2006

A Reconstruction of Paleoindian Social Organization in North Central Florida

David Kelley Thulman

FLORIDA STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

A RECONSTRUCTION OF PALEOINDIAN SOCIAL ORGANIZATION IN NORTH CENTRAL FLORIDA

By

DAVID KELLEY THULMAN

A Dissertation submitted to the
Department of Anthropology
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

Degree Awarded:
Fall Semester, 2006

The members of the Committee approve the dissertation of David Thulman defended on October 20, 2006.

William Parkinson
Professor Directing Dissertation

Joseph Donoghue
Outside Committee Member

Rochelle A. Marrinan
Committee Member

Glen H. Doran
Committee Member

Frank Marlowe
Committee Member

David G. Anderson
Committee Member

Approved:

Dean Falk, Chair, Anthropology Department

Joseph Travis, Dean, College of Arts and Sciences

The Office of Graduate Studies has verified and approved the above named committee.

This work is dedicated to Katherine Andrews, whose love,
support, patience, and understanding helped in so many ways.

ACKNOWLEDGEMENTS

A project of this sort requires the assistance of many people and institutions. I have always loved archaeology but was inspired to take it up again after a long hiatus after working on the underwater Aucilla River Prehistory Project, through which I met several people who became my good friends and inspirations. Through the support of the Florida Department of Environmental Protection, especially Larry Morgan and Tom Beason, I was able to work full-time and attend Florida State University part-time to obtain my degrees. I could not have pursued this degree to fruition without the financial support provided by FSU's University Fellowship and the cooperation of the Department of Anthropology, which saw the benefit in accepting a part-time doctoral student.

The genesis of this project grew out of several stimulating discussions with Jim Dunbar, who I met on the Aucilla project and whose earlier work on Paleoindian point distributions in Florida established the groundwork and set the framework for this project. Our musings about point variability and typology was the impetus to begin collecting information about Paleoindian points and thinking about how to collect data and characterize projectile point variation and consistency. Jim's relationships with collectors opened the door for me to build upon his earlier work.

The data used in my research was gathered from 29 collectors and three public institutions. Each collector was generous with their time and their collections, often letting me sit in their homes with my equipment for most of a day or several days. I found them all interested in the science of the project and wanting to contribute in some way. In particular, I want to thank Alvin Hendrix, Guy Marwick, Tom Kelley, Harley Means, Ryan Means, Tom Greenhalgh, Robert Knight, Don Munroe, Delwood Nelson, Tony Gilyard, Robert Allen, Jack Simpson, Jim Tatum, Hub Chason, Mike Simpson, Brian Evenson, Jeff Whitfield, and 12 anonymous collectors. In addition, I greatly benefited from the assistance of Donna Ruhl at the University of Florida, Dave Dickel from the Florida Bureau of Archaeological Research, and Nancy White from the University of South Florida.

As my major professor, Bill Parkinson provided helpful direction and the right mix of prodding, encouragement, and the leeway to let me follow my own course in the research. My committee members, Dave Anderson, Glen Doran, Joe Donoghue, Rochelle Marrinan, and Frank Marlowe, gave me comments and insights that were encouraging and helpful. I also want to thank Michael Faught for being always willing to listen to my ideas. I owe much of my interest and background in Paleoindian studies to him.

I could not have completed this project without the love and support of my family and friends. My father, Robert Thulman, my kids, and my colleagues have been part of my cheering section from the beginning and have kindly kept any doubts they may have had about the wisdom of this adventure to themselves. Finally, I want to thank Katherine Andrews, who has always believed in me and encouraged me to do the things I wanted most to do.

Thank you all.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

This research reconstructs Paleoindian social organization using models that describe the manner in which people create and maintain variability and consistency in material culture and predicts the spatial and chronological patterning that should result from those behaviors. The research also develops a methodology that is designed to discern these spatial and chronological patterns and provides a sound basis for inferring the presence and configuration of social organization. The models and methodology are applied to data consisting of isolated Paleoindian points from north central Florida. The results demonstrate a clustering of similar projectile point forms that are used to infer the presence of different social groups.

The models propose that consistency in material culture is created through social learning processes that tend to focus group members on one or a limited number of cultural models. Variation is created through individual innovation and the variable abilities of the group members to make artifacts based on those models. It is these processes of learning and making that establishes regional differences in the design of material culture. Typologies based upon these regional differences can be used to infer the territories of the groups that share cultural models.

The models predict that greater regional differentiation should be created through time and that the differentiation may only be present in relatively small differences in one or more attributes. In addition chronological effects, the degree of differentiation between groups should be more pronounced with distance.

The data in my research consists of about 950 Paleoindian points collected from Florida. In order to ensure that I was measuring an unaltered cultural model, I limited the statistical analyses to the undamaged bases of the points that were unaffected by resharpening, which left 107 Early Paleoindian and 385 Middle Paleoindian points. Nine measurement attributes, nine ratio attributes, and three or four principal components were used in analysis of variance and Tukey-Kramer tests to discern significant regional differences. The analyses produced five significant results for the Early Paleoindian period and 122 significant results for the Middle Paleoindian period.

The results comport with the models’ predictions. There was a significant increase in the number of differences through time, which can be interpreted as a

“settling in” of Middle Paleoindian groups in the region. The differences were apparent in such attributes as the size of the ear, the degree to which it flared out from the base, or the length of the waist. Based on the spatial pattern of differences and similarities, it appears there were three territories in the Middle Paleoindian period centered in the Chipola River, Santa Fe River, and the Hillsborough region.

CHAPTER 1

INTRODUCTION

The research problem addressed in this dissertation how Paleoindian social organization can be reconstructed for the north central Florida region (Figure 1.1). We can infer from the spatial distribution of cultural materials that people in prehistoric times organized themselves in socially bounded spaces and that regional organization appears to have been an aspect of modern human behavior for millennia. Researchers intent on reconstructing regional organization typically start with the creation of a typology of a particular type of artifact, collection of artifacts, settlement pattern, mortuary practice, or some other cultural practice or behavior. They then plot patterns of artifact or behavioral variability on maps and assess the degree of similarity or dissimilarity of these artifacts or behaviors (e.g., Hodder and Orton 1976; Clarke 1977). From that pattern and the degree of similarity or dissimilarity arise inferences of social organization, affiliation, interaction, integration, boundary maintenance, etc. Typically unstated in these regional reconstructions are assumptions about how variation in artifacts should be distributed temporally and spatially. Further, little attention is paid to whether a typology is an appropriate method for categorizing this variation or what it is that a typology describes. Finally, it is standard practice to infer that typologies reveal social entities that are concordant with ethnographic models of social organization.

This research project examines these theoretical assumptions and methodological practices in detail to determine whether we are justified in our use of typologies for reconstructing past human regional organization and whether our inferences drawn from those reconstructions are appropriate. I conclude that using typologies is appropriate because it mirrors the process of group identification that is used by people across the world, but the inference that the groups so identified match typical ethnographic entities is problematic.

Figure 1.1: The Study Area.

Rather than creating a typology first, then looking at spatial pattern of that typology and proposing post hoc explanations, my research attempts to work from first principles by formulating models that explain how variation in material culture is created and how consistency in material culture is maintained by groups of people, deriving predictions from those models, and developing a methodology that is in accord with both the theory and the research problem. These issues are examined in the context of a Paleoindian territorial reconstruction in north central Florida using the distribution of Paleoindian projectile points.

The dissertation is organized as follows. In Chapter 2, I discuss in depth the theoretical framework that guides this study. Cultural evolutionary theory (CET) as articulated by Boyd and Richerson (1985), Heinrich (2004), and others provides that framework. CET integrates anthropology, cognitive learning theory, genetics, psychology, and other disciplines to explore the effects of both biology and culture on human behavior (Paciotti et al. 2006). It emphasizes that genetically-based learning strategies are the strongest force in the evolution of cultural behavior, and these strategies allow people to cheaply sort through alternatives to choose those behaviors that are most likely to be successful. CET is not widely used as a theoretical foundation in archaeology, but it provides an explanation for how and in what manner material culture should change through time and space. The patterns of behavioral change we see in the archaeological record, which by and large are changes in artifact design, result primarily because of the way that cultural information is transmitted from individual to individual.

The variation and consistency of material culture over time and space allow archaeologists to reconstruct past social organization using distribution studies, but to reconstruct past social organization from these phenomena we also must understand how consistency and variation inform questions of social structure. The crux of CET as it applies to this research is the way that genetically-based learning strategies help groups of people maintain consistency in cultural behavior in the face of competing pressures to make changes to those behaviors.

Consistency in material culture arises through learning strategies that steer people toward a limited number of all of the available variations. In general, people learn to make things either though social learning or experimentation. Through social learning, people acquire mental models, which I call cultural models, from which they create behaviors, including the manufacture of artifacts (Boyd and Richerson 1985). Theories of social learning posit that people employ learning strategies that first narrow the pool of cultural models from which to choose and then choose the model to imitate from that narrowed pool (Bandura 1977; Boyd and Richerson 1985:chapters 7 and 8; Henrich and Gil-White 2001; Henrich and Boyd 1998; Henrich 2004). These learning strategies tend to promote consistency in material culture by constraining the pool of potential cultural models and focusing the majority of learners in a group on a single or limited number of the available cultural models.

Variation in material culture arises from the vagaries of artifact manufacture, such as skill levels and raw material differences. Even with intensive instruction, social learning is fraught with the potential for errors and innovation that lead to variation. Individual learning introduces another source of artifact variation by changing the model (i.e., the artifact's design; [Basalla 1988]). If a change is adopted by others in the group, then it becomes part of the group's cultural repertoire, which is the sum total of a group's cultural models. Two principles of artifact design are important here. First, no design is optimal for all people, so people will always tend to fiddle with a design (Petroski 1992). Second, all design changes are based on a predicate design (Basalla 1988).

From the theoretical foundation of CET, I derived the following models that describe how artifacts change through time, how people and archaeologists ascribe group membership, and how such a group is constituted.

The first model, which I call the model of design trajectory, describes how the same artifact can change in different ways in different areas. When a novice tries to master a new task, she tends to break the task down into manageable segments. If the task is to make a projectile point then the task could be broken down into learning to shape the base, trim the ears, sharpen the edge, etc. Each of these skills and decisions is a cultural model, and as each skill is learned it is combined with other skills for different purposes (Bandura 1977:27-28; Hardin 1979:93). Any particular artifact can be conceptualized as the sum of its constituent cultural models.

In regards to material culture, I call this collection of constituent models the "artifact design," although the broader term "behavioral design" could be used to describe non-artifact behavior. Changes in artifact design are really changes in one or more of the constituent models, which I call the design attributes. These design attributes can be manufacturing techniques, shapes, raw material choices, or any of the myriad components that make up a particular artifact. Thus, an artifact can be viewed as a temporally specific amalgamation of its constituent attributes.

A design trajectory is created when the members of a group adopt a change in the cultural model. Since all designs are based on predicate designs, the changes in designs adopted by any particular group can follow unique paths or trajectories. The model has several implications. First, design change should be the expected phenomenon; long term stability in artifact design should be the exception. Second, design changes should be seen in individual design attributes. Third, we should expect to see regional variation in the design of most artifacts, which will become more pronounced through time.

The second model, which I call the model of collective style, concerns the way that groups of people are identified by others. Collective style is the passive expression of one or more cultural models in a cultural repertoire that can be used to either ascribe group identity or assign a particular artifact to a particular group. For example, from the dress and behavior of another individual, I can ascribe that person to a particular social, ethnic, or economic group, etc. Or, by looking at an artifact I can ascribe it to a particular group. The dress, behavior, and artifact all express to me a collective style of a group. I evaluate collective style based upon a subset of the entire cultural repertoire of a group, and the evaluation is based on my estimate of a typical behavior or artifact for that group and an understanding of the range of variation for that behavior or artifact. In this sense, collective style is the same as an archaeological typology, which also is an estimation of a typical artifact or behavior within a range of variation that is derived from a subset of the cultural repertoire for the purpose of ascribing group membership.

The third model, which I call the model of a social group, concerns the composition of the group of people that can be identified by a typology. The members of the social group all share the same cultural model that is the subject of the typology. My research into the ethnographic literature indicates there is no necessary one-to-one correlation between the social group and any of the traditional ethnographic forms of social organization, such as band, tribe, chiefdom, etc. We can assume that the members of the social group have enough regular contact so that cultural models can be transmitted among them and a common cultural repertoire can be maintained. For hunter-gatherers, the maximum band, which is an affiliation of local bands, appears to be the best fit. Thus, the proper inference from a typology used for discerning regional organization is a group of people who share the same cultural model. In this research, I use a typology to discern the regional organization of social groups that share the same cultural model of a projectile point base.

Chapter 3 describes the social and environmental setting of the research. In order to determine whether different Paleoindian social groups were present in Florida, I must make an estimate of the size of their territories based on ethnographic data and models of Paleoindian regional organization in North America in general and Florida in particular. The spatial distribution of the data shows that they are concentrated in particular regions in the Study Area (Figure 1). To assess whether this distribution reflects collector bias or accurately represents the true point distribution, I reconstruct the hydrology of Florida at that time with attention to the location of dependable sources of surface water. From this reconstruction, it appears that the points are concentrated in areas that would have had the most reliable sources of water during the driest times. Thus, I conclude that collector bias had a minimal effect on the point distribution.

