	0
AO-z0604	N						0	0	0	0	0	0	0	0
AO-z0609	N						0	0	0	0	0	0	0	0
AO-z0610	N						0	0	0	0	0	0	0	0
AO-z0612	N						0	0	0	0	0	0	0	0
AO-z0644	N						0	0	0	0	0	0	0	0
AO-z0663	N						0	0	0	0	0	0	0	0
AO-z0674	N						0	0	0	0	0	0	0	0
AO-z0687	N						0	0	0	0	0	0	0	0
AO-z0728	N						0	0	0	0	0	0	0	0
AO-z0730	Y						0	0	0	0	0	0	0	0

Note: * D = Definite component; P = Possible component.