Chapter 4 describes the data and its quality and discusses ethical issues related to its use in this research. Although not perfect, the data are of sufficient quality for this kind of research. About 98 percent of the points in the database were initially collected by non-professionals, and this research would be impossible without their use. I review some recent considerations of the ethics of using this kind of data. The issues are complex, but I conclude that these are matters of public policy that should be left to public officials to decide. Public officials in Florida have concluded, at least implicitly, that the data in this research are not illegal. Thus, there is no ethical impediment to their use.

Chapter 5 describes the methodology developed to find regional variation, if it exists. The chapter begins with a review of the pertinent aspects of the theory and proceeds through a review of different methods for characterizing artifacts and parsing data. Since the model of design trajectory predicts that changes likely will be made on single attributes rather than the entire design of an artifact and the model of collective style requires knowledge of the mean and range of variation for an attribute, the methodology employs exploratory data analysis to examine single attributes, including ratios and principal components, to establish taxonomic typologies.

The points were culled, and only those with complete bases were used in the statistical analysis. The data were also divided into Early and Middle Paleoindian chronological units that segregated the points based on the presence or absence of fluting.

Four different initial data partitions were made on the points in each chronological unit using exploratory data analysis: no partition, a partition based on size, a partition based on shape, and a partition based on both size and shape. The points in each unit were assigned to one of five geographical regions based on their spatial distribution, and the Middle Paleoindian points were also placed in six and three region configurations.

An analysis of variance (ANOVA) was run on twenty-three or twenty-four attributes (depending on the number of principal components saved) for each regional configuration and each data partition that had enough members in each region to generate a meaningful result to determine whether any of the regions exhibited significant differences in attribute values. A Tukey-Kramer test was then run on all significant ANOVAs to identify the regions that were different. The chapter ends with a discussion of how the results were interpreted.

The results of the analyses are presented in Chapter 6. The Early Paleoindian unit had five significant ANOVAs, and the Middle Paleoindian unit had 122. These results are summarized in several tables that list the significantly different attributes and their means.

Chapter 7 presents the interpretation of the results. The Early Paleoindian period exhibited no significant distinctions in shape or size other than five significant ANOVAs that concerned the thickness of the points. Assuming the Early Paleoindians were the first people into the Study Area or that the fluted point was introduced and adopted quickly by the groups already in the area, then we would expect to see little regional variation, and the ANOVA results bear this out.

The model of design trajectory predicts that regions will become more differentiated through time, and this prediction is supported by the results. Unlike the early period, the Middle Paleoindian unit produced many significant differences that can be interpreted as the development of social group differentiation by that time. The pattern of differences and similarities between regions indicates that three different social groups were present that had territories centered in the Chipola River, the Santa Fe River, and the Hillsborough region. Intermediate regions produced fewer differences with the centers and appear to contain an assemblage of point designs that are characteristic of each adjoining center rather a single composite design that incorporates aspects of the point designs from both centers. This distribution indicates that the intermediate regions likely were areas where the territories of adjacent groups overlapped rather than constituting an independent social group in its own region.

The numerical differences are translated into a description of how the points from each region differ. On average, the points from the Chipola region are significantly narrower (~ 5 mm in the width of the base), and in some cases had significantly smaller ears. They also had a different shape with ears that flared less and a longer base as measured from the ears to the narrowest point of the waist. Three alternative hypotheses – statistical anomalies, raw material variation, and evolutionary models – are discussed that could also explain the variation.

The final chapter, Chapter 8, summarizes the theoretical and methodological issues, reviews the results, and discusses difficulties encountered in the project, the implications for this research, and directions for future research.

This research appears to be the first to examine the phenomenon of Paleoindian regionalization on such a small scale. While the theory predicted that regional variation could be present and the methodology found regional variation in the Study Area, I do not believe that the regional configuration of social groups inferred in the analysis precisely represents the configuration of Paleoindian groups at that time; I expect that more data from the Study Area or the inclusion of areas outside the Study Area would change the configuration. However, I do believe that the theoretical foundations for this research accurately capture the way that variation and consistency in material culture is created and maintained and that the methodology can discern these aspects of material culture and translate them into a regional configuration of social group territories.

The research also has broader applications, and my hope is that the project will contribute a theoretical structure and method that can be used to interpret regional variation for any kind of material culture to infer the regional distribution of social groups. The method developed should be applicable to all cultural behaviors at all times and places. In addition, the insights clarify the relationships among variation, style, and typology. Finally, it should give us pause in our use of the typical inferences about the composition of the social entities that are revealed by a typology.

CHAPTER 2

THEORETICAL FRAMEWORK

A principal concern of archaeology is the explanation of the temporal and spatial distributions of variations in the form of artifacts (Carr and Neitzel 1995:3; Parkinson 2006), and this effort has moved forward under the basic assumption that in the absence of natural or environmental processes, the aggregation, creation, differentiation, and distribution of cultural materials reflects patterned behavior (Plog 1978:144). For the problem of reconstructing social boundaries, we assume that a variation in material culture has something to say about the variation in the culture that produced the material, but sometimes the emphasis is on pattern recognition rather than on the cultural processes that created the pattern (Conkey 1989). The relationship between material culture and society requires a detailed understanding of the social processes that produced it (Dietler and Herbich 1998); otherwise there may be no concordance between the method and the theory (Carr 1995). Many theoretical and methodological steps must be taken between the largely isolated artifacts that make up my data and human social organization, and each must be adequately warranted and logically connected for the research to succeed.

Archaeology is in need of new approaches to the analysis of material culture if some of its more intractable problems are to be resolved. The current debate about whether Clovis predecessors originated in Northeast Asia or Europe is a case in point (Bradley and Stanford 2004; Straus et al. 2005). The material cultural evidence marshaled in support of either position is usually an inventory of the tools and techniques used in Northeast Asia, part of Europe, and North America (e.g., Straus et al. 2005:table 1) from which both sides of the debate emphasize the similarities and dissimilarities between assemblages. Forgotten in this exercise is the theoretical foundation for assuming how we should expect these assemblages that are separated by thousands of kilometers or thousands of years to appear. Perhaps the exercise of comparing tool categories is unwarranted. We need to be asking how we would expect material culture to change over time and space before we argue evidence.

In this chapter I will discuss the anthropological and archaeological theoretical framework within which my research is built. The presumption of this research is that my data, which are described in Chapter 4 and consists almost exclusively of isolated artifacts with location information, can inform questions of social organization. This social organization should leave spatial and temporal patterns of consistency and variation in the form of the artifacts. Since I am relying on the spatial distribution of material culture variation, I need to model how that variation is created through time and space, the nature of the group of people that create the variation, and how the variation may be revealed in meaningful ways through a typology. Finally, I need to articulate how these groups manifest themselves archaeologically and which inferences should and should not be extracted from the variation in my data.

I use cultural evolutionary theory (CET) as a single overarching theory from which I can derive theories of social organization, the temporal and spatial change of material culture, and methodologies for establishing typologies. I use the term "cultural evolution" to mean the temporal change in any and all aspects of a cultural system, such as its spatial organization, cultural mores, dance steps, and material culture.

This chapter is divided into five main sections. In the first section, I introduce cultural evolutionary theory and discuss the effects of learning processes on the evolution of cultural behaviors. Unlike selectionist theories based on biological evolutionary metaphors, which posit that changes in material culture are driven by the efforts of people to maximize or optimize their chances of survival, cultural evolutionary theory proposes that the process of transmitting culture through time and space has the greatest effect on creating and maintaining variation and consistency in material culture. In the second section, I discuss variation in material culture, how it is produced, artifact design, and the process of innovation. It is through these processes that material culture forms are spread spatially. The third section concerns the spatial distribution of artifacts, the nature of human groups, and style. In this section I introduce two ways of understanding style that can be directly related to how an archaeologist creates and uses a typology and show that a typology reveals the group of people who share models of material culture, which I call the social group. These social groups are not necessarily precisely concordant with traditional ethnographic models of social organization, such as band, tribe, clan, etc., but they are the social organization that is revealed by a typology. In the fourth section, I show that in a band-level social organization, the social group probably correlates with a regional affiliation of bands, and in Chapter 3, I use these ethnographic data on regional bands to estimate the likely spatial extent of Paleoindian social groups in Florida. In the last section, I discuss variation in archaeological assemblages, and how we should expect those to look, and I show that the archaeological typology is an appropriate method for discerning social groups.

I. Cultural Evolutionary Theory

"American archaeology is anthropology or it is nothing." When Binford (1962) quoted Willey and Phillips (1958:2) he was focusing on the use of archaeology to further anthropology. But I use the quote to mean that archaeology will greatly benefit from closer attention to anthropology. Recent theoretical developments in cultural evolution, especially cultural evolutionary, or dual-inheritance, theory are a case in point and underpin much of the theory in my research. Cultural evolutionary theory (CET) integrates anthropology, cognitive learning theory, genetics, psychology, and other disciplines to explore the relationship between genetic and cultural evolution (Paciotti et al. 2006). It promises to provide the behavioral foundations for many anthropological and archaeological phenomena. In contrast to sociobiology and evolutionary archaeology, Boyd and Richerson (1985), Henrich (2002, 2004), and others argue that cultural evolution should be understood foremost as a process of cultural transmission rather than as a process of adaptation in response to the pressures of natural selection. Successful adaptation is part of cultural evolution (we would not survive if we were not successfully adapted), but the way people acquire their culture has the greatest effect on the way culture both evolves and is maintained.

All evolutionary systems, including cultural systems in which behaviors or artifacts evolve or change, have three fundamental elements: variability, transmission, and selection criteria (Jones et al. 1995), but the strength of the effect of the particular mechanisms in each system may be significantly different. Generally, evolutionary biologists agree on the process of genetic evolution; variation arises from mutation, genes are transmitted from parent to offspring, and fitness is the criteria for selection of one variation over another. Variation and transmission are relatively straightforward, and natural selection is the factor that exacts the most significant changes in the genetic system. Temporal changes in a cultural system are different.

Early and mid-twentieth century efforts to explain culture change in a culture-historical framework (e.g., Willey and Phillips 1958) have been replaced in recent years with concerted efforts to explain culture change using neo-Darwinian concepts (Teltser 1995a; Bamforth 2002; O'Brien and Lyman 2003). While it is tempting to employ neo-Darwinian models of biological evolution to explain cultural evolution because they share some obvious parallels (Loney 2000), the over-reliance on concepts and assumptions derived from genetic evolutionary theory have created some questionable theories and problematic methodological dilemmas in archaeology.

Of all the cultural evolutionary theories, evolutionary archaeology has received the bulk of attention in recent years. Evolutionary archaeology posits that external selectionist pressures have the greatest impact on cultural evolution. In a process analogous to natural selection, behaviors that confer an adaptive advantage on an individual will tend to spread because they will make the individuals more successful and ultimately more likely to reproduce (Teltser 1995b:60).

The assumption that selectionist pressures work on adaptive behaviors requires evolutionary archaeologists to differentiate between functional behaviors upon which selectionist pressures can work and non-functional, or stylistic, behaviors that confer no adaptive advantage and are neutral in the face of these pressures. Functional behaviors change through time because evolutionary forces sort through the optional behaviors and favor the most advantageous. In contrast, stylistic behaviors do not have adaptive functions and are not subject to evolutionary pressures; they change through stochastic processes that are akin to genetic drift, meaning that at any particular point in time the frequency of stylistic traits is just as likely to increase as decrease (Teltser 1995b:60). Thus, evolutionary archaeologists argue that "different evolutionary processes are at work in the creation and persistence of stylistic and functional attributes of our artifacts and their associated behaviors" (O'Brien and Leonard 2001:2).

Evolutionary archaeology presents several theoretical and methodological problems (Bamforth 2002), but I will center on the issue of intentional human action that is pertinent to this research. By focusing on the effect of selectionist pressures on behavior, evolutionary archaeologists gloss over the mechanism of individual choice. Evolutionary archaeology does this explicitly because individual decisions cannot be extracted from the archaeological record (Jones et al. 1995). I think this is not precisely correct, and I discuss this in some detail later in the section on innovation and artifact design. On an individual level, evolutionary archaeology proposes that people want to be more successful and will choose the traits that will help them reach that goal (Jones et al. 1995). Thus, the selection criterion an individual uses is "will this trait make me more successful?" For functional traits, evolutionary archaeologists argue that people who make more effective tools obtain some advantage that translates into increased reproduction that, presumably, leads others to adopt that advantageous trait. This seems plausible, but the same cannot be said for the spread of stylistic traits.

Evolutionary archaeologists argue that stylistic traits are not subject to selectionist pressures, and their frequency varies stochastically. They point to the ebb and flow of pottery types in seriation studies in lenticular, battleship-shaped curves as evidence of this effect. But how would this work on an individual level? In other words, what selection criterion would an individual employ that would lead to stochastic variation? Does it mean that given the choice between incising a circle or a square on a pot, that the potter is not inclined either way? People make stylistic choices with the same intention that they use for functional choices (Bourdieu 1977; Ortman 2000, 2001). While evolutionary archaeologists acknowledge that people intend to incise circles or squares, they do not believe that that intentional choice makes a significant difference in cultural evolution (O'Brien and Leonard 2001).

The idea that the primary motivation of people in their lives is to maximize their efficiency, fitness, or environmental adaptation is pervasive in archaeology (e.g., Bleed 1986; Torrence 1989; Schiffer and Skibo 1997; Wobst 1977), but it is coming under increasing scrutiny (Lemonnier 1986; Loney 2000, 2001). Although these motivations are used to guide some decisions, it is difficult to believe that cultural differences can be primarily attributed to an ahistorical drive to optimize (Boyd and Richerson 1992). The significant technological differences that exist between groups in the same environments bespeak of different processes at work.

In contrast to evolutionary archaeology, CET emphasizes that genetically-based learning strategies are the strongest force in cultural evolution. Humans have evolved learning strategies that allow them to cheaply sort through available behavioral options to choose those that are most likely to be successful. These universal learning strategies can be characterized as a "psychological propensity" (Henrich 2002:200) or "learning instinct" (Paciotti et al. 2006). Individual-level decisions and behaviors have group-level consequences, and thus a close examination of how people make decisions and acquire their culture is required for an understanding of how culture is structured and changes. The patterns of behavioral change we see in the archaeological record, which by and large are changes in artifact design, result primarily because of the way that cultural information is transmitted from individual to individual rather than from the effect of selection upon functional behaviors. Although it relies heavily on mathematical models to describe social-level consequences of micro-evolutionary processes, the foundation of CET is derived from research in anthropology, psychology, cognitive studies of learning processes, innovation processes, and cross-cultural experimentation (Henrich et al. 2001), and it can be understood outside of its mathematical framework. As an aside, I view mathematical models as simply a type of symbolic logic; the fact that a model is mathematical makes it no more or less persuasive or powerful than non-mathematical models.

Throughout this exposition of CET, I will use the process of learning to make a Clovis point to illustrate the principles involved with the understanding that CET is applicable to the transmission and evolution of all human culture, whether it is functional or stylistic, or leads to the creation of artifacts, the performance of rituals, the comprehension of beliefs, or what to do when it rains.

A. Learning Processes

In genetic evolution, an individual receives her genetic information from her biological parents, and her phenotype is the expression of that information. Likewise in cultural evolution, an individual's cultural "phenotype" is the expression of her cultural "genotype." Thus, culture is "information capable of affecting individuals' phenotypes which they acquire from other conspecifics by teaching or imitation" (Boyd and Richerson 1985:33). In other words, culture is the set of mental models of behavior that are passed from one person to another; it is not the behavior itself. The set of cultural models for a group of individuals is referred to here as its *cultural repertoire*. A *cultural variant* is one of several alternative cultural models. The *cultural expression* is the way an individual enacts a model. Material culture, performance, and verbal description are all expressions of an individual's cultural models. I use the terms *behavior* and *artifact* to mean the expression of the model. The *behavioral repertoire* is the sum of the individual expressions in a group. *Social group* is used in a general way to mean a group of individuals who share cultural mores and learn from each other. This vague working definition is sufficient for now but will be refined later in this chapter when I try to define the kind of group that can be discerned from my data.

Cultural information is transmitted through social learning to a naïve learner, who is an individual who has not yet acquired the mental model, by "cultural parents," who may be her biological parents (vertical transmission), other adults (oblique transmission), or peers (horizontal transmission). Social learning is the "transmission of stable behavioral disposition by teaching or imitation" that does not change as environment changes (Boyd and Richerson 1985:40). Thus, social learning is the acquisition of the models that make up the cultural repertoire. During social learning, an individual does not change the cultural model but may express the model differently in different environmental settings. For example, a simple cultural model of "wear clothes" is expressed differently in the summer than in the winter. Individual learning, in contrast to social learning, works on a cultural model that has been previously transmitted (Boyd and Richerson 1985:86), and changes to the cultural model are manifested in changes to the phenotype. Individual learning might change the cultural model "wear clothes" to "wear clothes, but not wool" based on an individual aversion to scratchy material. The nuances and consequences of individual learning are discussed in detail below. Once learned, culture is then expressed individually as a person acquires cultural models, translates those into action, and, perhaps, modifies them through individual learning.

Humans cannot transfer their mental models intact. Instead, mental models must be inferred by a learner from the available cultural expressions and learned through instruction, observation, or imitation. All of the ways to acquire cultural models are referred to here under the rubric "imitation." The process is analogous to the way children discern the rules of grammar by listening to the way people converse, practicing what they have heard, and receiving corrective instruction (Henrich and Boyd 2002:98). However, any group will have as many expressions of a cultural model as there are individuals expressing that model, because no two people will express precisely the same behavior even if everyone in the group shares the same model. A naïve learner must decide which expression of the cultural model to interpret from all available options: she can pick her parents to copy, pick a model at random, evaluate each model, or use some other "learning rule" that will guide her choice.

Learning rules by which cultural information is transmitted vertically or randomly are unbiased because both learning rules result in no change in the frequency of cultural models through time, except in small populations where sampling errors would become a factor (Boyd and Richerson 1985; Henrich 2002). Thus, vertical transmission is most like genetic transmission because a child receives both her genetic and cultural information from her parents. In both genetic and vertical cultural transmission processes, the child has no choice among options and any differences between the model that the parent possesses and the model the child receives occurs during the learning process.

Biased transmission, on the other hand, involves rules for choosing one cultural variant over another. These rules are biased because they change the frequency of cultural variants over time. Under direct bias the choice between variants is based upon an assessment of the qualities of the option, such as when people use their senses or cultural preferences to make choices. Hitting one's thumb with a hammer gives immediate and direct sensory information on how to properly hold a nail. Likewise, an individual employs a cultural preference when she chooses a novel food that is similar to one she has already tried and enjoyed.

Some researchers argue that model choices involve conscious or active decisions to weigh options, and people go with the best or most adaptive (Shennan 2001), but the human capability to evaluate options is limited and far beyond the competence of most people to make the decisions that face them rationally (Henrich and Gil-White 2001). Relying on sensory data to make behavioral choices is time-consuming, potentially dangerous, inefficient, and often uninformative if years of data, proper sampling, and convoluted inferences are required to make an informed choice. For example, sensory data can readily link a painful sunburn to prolonged exposure to the sun but not to skin cancer that develops decades later.

Although people use sensory data or straightforward cultural preferences in some cases to choose between models, they typically rely on the assessments made by others (Bandura 1977:97), which Boyd and Richerson (1985) called indirect biased transmission. Positive consequences for others foster the adoption of a behavior by the observer (Bandura 1977:117-119), and by inferring what other people think about the options or by observing the consequences of the actions of others, a naïve learner can make a reasonable choice with a minimum of effort and risk to himself. Boyd and Richerson (1985), Henrich (2002), and Henrich and Boyd (1998) have demonstrated mathematically that indirect biased transmission is an advantageous behavioral adaptation under a variety of environmental and demographic conditions. It is an efficient, although by no means perfect, way to choose quickly the variant that is most likely to be successful. The transmission of cultural traits through indirect bias drives cultural evolution and forms the basis of many social structures that affect this research.

B. Indirect Bias

Under cultural transmission by indirect bias, people use social cues to guide their choice of the person or cultural model to copy. They do not choose a mental model directly; rather, they infer the model by reviewing and considering the available expressions of that model. Some cues, such as ethnic markings, self-similarity, speech, age, or gender, are used to identify the pool of appropriate models (Henrich and Gil-White 2001:181; Bandura 1977:89). Rogers (1995:305) described this phenomenon as "homophily," in which an exchange of ideas occurs most often between individuals who share common beliefs, mores, etc. Once the field is narrowed, specific learning strategies are employed to sort through the available models. Boyd and Richerson (1985:chapters 7 and 8) describe two learning strategies that allow people to quickly decide which behavior is most likely to be successful from the pool of potential models. Under model-based bias, the naïve learner assumes that the same behaviors employed by the most successful or prestigious individual will also make her successful. People are influenced by the actions of others and respond to those with high status, power, or competence (Bandura 1977:87). For example, a naïve learner in a band of hunter-gatherers will chose to imitate the hunting techniques of the person he believes is the most successful hunter because that is more likely to lead to hunting success than imitating the techniques of a less successful hunter. Naïve learners rely on social cues that indicate success, which can be straightforward, such as the number of deer each hunter kills, or tangential, such as the deference shown to a hunter by others (Henrich and Gil-White 2001:18). Under the second learning strategy, frequency-dependent, or conformist, bias, the naïve learner adopts the most common behavior in the pool, because it is safe to assume that if most people are using it, the model will be at least satisfactory. Frequency-dependent bias may be used when an individual is uncertain about whom to emulate (Bandura 1977:89).

Read (2006) has criticized the proposition that people primarily learn through biased-transmission processes. Instead, Read (2006:174) argued that outside models can be introduced through verbal instruction even when no behavior is present to model, such as a potter relating a new technique she heard about elsewhere. However, extensive research in learning theory (Bandura 1977) and the diffusion of innovations (Rogers 1995) demonstrates that a new technique would not likely be adopted in this situation unless the teacher had enough prestige to convince others to adopt the variant. For cultural evolution, the origin of the model is less important than from whom it is transmitted. Thus, successful adoption of a cultural model through verbal instruction is just another example of prestige-biased transmission. Further, it is unlikely that the model would have been picked up by the teacher from very far afield. Gosselain (1998:94-97) found that among potters in Cameroon, most learning took place between related individuals, there was a high correlation between the languages of teachers and learners, and technical knowledge tended to circulate within recognized ethnic boundaries. Thus, it is likely that if outside models were passed on through verbal instruction, they would come from groups that at least share the same language and ethnicity.

Bentley and Shennan (2003) suggested that prestigious variants, rather than prestigious individuals, may also attract copiers. They hypothesized that prestigious variants are desirable because they are rare and used a Rolls Royce as an example (Bentley and Shennan 2003:472). However, there are plenty of rare objects that carry no prestige, and I suspect that a Rolls Royce is desirable in large measure because prestigious (i.e., rich) people own them.

Several researchers have proposed that the dominant mode of cultural transmission is from parent to child (Hewlett and Cavalli-Sforza 1986; Gosselain 1992:564, 1998), rather than through oblique or horizontal transmission, although there is also conflicting evidence to suggest that it plays a relatively minor role (Henrich 2004:204-205). It appears that the predominance of vertical transmission is inferred from interviews rather than observation, and I suspect that the reality is much more complex and multi-faceted and cannot be summarized simply as “who taught you to make pots” on a questionnaire. We would not expect a child to sit down with an accomplished hunter to learn to make a Clovis point until the child had at least mastered basic and intermediate flint-knapping skills. It seems likely that parents are the earliest educators of children, but later children will model slightly older children who are somewhat more proficient and will practice those models with their peers. Eventually, as the motor and cognitive abilities of adolescents and young adults mature, they will begin to model adults. For example, many potters who live or work in communities of potters will model others unconsciously or nonchalantly regardless of where they initially learned to make pots. Friedrich (1970:336-337) described such a pattern among Tarascan potters who shared decorative patterns freely with one another, even though pottery production was a family-based operation.

In sum, model-biased transmission tends to constrain the number of cultural models in a group and provides a mechanism through which the most adaptive traits are copied. But if model-biased transmission was the only operative learning strategy, people would frequently change their behavior to copy the techniques of the latest most successful individual. Conformist-biased transmission militates against the fickle variation that might result solely from model-biased transmission and works to make common traits more common. These strategies operating together tend to decrease the number of cultural models and increase their spread in the group, whereas errors in transmission and replication of the chosen models and innovation, which are discussed in the next section, tend to increase the variation within a single model and its expression in a group.

II. Variation in Material Culture

The mechanics of social learning are a fundamental part of understanding how model-biased and frequency-biased transmission affect cultural models. Social learning is imitation, but by imitation, I do not mean a "monkey-see, monkey-do" process (Read 2006). Rather, imitation is a continuum of instruction from simple copying to intensive prolonged apprenticeship. Even with intensive instruction, social learning is fraught with potential errors that affect the expression of a cultural model (Henrich 2002:262). The naïve learner could misinterpret the social cues for determining which person to model or cultural variant to copy. She may derive the most common variant from a limited and skewed sample of the population, or she may "pick the wrong horse" in choosing the most prestigious individual to copy by focusing on irrelevant or misleading cues. The processes of teaching and learning also can be error-prone. The naïve learner may not accurately infer the cultural model being presented, or the modeler may present the model or instruct in a way that misleads the learner. Finally, there can be errors in production, which is the process of translating the mental model into action. The learner may accurately infer the cultural model but be unable to accurately produce it because she is unskillful or inexperienced.

Henrich (2004:200-203, figure 1; Henrich and Boyd 2002:104-107, figure 7) has shown that these errors in transmission and replication can be expressed mathematically and graphically in a Gumbel probability distribution (Figure 2.1). The Gumbel distribution represents an appropriate model for this process because it does not assume the variation is normally distributed and predicts the mode of a distribution rather than the average. It also captures the notion that people demonstrate a minimum level of acceptable competence for most behaviors, which is represented by the steep slope on the left side of the curve. The Gumbel distribution in Figure 2.1 illustrates several significant points. The precise shape of the distribution does not affect this discussion.

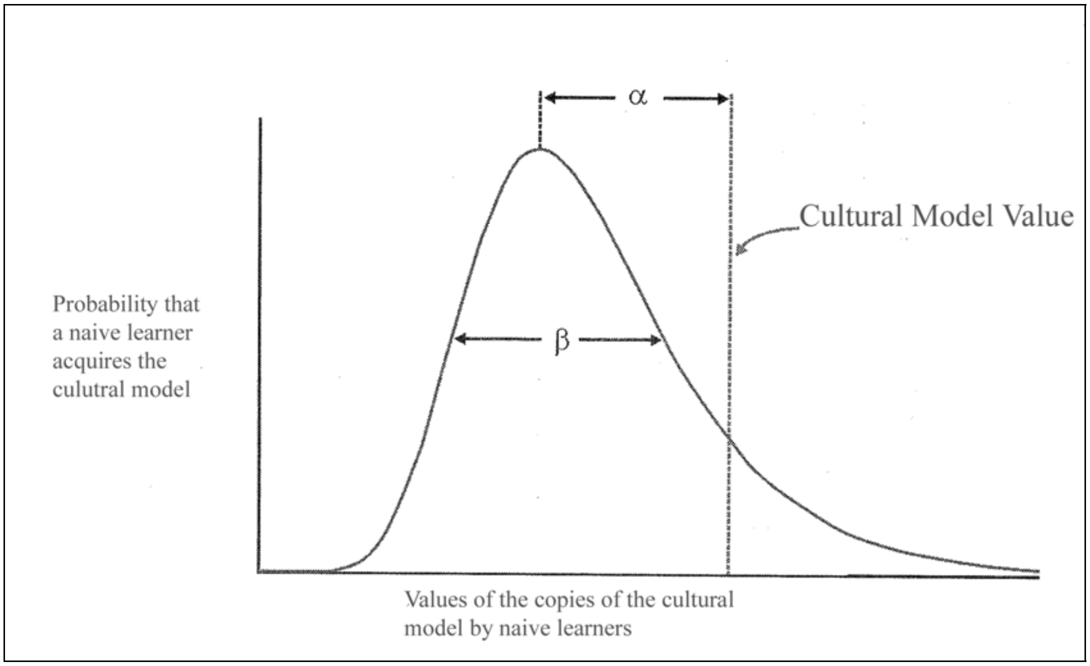

Figure 2.1: Gumbel probablility distribution illustrating an idealized distribution of behavioral variation in a system of social learning with imperfect inference and replication of a cultural model. The area under the curve includes the values of all of the expressions of the model. α is the difference between the value of the cultural model and the value of the mode of the expressions. β is the dispersion or spread of the expression values. Modified from Henrich (2002:figure 1).

The dotted line in Figure 2.1 represents the cultural model that everyone wants to copy to express. The model can be any cultural trait, such as a dance, story, artifact, or particular skill. For this illustration, we assume that the values of the model and copies reflect the skill level of the modeler and her imitators, respectively. The intersection of the dotted line on the x-axis is the skill level expressed by the model, and its intersection with the curve is the probability that an imitator will successfully copy the model. We can see that the skill level of the model is high compared with the majority of imitations, but it is not the highest in the population; it could be the highest, but that is not necessary. α is the amount by which the mode of the copies missed the model. Negative values of α (model value – α) mean that most imitators made a poorer copy; positive values mean that most made a better copy. A high value for α means that the model is difficult to imitate, in the sense that the model is difficult to conceptualize or learn. β is the spread of the variation of the copies. β should be within the range of socially acceptable variation, otherwise a copy would be discarded or modified and used for other purposes. A small value for β means that the model is easy to copy. We should interpret Figure 2.1 to mean that all of the copies meet a basic level of competence, most of the copies are inferior expressions of the model, and the probability that an imitator will make a less skillful copy is high, although some copies may be more skillfully produced.

Henrich (2002:202) described four configurations of the distribution that are likely to occur. A small α and small β mean that the model is easy to conceptualize and easy to copy. A large α and small β mean that the model is hard to grasp but everyone makes the same basic mistakes in copying. A large α and large β mean that the model is hard to understand and everyone has difficulty copying it, and a small α and large β mean the model is easy to understand but difficult to copy. Different models have different α and β values. Successfully removing a flute from a Clovis point would have a small or average α and large β, whereas grinding the edge of the point would have a small α and small β.

A. Individual Learning

Individual learning introduces another source of phenotypic variation. Boyd and Richerson's (1985) definition of culture only includes transmitted information; it does not include individual modifications of cultural models, which they call individual learning. I use the term *innovation* to refer to the deliberate modification of a cultural model by an individual. An innovation becomes part of the cultural repertoire only when it is transmitted to and adopted by another individual.

Variation due to individual innovation should be distinguished from that created by errors in learning and production. The purpose of an innovation can be to improve the design, such as to make it more effective or easier to manufacture, or to assert some expression of individuality (Basalla 1988). Modification may be active, such as when an individual changes the haft of a tool to create a tighter fit with the shaft, or it may be passive, such as when a flint-knapper settles for a short flute because it is "good enough," i.e., his copy falls outside the ideal tolerances of his mental model for that particular artifact, but he accepts it anyway. Although this inadvertent change in design is not intentional in the sense that the individual intended to modify the design with some specific goal in mind, it nevertheless represents a purposeful act since the artifact was accepted and not rejected.

It is important to understand that Figure 2.1 represents the expression of the mental model through social learning and individual learning. It does not necessarily represent an archaeological distribution because of the effect of other processes, which is discussed in the last section. In addition, we cannot assume that the average value in the distribution of variation of the phenotypic expression is necessarily the most common phenotype or that the mode or average is necessarily a close approximation of the cultural model.

I have presented an ideal and simplified situation to illustrate the process and results of biased transmission, but reality is undoubtedly more complicated. Instead of copying a single design, the naïve learner may take parts of several models to suit her individual needs so that her efforts may not reflect a single cultural model (Bandura 1977:48). There may be more than one hunter worth copying, or there may be reasons other than prestige or frequency for copying a model. However, the model of biased transmission has extensive support in learning theory, psychology, and ethnography in addition to the mathematical demonstrations (Bandura 1977; Henrich and Gil-White 2001), and it appears to accurately describe the predominate processes of cultural transmission.

B. Model Design and Changes in Material Culture

Most cultural models, such as complicated artifacts or performances, must be learned in stages. The novice flint-knapper first learns which raw material is appropriate, how to hold and strike the stone, how to protect himself from sharp edges, etc. When novice learners are presented with a new behavior they tend to focus on segments of the behavior and approximate those before attempting the entire behavior. Each behavioral segment is practiced and errors are self-corrected through feedback as the novice compares his efforts with the model. The novice may first make flake knives, then side scrapers, end scrapers, and overshot flakes before he is ready to attempt a Clovis point. Each of these skills and decisions is a cultural model, and as each skill is learned it is combined with other skills for different purposes (Bandura 1977:27-28; Hardin 1979:93). Learning can be seen as the conceptual ability to rearrange skills, which is simply the capacity to operationalize the learned model (Roux et al. 1995:66). Except for the simplest tasks, the process of inferring a model is not likely to be straightforward. It is liable to involve a multi-stage conception as the behavior is broken down into constituent components. Thus, any particular artifact type is the sum of its constituent cultural models, whose variations in the population will have a different α and β values depending on the relative difficulty of inferring and copying the models.

I call this collection of constituent models the "artifact design," although the broader term "behavioral design" could be used to describe non-artifact behavior. Changes in artifact design are really changes in one or more of the constituent models, which I call the design attributes. These design attributes can be skills, shapes, raw material choices or any of the myriad components that make up a particular artifact. For example, the design attributes related to an incised decoration on a pot include the decorative elements, method of application, choice of utensil, color, paint, burnishing tool, surface treatment, proper clay and temper, location on the vessel, sequence of application, etc. My working hypothesis is that for purposes of tracing culture history an artifact-type can be viewed as a temporally-specific amalgamation of its constituent attributes.

The conception of an artifact or behavior as the sum of its constituent parts is similar to the *chaîne opératoire*, which closely examines the transformation of primary material into finished product by focusing on technical processes (skills), objects (action on matter), and knowledge (Lemonnier 1986; Schlanger 1994), and which Van der Leuuw (1994:136) argued is the way that the artisan conceives of the problem. Thinking about artifacts as the endpoint in a *chaîne opératoire* helps my work in several ways. First, Lemonnier (1986) found that some steps in the *chaîne* are flexible and others were inflexible, meaning they could not be changed without dooming the enterprise to failure. Although differentiating flexible and inflexible steps can be tautological, the concept is apropos to the artifact design trajectories discussed in the next section. Second, the analysis demonstrates that small changes along the *chaîne* can have profound effects on the final product. Third, the failure to adopt clearly more effective alternatives in the process of creating a behavior demonstrates that optimization is not the primary motivation (Lemonnier 1986:171). Finally, the *chaîne* itself along with the final product are culturally specific and can be a means for differentiating groups (Gosselain 1998; Dietler and Herbich 1998).

Figure 2.2 illustrates this idea of treating an artifact as the sum of its constituent attributes. In Figure 2.2, I use the consensus understanding of the evolution of projectile points in peninsular Florida during the Paleoindian Period starting with Clovis and progressing through Suwannee, Greenbriar, and Bolen points. This chronology of artifact evolution is used simply to illustrate the concept with the understanding that the actual chronology would not be this straightforward and could be different in different locales. On the x-axis are the point types arranged in chronological order from earliest to latest. On the y-axis are five attributes of a Clovis point: fluting, lanceolate shape, basal concavity, flared ear shape, and basal grinding. These are not all of the attributes, which could include everything about a Clovis point such as raw material choice, reduction strategy, overshot flaking, thinness, etc.

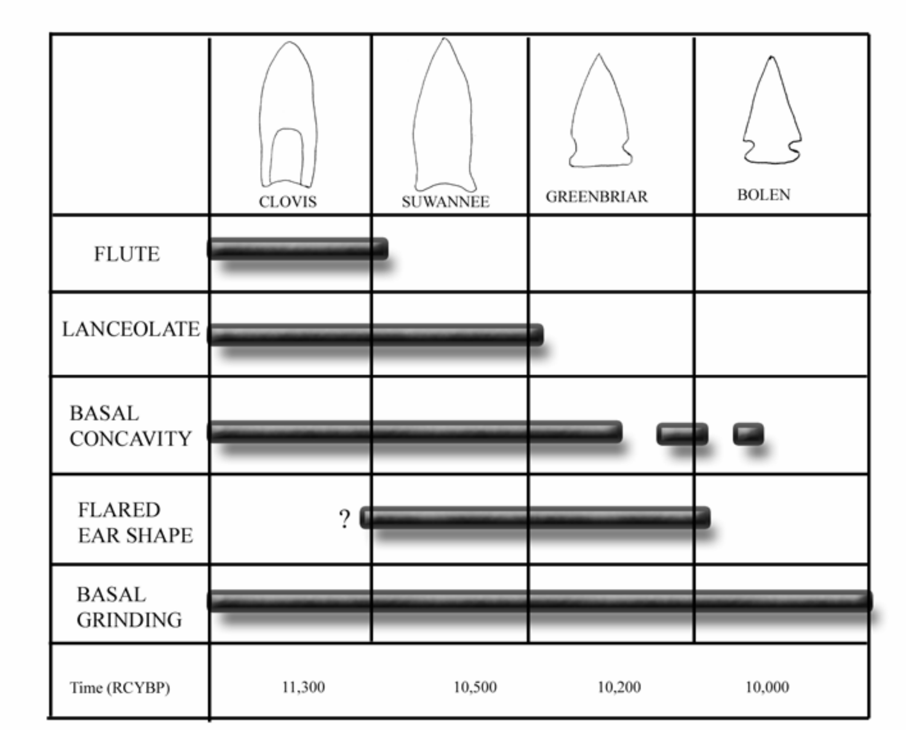

Figure 2.2: This illustrates that an artifact can be thought of as a temporally specific sum of its constituent design attributes. These attributes change through time and are rearranged, which affects the final form of the artifact.

Figure 2.2 shows that separate and distinct design attributes are combined to create each of these point types. Through time these design attributes change, are replaced, and disappear, which changes the projectile point. If the points themselves were the loci of analysis, then we would see the abrupt change in form and might infer more dramatic social processes at work such as diffusion or population replacement (Willey and Phillips 1958). The *chaîne opératoire* is an analytic technique for breaking down a technical process into its constituent parts, but Figure 2.2 shows how this technique also can help in understanding diachronic change in artifact design.

C. Innovation and Artifact Design Trajectories

The process of design modification, whether experimental or passive, fits neatly with models of the development and spread of innovations. As discussed previously, experimental modifications are made when an individual chooses to fix a perceived problem, whether in the use, manufacture, or "look" of the artifact. It does not matter whether the problem to be fixed is real or imagined, because in either case the individual will work to change the design (Petroski 1992). For example, if an individual believes that the reason he is not consistently catching fish is because his hook is not round enough, he will modify its design to make it rounder, even though the real problem is the color of the hook.

Scholars of the evolution of design have made several observations that are apropos to my work. First, no design is optimal or perfect for all users or applications (Petroski 1992), and any particular artifact may be modified for use in a new circumstance or to meet an individual's needs or preferences. For example, a projectile point that is adequate for killing large mammals may be inefficient for killing birds, or some hunters may have better results with smaller darts or shorter shafts. Petroski (1992:chapter 4) illustrates this point with the evolution of the paper clip, which has gone through many changes in material, shape, and size, but has never reached an optimal design. Second, most design change is incremental as innovators tinker with one or another of the design attributes; radical design change is rare (Basalla 1988). Third, design modification is always based upon an antecedent form (Basalla 1988), which means that an innovator is always working on the cultural model that he previously acquired. Thus, the continual change in artifact design in the archaeological record does not necessarily reflect efforts to optimize designs in response to changing environments; it may simply result from continuous tinkering and incremental design change in a stable environment.

Some design changes are constrained by cultural disposition, and perfectly functional or more optimal options may be rejected because they are perceived as inappropriate (Bourdieu 1977:95; Deitler and Herbich 1998:253). If a design change shows promise to its users, then we might expect to see a flurry of experimentation and design modifications until a satisfactory new design was found, but the spread of changes in behaviors is not necessarily dependent on the worthiness of the innovation. Rogers (1995) cited several examples of innovations that took centuries to adopt, such as the cure for scurvy in the Royal Navy, or have never been adopted, such as an improved computer keyboard, even though they were clearly advantageous. Such phenomena indicate that processes other than a simple assessment of efficiency affect the spread of innovation. In most cases, the spread depends on how an individual perceives its relative advantages (Rogers 1995:233), but several other factors affect its adoption and spread: compatibility with existing standards and values, complexity, the degree to which experiments can be conducted, and how observable the innovation is (Rogers 1995:15). These factors harmonize with the structures of cultural transmission already discussed, but none ensure that an innovation will be adopted.

Innovations, regardless of the type, tend to spread through a population in a similar fashion (Rogers 1995). A new innovation is adopted initially by only a few people (assuming it is associated with a prestigious or successful individual), but through time model-biased transmission will spread it at a faster pace until it nears its maximum frequency. The plot of frequency versus time is known as an S-curve (Rogers 1995; Henrich 2001).

Figure 2.3 illustrates this process in a simple situation where only two traits are present in a population at any time. Assume that Trait 1 is a concave base on a projectile point, Trait 2 is a flat base, and Trait 3 is a convex base. Initially (t_0), all members of the group make concave-based points. At time t_1 an individual develops or introduces Trait 2. Through model-biased transmission Trait 2 slowly gains users. At some point in the steepest part of the curve (t_2), frequency-biased transmission will begin to work as Trait 2 becomes the most common variant and is made by more and more people until finally it totally replaces Trait 1 (t_3). By horizontally flipping the S-curve that describes the rise of Trait 3 in relation to Trait 2 and conjoining it to the end of the S-curve for Trait 2, we can how the S-curve describes both the increase in frequency of Trait 3 and the decreasing frequency of Trait 2. Figure 2.3 describes the rise, fall, and replacement of all cultural traits, including archaeological theories of cultural change.

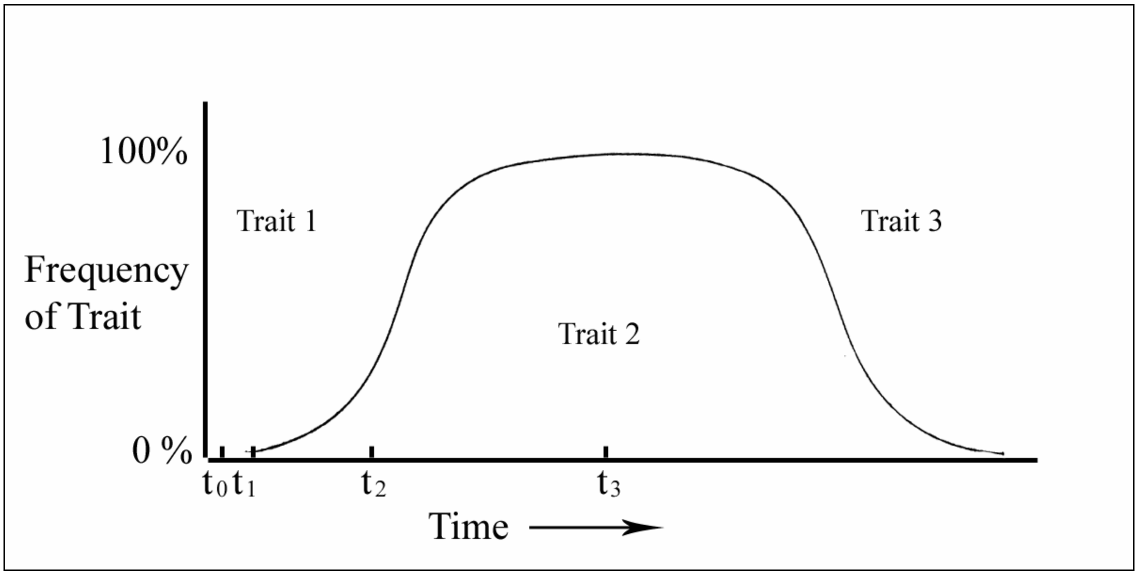

Figure 2.3: This figure illustrates the innovation process for three mutually exclusive traits.

Figure 2.3 illustrates two important phenomena. First, at some point during the steepest slope of the curve, frequency-biased transmission becomes effective and may work in conjunction with model-biased transmission. Second, it is clear that two different cultural models may be present in the same assemblage at the same time during the replacement of one model by another. This means that assemblages containing different projectile points or pottery designs, for example, may represent a process of innovation spread in a single social group rather than some other social or site formation process.

If a modified design becomes a new cultural model (because it is transmitted), then subsequent innovators will work on the new model. The process compounds itself as new innovators make new design changes. From the initial design modification, we can reconstruct a design trajectory (assuming we have all the intermediate designs to review). Different groups of people who all started with the same design, such as a Clovis point, can end up with significantly different designs after generations of innovators work on it, because final designs are sensitive to initial conditions (Boyd and Richerson 1992). For example, one hunter in one group may add ears to the base of the point to address a weakness in the haft while another in a separate group works on increasing the width to enhance the point's cutting efficiency. Subsequent hunters in the first group may also work on the cutting efficiency, but their design will have ears, which may affect how the cutting efficiency problem is tackled. In the second group, a wider point may present different solutions to the hafting problem.

Because social learning is error-prone, maladaptive or selectively-neutral traits may be incorporated in the cultural repertoire so long as they do not adversely affect the overall fitness of the population to a point where their survival is affected (Boyd and Richerson 1985:14; Henrich 2004). For example, a naïve learner who uses the best hunter as a model may be unsure about what leads to his success and may copy not only the way he makes weapons and stalks his prey but also his adornment, diet, stance, and speech patterns. Inferences can be further convoluted when a learner infers that a modeler's success in one area indicates the likelihood of success in an unrelated area (Henrich and Gil-White 2001:184-187). It is these phenomena along with the process of design innovation discussed next that can lead to differential and longer term retention of traits in the cultural repertoire regardless of their adaptive benefits.

Sometimes designs or design attributes persist in the archeological record, but our usual assumption that the persistence of difficult-to-create designs is an indication of their technical effectiveness (e.g., O'Brien and Leonard 2001) is suspect. We can infer that the purpose of the initial design change was to fix a perceived problem by one person, but we cannot infer that the subsequent use of that design still addressed the initial problem. For example, assuming that grinding the edge of the base of a point was a design change intended to fix a problem with the binding, once established as a cultural model, the persistence of grinding may be more a function of biased transmission and demographics than efficiency of the design. Bourdieu (1977) characterized this persistence of design as a result of the *habitus* of a group, which is discussed in more detail in the section on style. Henrich (2004:204, figure 3; but see Read [2006] for a critique) showed that maintenance of a cultural model depends on the size of the pool of potential social models and the difficulty of the skill. Larger populations tend to maintain enough skillful artisans who can accurately replicate a model and then act as models for the next generation, while smaller populations with few artisans will tend to lose techniques that are difficult to comprehend or perform. Because most learners will master simpler skills adequately, these can remain in the cultural repertoire longer before they will be lost. Thus, all other things being equal, we should expect a group to maintain simpler designs longer than more complicated designs.

If this is correct, then we should see longer retention of easy-to-replicate skills than harder-to-replicate skills in the archaeological record, assuming neither is necessary for the satisfactorily use of the artifact. A possible example of the inertia of design attributes is the differential persistence of basal grinding and fluting in the Paleoindian period in Florida (Figure 2.2). The general consensus among archaeologists is that Clovis points were basally ground to prevent the binding from being cut and fluted to improve the contact with the haft, lower the profile of the point to improve its penetration, or both (Musil 1988; Titmus and Woods 1991; Howard 1995). However, neither grinding nor fluting appears to have been necessary for effectively killing megafauna, since unfluted and unground points have been used in other parts of the world for that purpose. Further, Titmus and Woods (1991) found that with mastic, basal grinding was not needed to keep the binding from being cut or keeping points securely in the haft. Thus, assuming they used mastic for binding, Florida's Paleoindians continued to grind their edges long after it was required. Fluting disappears relatively rapidly after Clovis times, however. If we assume the $\beta - \alpha$ is positive for fluting (i.e., fluting is easier to comprehend than to replicate), then it is more likely that this design attribute will evolve because more alternative fluting models will be inferred from the wide range of available variations to copy. In this case, fluting evolved out of existence. Thus, the hypothesis that the easy-to-master skill (grinding) remains longer while the harder one (fluting) disappears sooner is supported.

Bentley and Shennan (2003) showed generally that in biased transmission a new design will have a hard time breaking into a cultural repertoire and growing. It may be that some design attributes are harder to change than others because they are fundamental to the design (Lemonnier 1986). Gosselain (1992:582) concluded that the shaping process in Bafia pottery manufacture is so ingrained that it would be difficult to unlearn, while other stages in the *chaîne opératoire* are not fundamental to the overall success in the process of making a pot, and these should be more susceptible to innovation. Thus, even easy-to-change design attributes will remain unchanged if they are integral to the proper functioning of the design. An example would be the pointed tip and sharp edges of a projectile point. Both are easy to alter, but only the tip is so fundamental to the proper function that it has remained unchanged. Sharp edges are not so fundamental, and effective projectile tips have been made of bone, wood, or copper with sharp points but smooth conical sides.

Because no design is optimal and all designs are based on predicate forms that may be different in different places, we cannot infer that an artifact is necessarily the most efficient design for its function. In fact, different designs can be equally effective. For example, different design trajectories led to bifurcates in one area and flat-bottomed points in another in the Archaic period of eastern North America (Justice 1987), but we can not infer that these points were used for different purposes or that bifurcates were the most efficient design for that area at that time. We can only infer that they were satisfactory. Similarly, it is not likely that all the hallmarks of the Clovis point were developed in conjunction to solve a single technological challenge, like the hunting of megafauna. It is more likely that each attribute, such as fluting, basal grinding, lanceolate shape, basal concavity, or reduction strategy, was developed at different times to solve different technical challenges, and that all these design attributes came together at one particular time and place to become what we call a Clovis point (Figure 2.2).

III. Spatial Distribution of Material Culture

I have been discussing the hows and whys of variation in material culture and now will focus on variation in the spatial distribution of artifacts. Again, we should start with an understanding of how and why people will occupy space before we can analyze why material culture will vary over space and what that means. This can be broken down into two independent phenomena that may interrelate in informing the ultimate goal of reconstructing social territories: the discard of material on the landscape and the spatial pattern of material culture variation. The discard and distribution of material will be discussed in this section, and the variation of material culture over space will be discussed in the subsequent section on territories.

The spatial distribution of material has been the focus of archaeological, ethnoarchaeological, and geographic research, which can be summed up as follows: people discard material in areas they occupy, either through intention or loss, and the longer or more intensely people use an area, the more material they will discard or lose there. Thus, the relative density of artifacts is some measure of the intensity of use, length of use, the number of people using an area, or some combination of all of these. Most of the models developed to explain discard patterns use efficiency as the central tendency of this human behavior (Clarke 1977:19), although Clarke (1977:27) noted that they are based on modern notions of social physics and could miss patterns that are no longer extant. Nevertheless, these are intuitively pleasing hypotheses and are generally supported in the ethnographic and archaeological record.

Site catchment models posit that people, especially in smaller societies, will most intensively use the zone of resources around their settlements (Jarman et al. 1972; Flannery 1976:91). The shape of the catchment area is based on a theory of least-effort, with the size dependant on time, effort, and distance in relation to the location of resources. In an ideal region with a homogenous distribution of resources, no physical impediments, and settlement mobility the catchment area used by a single group would be circular with a uniform distribution of artifacts throughout the area. If a settlement is located in the center of the area, then the distribution of artifacts would present a distance-decay pattern of decreasing density of artifacts as one moves further from the settlement. Catchment areas have some maximum size beyond which it is unlikely people will travel for resources (Flannery 1976:94).

In the real world, resources are typically patchy, and there may be several catchment areas for different resources, none of which will be circular (Yellen 1977). Also, because the theory is based on an assumption that people will minimize their effort, the presence of features that facilitate travel, like rivers, or hinder travel, like mountains or deserts, can also distort the shape of the catchment area. Different resources may have different catchment areas depending upon their accessibility, number, and location. Different groups may share a resource location, which would tend to increase the archaeological signature of use at that location. Mobile groups that make a seasonal round may exploit different catchments depending on where they are. Thus, a proper interpretation of a pattern of artifact density must take these factors into consideration. Catchment areas can be analyzed simply by drawing concentric circles around a settlement and inventorying resources (Flannery 1976:110) or ecological zones (Zarky 1976), or creating more sophisticated productivity contours that consider plant and animal productivity, ecosystem structure, and human energy input (Foley 1977). Any consideration of a catchment area requires some understanding of the landscape at the time it was occupied (Flannery 1976; Foley 1977). Central-place theory (Johnson 1977) and rank-size distributions of settlements (Haggett 1966; Johnson 1980) are also models of human spatial occupation and use based on least-effort models of human interaction, but they concern settlements and are not apropos to my research.

At a larger scale, the spacing of territories has been hypothesized using the same notion of efficient use of space. Equally-sized hexagonal polygons represent the most efficient division of the exclusive use of space and have been used to hypothesize adjoining territories in hunter-gatherer studies (e.g., Wilmsen 1973). Theissen polygons are sometimes used to divide space evenly between a distribution of points in two-dimensional space (Haggett 1966:247-248), and they have been used to model the size and location of archaeological territories (e.g., Hester and Grady 1977).

In sum, this is one area of distributional analysis that is relatively uncontroversial, and excluding post-depositional processes that change the location of artifacts, we can be fairly certain that on a geographic scale somewhat larger than a settlement, the relative density of artifacts is highly correlated with the intensity of use. In the next section, I will start to discuss the implications of the spatial distribution of material culture variation on the identity of groups of people.

A. Human Groups

In its broadest usage in archaeology, “style” refers to variation in cultural behavior. The goal of all archaeological research in style is to understand the relationship between variation in material culture and groups of people, which are variously referred to as ethnic, linguistic, cultural, or social groups, and, as a general proposition, most researchers assume that behavioral style, including material cultural style, in some way embodies the identity of ethnic, cultural, or social groups (Jones 1997). However, this presupposes that a group of people has a collective identity that can be identified with archaeological data, and before proceeding further in the discussion of style and territory, it is worth briefly exploring the phenomenon of human groups. I start this discussion by using the term social group to refer to a collection of people who share cultural models but will develop this definition further. Ethnic group is a similarly slippery concept and is used here to refer to a collection of individuals who identify themselves as such. An ethnic group and social group may or may not be coextensive.

Human grouping behavior is empirically uncontroversial, and it is fair to characterize the prevailing view among evolutionary anthropologists that humans evolved this social behavior to foster interpersonal coordination or cooperation (or exploitation). If we accept this view, then it follows that people need ways to identify others with whom they can coordinate activities. Kinship has been suggested as one means of identifying potential coordinators (Hamilton 1964), and visible cues could also be used (McElreath et al. 2003:122). I have already discussed how social cues are used by learners to determine the pool of acceptable models, and this behavior is simply a specialized instance of a more general propensity to identify potential coordinators.

Thus, it follows that social cues signal group inclusion primarily and exclusion secondarily. To use an analogy from linguistics, exclusion is the marked case (Foley 1997), i.e., inclusion is the default meaning in the symbolic system of social cues. In other words, social cues are initially interpreted as “my people/not my people.” This is not to say that social cues are not also used to differentiate between the groups that make up “not my people,” only that this is not their primary function. The remarkable thing about social identity is that it is maintained in the face of forces that should obliterate it, such as intermarriage, migration, and contact. There must be other social processes at work to maintain differences in the face of these homogenizing pressures (Henrich and Boyd 1998:219).

McElreath et al. (2003) demonstrated mathematically that natural selection would favor a preference that inclines individuals to identify others with whom they share identifiable traits. Assuming that groups are initially separated, model-biased transmission will tend to spread cultural norms within each group, and conformist transmission will lead to the maintenance of group differences (Henrich and Boyd 1998:230). Natural selection will favor the development of a psychological bias in an individual to gravitate towards people who share norms in common. Some of these norms will come to symbolically mark membership (Henrich and McElreath 2003). As with any symbolic system, the designation of a behavior as a pertinent social cue is arbitrary and fluid.

The theoretical group that is just described is one in which members share cultural norms, identify each other as an appropriate pool of potential cultural models, tend to coordinate their activities, and pressure newcomers to conform. Group members probably produce expressions of those models in distributions like those described earlier (Figure 2.1) and in the final section of this chapter. Ethnographic evidence to support the existence of such groups is reviewed latter in this chapter.

B. Style

Style has engendered some of the more confusing research in archaeology, and much time is spent just defining terms (e.g., Conkey 1990; Hodder 1990). Much of this confusion arises from the ambiguous use of the term “style” (Dietler and Herbich 1998) and its contrast with the term “function.” To avoid this trap, I use the term “behavioral variation” or “material culture variation” to mean the empirical record of variation created by the learning and innovation processes described above. Behavioral variation and style should not be confused or conflated for the same reasons that genetic and cultural evolution should not be conflated; they are different albeit superficially similar. Thus, I will use the term “style” only when relating material culture variation to social groups.

Variation in material culture can be analyzed as a symbolic system, especially as it relates to group identity, group differentiation, and social boundaries. Humans have a penchant for imposing meaning on natural phenomena: vocal sounds become speech, tea leaves predict the future, and lightning bolts display a god’s emotions. Likewise, people have taken human behavioral variation, which is a result of differential human abilities, and given it symbolic meaning, and they are adept at parsing out subtle distinctions in variation. In this section, I use the concept of style as a symbolic system to review and critique the pertinent research and address the use of style to inform issues of social groups and ethnic identity.

Some researchers (e.g., Hodder 1991) have treated style in material culture as a language that can be read to provide insight into the social processes that produced it. This approach inappropriately uses language as a metaphor. The distinction between my use of material culture and Hodder's use is the difference between signification and text (Foley 1997). Although material culture evokes meaning, it cannot be understood in the way language communicates meaning (Dietler and Herbich 1998:244). A simple example that illustrates my use of style is a red traffic light. The traffic light embodies an arbitrary assignation of the color red with the notion of danger, and it evokes an intellectual response and understanding but nothing more specific. I think material culture can elicit the same kind of response and understanding, and I am interested in using material culture variation in one of the ways that its participants used it: to signal group identity.

Style also has been used as a "language" to unveil deeper cognitive and social structures (e.g., Deetz 1996) in much the same way that Levi-Strauss (1966) used language for the same purpose, the thought being that culturally mediated structures affect all aspects of our lives, including symbols (Robb 1998:335). This structuralist use of material culture has been criticized for ignoring the historical context of style and assuming that the production of style has no impact on its structure or meaning (Dietler and Herbich 1998), although my interpretation of Bourdieu (1977) and Deetz (1996) is that they recognize that these social structures are historically contingent.

C. Style as a Symbolic System

Social identity is manifested through style in two ways: specifically through intentional behavior designed to signal inclusion, exclusion, or both, and collectively through the cultural repertoire. I am hesitant to introduce two more terms into the style discussion, specific style and collective style, but the available terms are insufficient for the points I want to make. My intent is to understand the ways that participants obtain information about group identity from behavioral variation with the aim of using that understanding to justify my analysis. Specific style is used by individuals to transmit information about them (Weissner 1983, 1984; Wobst 1977; Plog 1990). In contrast but not opposition, collective style includes all cultural behaviors and provides information about the group that generated it. It is similar to Sackett's (1990) isochrestic variation but closer to Bourdieu's (1977) *habitus*, which are discussed below. Specific style is a subset of collective style.

Specific style is functional. People create and use it to assert personal and group identity and difference, and it is comprehended by others as a personal statement (Wiessner 1983). The research interest in specific style stems from a recognition that the individual is the active participant in his group membership (Wiessner 1984; Barth 1969) and is a reaction against the notion that groups are culture-bearing entities rather than an association of people who identify themselves as such and are differentiated as such by other groups (Barth 1969:10-11). The Self or individual identity is created both reactively and actively, but it is created in contrast to someone else (Voss and Young 1995) in a process of marking individuality (Wiessner 1984).

Like specific style, collective style is also created by individuals, but it is comprehended as a collective statement. Thus, collective style, which includes overt social cues and signals but also the totality of the circumstances, is used to assess group membership and identity, or it may be used to determine whether a person who "talks the talk also walks the walks." Collective style is recognized in the behavioral variation of a group. If we stick with the definition of culture as the set of transmitted ideational models, then collective style includes all of a group's expressed behaviors of those models. The idea that a group can be objectively defined by its complete cultural repertoire is similar to what Sackett (1990) called isochrestic variation, which is a "spectrum of equivalent alternatives, of equally viable options for obtaining any given end in manufacturing and/or using material items" (Sackett 1990:33). The choice between options is dictated by enculturation. My main criticisms of isochrestic variation are that Sackett (1990) viewed cultural transmission essentially as a passive process of enculturation and that people are rational decision-makers who actually make choices between equivalent alternatives. He misperceived both the decision-making process and the amount of freedom people have to make choices. As we have already seen, people make active choices, but the pressures of psychology and rules of biased transmission limit the number of viable options to those few that are culturally acceptable (Bourdieu 1977; Gosselain 1992:572).

Notwithstanding these criticisms, Sackett had several important insights. First, he saw that style is ubiquitous and function is stylistic, i.e., the function/style dichotomy is meaningless when you are evaluating collective style. Style resides in every stage and facet of the creation of artifacts (Gosselain 1998:82). Second, he recognized that the totality of behaviors signal "you belong" or "you are a foreigner," and although this message is not active or deliberative, it is effective nonetheless (Sackett 1990:37).

Bourdieu (1977) described how powerfully the structure of culture inculcates its practitioners with feelings of objectivity and constrains their universe of optional behaviors. His concept of *habitus*, which both informs and constrains social choices (Bourdieu 1977:95), is what people interpret as collective style. *Habitus* is created by individuals through their actions but also constrains those actions. To put it in the context of cultural transmission we have been discussing, individuals express cultural models through action, which in turn influences the form of the cultural models they acquire. This system of creation and recreation of social action is the *habitus*, and it is a self-perpetuating engine (Bourdieu 1977:82).

Individuals do not realize their *habitus* is historically contingent, and its categories and internal logic, although arbitrary, seem natural and objective (Bourdieu 1977:164). Options that fall outside the cultural logic seem unnatural, unrealistic, and unlikely to be successful. Individuals may feel that all options are open to them, but they only consider "natural" or "logical" those options that are constrained by the *habitus*. Although individuals are choosing how to behave, all members of the group, who are working with the same logical structures, are constrained to the same set of choices, which creates the appearance of a group *habitus* (Bourdieu 1977:80). Thus, Bourdieu explained how individual choice constrained by the *habitus* creates a collective style.

Collective style and specific style really describe different dynamics of group creation and maintenance. The difference between collective and specific styles is apparent in the interpretation of Wiessner's (1983) data on San arrowheads. Wiessner's (1983:269-270) conclusion that arrowhead differences were emblemic, meaning they signaled group identity because they could be used to differentiate linguistic groups, means they somehow were intended to represent those groups. But there was no indication that the arrowheads were made for the purpose of signaling identity, and Sackett (1990) was correct in pointing out that identity can be inferred from the arrowheads with or without intention. I interpret that the arrowheads were being used as collective style, albeit collective style inferred from a single artifact. Once the arrowheads had been identified, the San hunters were able to infer all sorts of things about their makers, such as their ferocity, skill, etc. (Wiessner 1983).

Group identity, as apprehended by the individual, comes from the recognition of a way of life more so than from the expression of one or more specific social cues. The active expression of group identity is just one aspect of a panoply of what Wiessner (1990) would call passive expression, all or most of which is required to signal group membership. Thus, the individual assertion of style is secondary to the archaeological analysis of group identity. It matters not whether an individual shouts her ethnic inclusion from the mountaintop; if she has not adopted the essential package of ethnic behaviors, she will not be recognized as a member of the group.

A final point about collective style: it is a normative evaluation of behavioral variation based upon a subset of the behavioral repertoire. At no time is the entire behavioral repertoire of a group on display for evaluation, and some behaviors may never be manifested by any group member in their lifetime, so any interpretation of collective style is approximate and subject to misinterpretation. Nonetheless, enough behavior is practiced to give an individual some idea of the norm and range of variation of behaviors that are appropriate to one ethnic group or another. These preconceptions of norm and variation might be called prejudices in some contexts, or fodder for anthropological assessments of cultural personality in others (Benedict 1934). Regardless, such conceptions are necessary to evaluate whether an individual belongs or would fit into a group. Thus, the essence of collective style is a notion of behavioral norms and acceptable variation.

D. Territories

In the last section I discussed the relationship between variation in material culture and social groups. In this section I am concerned with the relationship between the spatial distribution of that variation and social groups. The working hypothesis for this research is that Paleoindian social groups were highly correlated with a contiguous geographic space, which I call a territory and define in greater detail in the next section. The ethnographic evidence that supports this assumption is discussed below. For most of human prehistory and history, social and spatial territories were coextensive, and only with the advent of high mobility, do social and spatial territories no longer necessarily coincide. The social group of a modern American family may be spread across the county, and social groups may mix and inter-digitate geographically without losing their social identities. However, for this research we can be fairly certain, based on ethnographic analogy, that Paleoindian social and geographic territories were essentially coextensive, at least at the resolution that is possible from the archaeological record.

How, then, should territories look in the archaeological record? Based on the models of artifact discard, there should be a pattern of variable artifact density in a contiguous geographic space. Second, based on the model of design trajectory, we should see regional variation in artifact design, which becomes more pronounced through time. Assuming that the initial population shared the same cultural model and there was no convergence of variation, early assemblages should be less regionally differentiated than later assemblages. Further, we should expect these regional forms to be maintained through time despite intermarriage and migration among different groups. Figure 2.4 illustrates the expected divergence in assemblages through time.

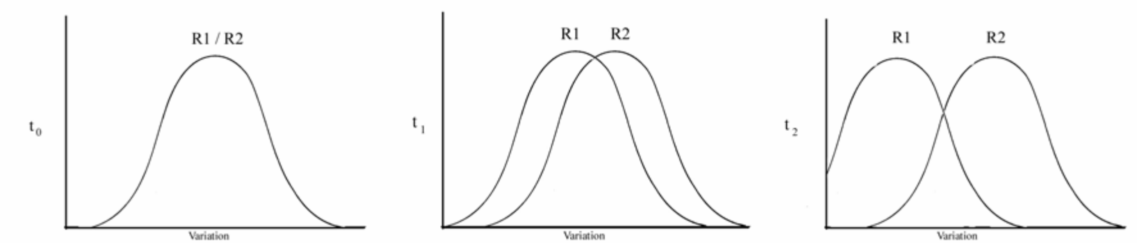

Figure 2.4: These graphs represent the expected divergence of variation of a cultural attribute or cultural repertoire over time in two regions (R1, R2). Initially (t_0), a single cultural group enters both regions and the variation is indistinguishable. At t_1 the groups settle into separate regions, and there is some differentiation, although it may not be detectable without a large sample. At t_2 the differentiation is more distinct and should be detectable.

This phenomenon of regional diversity through design trajectories and cultural inertia that cannot be explained as an adaptational response to different environmental conditions, a lack of knowledge, or "stylistic" choices has been documented in many ethnographies and ethnoarchaeological work. I will list just a few: differences in cattle raising and subsistence practices between the Nuer and Dinka (Evans-Pritchard 1940); microstyles in pottery for the Luo in western Kenya (Dietler and Herbich 1998), and Cameroon (Gosselain 1992, 1998); differences in arrow shape, house construction, skirt forms, and pig traps in New Guinea (Lemonnier 1986); and San arrowhead design (Wiessner 1983).

In the last section, I showed how collective style is used by people to determine group identity and that collective style is the behavioral repertoire of a group, although an individual's conception of collective style is derived from a limited sample of the possible behaviors. Thus, archaeologists interested in discerning social groups are justified in using methods that find norms and variations in a subset of material culture, despite the fact that they will never see all of the behavioral variation (Barth 1969). It is important to remember that any interpretation of collective style is approximate and will always benefit from additional data.

This only gets us half way towards our goal of discerning social territories. The question is where we should look for collective style. Several ethnoarchaeological studies have established that the distribution of material culture may be spread far from its point of origin, i.e., the locus of its cultural model (Gosselain 1998; Dietler and Herbich 1998; Hodder 1977). While the presence of artifacts from other locales may be part of the collective style of a group because its members like exotic pottery, there may be little correspondence between where the pot was made and where it was discarded. This conflates two different issues: who made the artifact and who used and discarded it. As explained below, for purposes of discerning collective style, we are only concerned with the second issue.

Clarke (1968:247) states that "an archaeological culture is a polythetic set of specific and comprehensive artifact-types which consistently recur together in assemblages within a limited geographic area." This succinctly describes collective style for societies that are somewhat constrained territorially, which is the way we envision Paleoindian societies, especially after Clovis times. Although Clarke (1968:330) cautions against the use of a technocomplex, which includes broad technical or subsistence categories like fishing or horticulture, in the polythetic approach because similarities in artifact form may result from a common adaptation to similar environments, such material would fall within the collective style of a group. Clarke's polythetic approach has been criticized, but I think it still has efficacy for sorting material culture variation.

IV. The Structure of Social Groups

In this section, I review the demography and territories of band-level social organizations to find approximate correlates for the social group. The purpose of this review is to estimate the likely spatial and population size of the social group so that I can estimate the likely geographical range of Paleoindian groups in Florida using population densities in the next chapter. Throughout this section, I will be using *territory* to mean the geographic expanse that a group uses. Casimir (1992:20) defined territoriality, which is the behavior that creates territory, as follows:

> Human territorial behaviour is a cognitive and behaviourally flexible system which aims at optimizing the individual's and hence often the group's access to temporally or permanently localized resources, which satisfy either basic and universal or culture-specific needs and wants, or both, while simultaneously minimizing the probability of conflicts over them.

This definition encompasses several themes: territory as a cognitive construction that derives from satisfaction of biological needs, flexibility, exclusivity, and access to basic resources. A territory results from the use of space for these purposes, and there is no need to have a territory independent of these purposes. This definition does not include a criterion of exclusivity, and I do not use the term to imply that a group necessarily desires to exclude others from its territory. Not all people recognize that they occupy a culturally-defined territory, but they all seem to understand that they will occupy a geographically constrained expanse (Binford 1983:33). I would add to this definition that once established, a territory can be a place where people build a relationship with the landscape, where their ancestors are buried and their descendants will live (Hitchcock and Bartram 1998:31).

Much of the theory on territory derives from ethnographies. The use of ethnographic analogy in archaeology has been criticized in several regards (Yellen 1977:chapter 1), which all concern the justification for inferring prehistoric behaviors from modern environmental and social conditions. One warranted concern stems from the unspoken assumption on the part of many theorists that modern hunter-gatherers represent a snapshot of prehistoric behavior rather than the latest incarnation in a continuum of change. These groups cannot be understood without at least acknowledging that powerful social forces can affect and have affected their behavior. Even without the effects of modernity, temporal change is a natural aspect of hunter-gatherer behavior, especially in the use of the landscape. For example, a !Kung band may only use the same waterhole location for 30 to 50 years (Lee 1972:129), and Nuniamiut groups move their annual ranges every nine years (Binford 1983). In addition, Yellen (1977:4-5) noted that prehistoric variability exceeds what we see in extant groups, and this must be due in part to the limited variety and marginal nature of the environments available to modern groups (Wobst 1978; Kelly 1995:341). Only a limited number of hunter-gatherer groups have been studied in any detail, which skews the sample from which we justify inferences about normative behaviors for them (Yellen 1977:5). For Paleoindian studies, the caution is further compounded by our uncertainty about environmental conditions at the end of the Pleistocene and the behavior of people in an unpopulated or marginally populated landscape. But as Yellen (1977:4) pointed out, there are not many alternatives to the use of these data, although we must use it judiciously.

The phenomenon of territoriality has received much attention from ethnographers and archaeologists, but in contrast to most of their efforts, I am interested in the social territory, which is where we would expect the social group to have regular opportunities to evaluate the most common cultural variants and the most successful individuals. Most ethnographers are interested in social and subsistence structures, so I must look into those data for information on the degree of social intercourse. I will focus on the dynamics of group interaction that create the broadest pool of likely cultural models. By “pool of likely models” I mean the people an individual would interact with on a regular or periodic basis to an extent that would allow the successful transmission of cultural models. I would anticipate that such interactions would have to last long enough so that difficult-to-replicate models could be perfected through practice and instruction.

It is readily accepted that hunter-gatherers fluctuate between periods of dispersion and aggregation, which are spurred by subsistence and social factors (Lee 1979; Kelly

1995). Aggregation, which increases social intercourse, would be the time when the pool of likely cultural models would be largest. People may aggregate seasonally when cooperation is needed to effectively harvest certain resources (Damas 1972; Bahuchet 1992), or on an annual or longer interval for ritual or social purposes (Lee 1979). The reasons and timing are variable, but the regular process of aggregation and dispersal appears universal. I am not assuming, and would find it unlikely, that efforts to increase the size of the pool of cultural models are ever a motivation for aggregation; it is likely simply an unintended consequence of people getting together.

A. Band Social and Territorial Structures

Ethnographic studies demonstrate wide variety in the social and territorial structures of hunter-gatherers, but they all can be conceptualized as a set of nested social relationships that are mapped in different geographical scales. These different scales of social relationships are defined differently by different researchers. For example, Wobst (1974) defined a nuclear family, minimum band, and maximum band; Helm (1968) described the task group, local band, and regional band; and Wiessner (1984) defined five levels for the San: nuclear family, band/camp, cluster/nexus, dialect group, and language group. Binford (1983) approached the issue slightly differently by defining the annual and lifetime geographical ranges of an individual rather than his social sphere, but these correspond to the geographical extent of the local/minimum/camp and regional/maximum/cluster/nexus bands, respectively. I will use the terms "local band" to describe the group an individual spends most of the year with and "regional band" to describe the aggregation of affiliated bands.

Like Binford's approach but focused on reproductive requirements, MacDonald and Hewlett (1999:511) conceptualized the geographical scale of local and regional bands in terms of individual movement for particular purposes, which helps translate the social dimension into a geographical dimension. Figure 2.5 depicts their idealized social and territorial structure of two regional bands. Micromovement corresponds to the local band's annual territory, which encompasses subsistence activities; mesomovement corresponds to the regional band's territory, which includes visits to friends and family; and macromovement likely corresponds to Wiessner's language group territory, which includes exploratory travel and would overlap with the ranges of unrelated or more distantly related groups. The intensity of use and social interaction decreases as the individual moves from the micromovement sphere. The social group includes the overlap of the mesomovement spheres. Cultural models could be acquired from people encountered in the macromovement sphere, but since this represents the lifetime range of an individual, the interaction will be infrequent at most. Nevertheless, even single encounters can provide the opportunity to acquire new models, and it is this phenomenon that facilitates the diffusion of models between unrelated or distantly related groups.

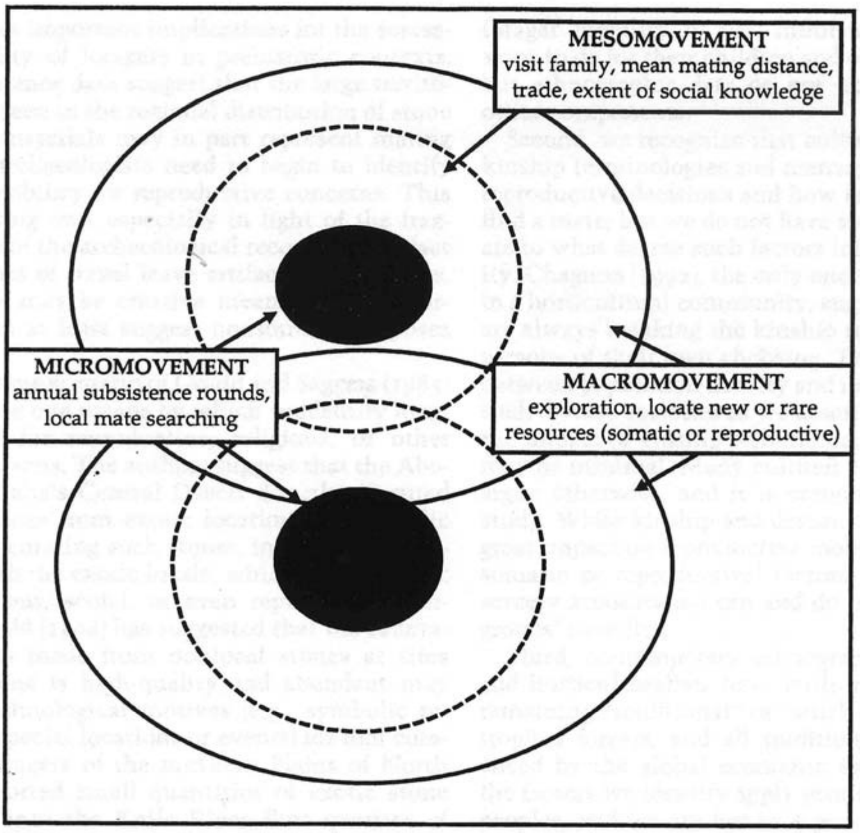

Figure 2.5: An idealized set of nested social and territorial spheres for two local bands (black ovals) in different regional bands. The mesomovement ovals represent the territorial spheres for regional bands to which the local bands belong. From MacDonald and Hewlett (1999:figure 10).

The absolute amount of interaction in any of these social territories varies considerably between cultures. Among Pygmies, yearly membership turnover in a band can be high as individuals come and go (Turnbull 1968), and !Kung band membership is so fluid that Yellen (1977) argued that the term band, in the sense of a cohesive unit, is not appropriate for the !Kung. !Kung nuclear families and individuals constantly visit other groups, and these "non-residents", which Lee (1979:table 3.1) called "Marginals," made up about 25 percent of the Dobe !Kung in his study area. In contrast, the !Xo, another San group, are much less gregarious (Barnard 1992).

The regional band, which is a loose interlocking network of local bands with spatial boundaries in which people share language, kinship, and culture (Barnard 1992:137), is usually less ephemeral than the local band. It corresponds to the identity of the "people" (Helm 1972), which we might think of as including everyone an individual would identify as belonging to his group, even though some of these regional band members rarely get together or never meet. It provides opportunities for trade (Lee 1979:366) and a pool of likely marriage partners (Dumas 1972:28; Binford 1983; Wiessner 1983).

Yearly and periodic aggregation seems typically to occur at the regional band level, and even highly territorial bands will meet with allied bands at regular intervals (Clastres 1972:165). This phenomenon is seen in many groups, such as the Dogrib with 12-20 conjugal pairs and dependents (Helm 1968:table 1); the Copper Eskimo with a winter aggregation of about 100 individuals (Damas 1968); the !Kung with winter camps of 100-200 individuals (Lee 1979:366); Pygmies with dry season cooperative net-hunting groups of 25 families (Bahuchet 1992); and Western Shoshone communal hunts with two dozen families (Steward 1970:231).

Cashdan's (1983) comparison of four San groups shows remarkable variety in how social relations and territories are structured, even in similar environments. On one extreme, the !Kung and Nharo have fluid group membership and liberal territorial exclusivity, whereas the !Ko have extensive band relations within a nexus but not outside of it. The G/wi have a more cohesive band structure than the !Kung, but make alliances throughout their region (Cashdan 1983:53). This is not meant to exhaust the possible configurations, but it belies generalizations about band interactions or predictions of group structure solely as an adaptation to different environments.

I emphasize that the geographic extent of regular social intercourse alone does not delimit the size of the pool of appropriate cultural models, and exposure to new models is no guarantee that they will be incorporated into the cultural repertoire. If this was the case, then we would expect to find homogenous stylistic variation throughout the territory of the regional band, but that is not what we find consistently. Yellen and Harpending (1972:251) noted that even with highly non-nucleated societies like the !Kung, there can be what they called micro-fragmentation in the variation of material culture over large expanses. In contrast, Wiessner's (1983) observation of the remarkable consistency of arrowheads throughout the !Kung region indicates that some material cultural variation will be seen between local bands, and some will not. The cultural rules for copying models are arbitrary and variable and not subject to firm prediction, and in prehistoric contexts, these rules can only be inferred from the spatial variation of the artifacts.

B. Size, Shape, and Demography of the Band Territory

Since territories result from a need for people to satisfy their basic requirements, they all contain essential resources including water, animal and plant food, and raw material sources, and secondary considerations like the availability of shelter and the opportunity to view game and strangers (Jochim 1976:49-50). They should be defined by stable resources, denser resources, and environmental productivity (Jochim 1981:168). The size and shape of a territory is constrained by cultural, ecological, and geographic factors, such as the number of local bands and the fecundity and availability of resources in the area. Foraging group size depends on the resource structure in the area, maximum encounter rates for resources, and whether the resources are aggregated or dispersed (Smith 1981:40). The upper limits on group size are correlated with the effective area the group can exploit (Smith 1977:47).

Although the geographic extent of any territory is highly variable, the population size of local and regional bands is more tightly constrained. Based on his estimates of the requirements for reproductive success in the Paleolithic period, Wobst (1974) estimated that the minimum band had at least 25 members. This magic number of 25 members for the minimum band is supported by ethnographic research, and models of fecundity, optimal foraging, and information theory (Kelly 1995:210). Wobst (1974:173, 169) estimated that the maximum band had at least 175-475 members consisting of 7-19 minimum bands, which is the number of members needed for the successful operation of the system. MacDonald and Hewlett's (1999:513) estimated that at least 600 individuals were needed for a viable marriage population. Binford (2001:table 8.01) compiled exhaustive data from a global sample of 339 hunter-gatherer groups for the sizes of local bands, which he characterized as most dispersed and most aggregated states, and what he called "periodic regional aggregations," which seem to roughly correspond to the regional band. Although there is wide variability, this ethnographic evidence agrees in large measure with the theoretical estimates.

In sum, if we assume that the pool of likely cultural models will be composed of people an individual will regularly and periodically encounter, then the regional band is an appropriate rough correlate for the social band. Although it is possible that cultural rules may restrict or widen the pool, the instances in which an individual may find models outside the regional band will be infrequently encountered and should not make up a significant percentage of the models the average individual encounters in a lifetime. We can infer that the pool of likely cultural models an individual will regularly and periodically encounter will be something less than the population of the regional band, if there are gender-based and age-based divisions of labor.

V. Variation in an Archaeological Assemblage

Variation is an inherent property of all artifact assemblages that results from multiple processes and has temporal and spatial dimensions. I have discussed already the processes of transmission, replication, and individual innovation, which include all the variation that is culturally acceptable. But these will not fully capture the variation in an archaeological assemblage. I am not concerned in this discussion with variability to individual artifacts resulting from post-depositional processes, reworking, or repair, or due to sampling errors. I am only interested in variability introduced by the individual when the artifact was completed initially.

Three additional sources of variation may also be present in an archaeological assemblage other than the variation introduced by the transmission and innovation processes: artifacts for which the cultural model was derived from outside the group (exotic artifacts), artifacts that fall outside the range of culturally acceptable variation, and fakes.

Exotic artifacts that were brought in from outside the territory of the social group or were made in the territory by someone who learned a different model elsewhere could end up in the archaeological assemblage. For example, if husbands live with their wives' social groups and they learned to make projectile points before they were married and maintained that practice after they moved, then we would find the husband's model distributed beyond its place of origin. If exotic artifacts are found in the context of the entire behavioral repertoire (i.e., the territory) and so long as outside groups were not discarding material in their neighbor's territory, which is an unlikely phenomenon except in modern times, then exotic artifacts are a legitimate component of collective style.

In any event, I do not anticipate that exotic artifacts will make up a significant percentage of my data. Gosselain's (1998:102-103) ethnographic study of potters in west central Africa sheds some light on this potential source of assemblage variation and indicates that social forces work to narrow the available cultural models and maintain material cultural distinctions between groups. He found that experienced potters did change some parts of the pot-making process when they entered a different village upon marriage, but these new methods were generally limited to practices performed in the open or in collaboration with others. In some areas, potters undergo intensive resocialization and are required to learn the local process in its entirety. The modification of manufacturing technique is not difficult since the basic techniques in the artifact design are already mastered. Gosselain (1998:103) concluded that these practices create microstyles that coincide with single or clustered extended family homesteads. A similar process was documented by Dietler and Herbich (1989) for the Luo in western Kenya, although this process is not universal (Gosselain 1992:582).

Read's (2006) criticism of imitation as the predominant vehicle for cultural transmission discussed earlier raises an issue that should be addressed. Read (2006:147) proposed that models from outside the social group could be introduced through verbal instruction rather than modeling. Problems with Read's assumptions about the learning process were discussed earlier, but the effect of such a process would be negligible in the archaeological assemblage. Assuming the new model was made by every naïve learner, it would only make a difference if the model made "sense" (Bourdieu 1977) and was incorporated into the cultural repertoire. If it was incorporated, then it would simply become one of the models in the cultural repertoire. If it was not incorporated then the artifacts would be few in number and end up as outliers.

Artifacts that fall outside the range of acceptable variation would include failed attempts to replicate the model and artifacts that would not be recognized by the social group as acceptable. For example, unacceptable tools would be discarded (or converted into other things) and could still show up in the archaeological assemblage. Both exotic artifacts and replication failures would not be expected to be transmitted as new cultural models and thus not added to the cultural repertoire. As such, I would expect these to be rare, and they would likely be outliers in a statistical distribution. This introduces the issue of the bounds of social acceptability, which I call the social tolerance for variation. Social tolerance will be present in the *habitus* and the group's collective style. It is also related to what Read (1982, 1989) called functional tolerance, which he saw as a narrower range of variation compelled by the proper functioning of a tool. However, the functional and social tolerances will be coextensive, since tools that do not work well would be socially unacceptable. Further, we have already seen how functional distinctions are problematic, and stylistic behaviors like ritual dance steps or incantations may have much tighter acceptable tolerances than a stone tool.

The problem with fakes is discussed in Chapter 4, and some may be included in my data. However, they should only cause a significant problem if they are numerous and do not fall within the actual range of variation for an artifact, i.e., they are poor attempts at replication of a cultural model. If they fall within the range of variation, then I would expect them to affect α but not β (Figure 2.1). If they fall outside β, then they should register as statistical outliers.

Figure 2.6 shows the expected distribution of variation in the archaeological assemblage. Earlier, I cited Henrich (2002) for the description of β in Figure 2.1 as some measure of the difficulty of replicating the cultural model; if β is large, then the model is difficult to make. However, β more accurately represents the amount of socially acceptable variation, whether or not the model is easy or difficult to make. More artifact variation could simply reflect more cultural flexibility rather than greater difficulty in manufacture (Conkey 1989:123) or flexibility in one or more of the steps in the *chaîne opératoire*. Again, I use the Gumbel probability distribution in Figure 2.6 for the same reasons articulated above for Figure 2.1. The amount of variation in an archaeological assemblage (β') represents the variation due to transmission, replication, individual innovation, culturally unacceptable rejects, exotic artifacts, and fakes. Because rejects will be rare and should be identified as statistical outliers, β' is an acceptable approximate of β so long as the assemblage is an appropriate sample, there is little post-depositional damage, and exotic artifacts and fakes do not comprise a significant percentage of the assemblage. In many and perhaps most cases, exotic artifacts and fakes will also appear as outliers or may be identified as a distribution that is distinct from the non-exotic artifacts. Thus, it is reasonable to assume that the archaeological assemblage will approximate the amount of culturally acceptable variation in the expression of the model, which means that it is an appropriate approximation of the collective style of the group.

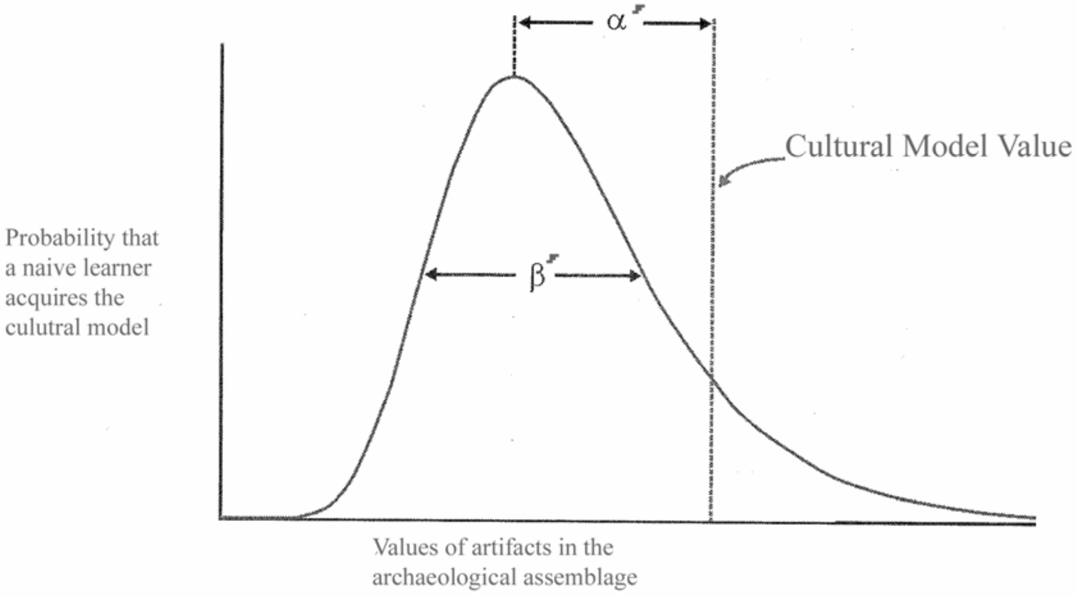

Figure 2.6: This illustrates the distribution of artifacts in the archaeological assemblage including artifacts that fall outside the socially acceptable tolerances, exotic artifacts, and fakes. α'and β' may be different than α and β in Figure 2.1.

In this view, it should be possible to objectively differentiate groups by listing their entire cultural repertoires. Clarke's (1968:247) polythetic approach to identifying cultural groups captures this idea. He proposed that archaeological cultures are polythetic collections of normative types (artifacts, settlement patterns, subsistence adaptations, etc.), and could be identified as a "polythetic set of specific and comprehensive artifact-type categories, which consistently recur together within a limited geographical area." As discussed above, normative types could be derived from the model expressions, which would represent an approximation of shared cultural models.

Clarke's polythetic approach has been criticized because it defines a cultural group as the sum of its cultural traits. Shennan (1989) argued that there are no archaeological cultures, only distributions of artifacts that we label as one culture or another, and Jones (1997) made the same criticism for the temporal division of archaeological cultures. Wiessner (1983) and Hodder (1990) objected to Clarke's failure to consider that individuals establish their group membership through active choices. However, as I hope I have established, the polythetic approach best mirrors the process that individual participants use to define social groups, and comes as close to capturing this emic process as possible for an observer (the archaeologist) who doesn't speak the language, lives in a different time, conceptualizes the world in a different way, and works mostly with discarded inorganic objects.

VI. Summary

Before I can settle on a methodology, which is discussed in Chapter 5, it is worth summarizing some of the main points of this chapter.

1. People organize themselves into groups. One of these group configurations is what I call a social group from which an individual is likely to draw most of her cultural models. In many situations (perhaps most) the members of the social group will share cultural mores and language and are likely related by marriage or blood.
2. The social group occupies a geographic territory of unknown dimension, although it probably contains the basic resources: plant and animal foods, potable water, and raw materials for making things.
3. The social group discards artifacts within this territory. It is likely that the density of artifacts is positively correlated with the intensity of use and a distance-decay pattern would be present expanding out from one or more settlement loci. Single artifact types with limited functions would have more limited distribution that may not coincide with the discard pattern of the entire artifact repertoire.

4. Over time regionally restricted social groups can develop distinctive styles of behavior, including artifact styles. Regional differences could be ameliorated with the introduction of new people and cultural models, but psychological propensities and the cultural learning and innovation processes will lead to the development and maintenance of regional variations.

5. Regional variation will increase over time and will be most apparent in the behavioral repertoire of the social group, although individual artifacts should also display regional variation.

6. Artifacts created by members of a social group through social learning and individual innovation will vary around a mode that may or may not be equal to the average value of that artifact. The variation is no more than the extent of socially acceptable tolerance for the artifact.

7. The behavioral repertoire constitutes the collective style of the social group. Members and non-members use a subset of the behavioral repertoire to evaluate group membership. The assessment of that subset entails the derivation of a norm and an acceptable spread of variation.

8. The archaeological assemblage will contain a subset of the variation created by members of the social group, rejects that are socially unacceptable, exotic artifacts, and fakes. Rejects should be a minimal component of the assemblage. Exotic artifacts and fakes may or may not be a minimal component.

9. The archaeological assemblage is a subset of the behavioral repertoire and is an acceptable measure of the collective style of the social group.

CHAPTER 3

SOCIAL AND PHYSICAL SETTING

In Chapter 2, I reviewed the theoretical bases for social territories and justified the ways that archaeologists can find them through analysis of material culture. Although I discussed the relationship between the social group, collective style, and territory, it is still not clear how the social group is constituted, other than it is made up of people who share cultural models, and how that would be apparent in my data. My goal in this chapter is to map social groups' territories on Florida's Paleoindian landscape, and to do that I must predict their size and location and understand the physical setting in which they lived.

In order to explore how Paleoindian social groups may have been constituted, I review models of Paleoindian colonization of North America and models of their social structures and territories with an emphasis on the data and models from Florida. Florida-based models more or less turn on how anchored Paleoindians were to reliable sources of surface water. To test that aspect of these models, I propose a reconstruction of surface water availability in Florida during the Paleoindian period that is based on the particulars of Florida's modern hydrodynamics, and proxy data that informs questions of water levels and climate during that period. I then rate the likelihood of reliable surface water in the Study Area. Finally, in the last section I plot the location of all of the artifacts in my database and compare those to the predictions of reliable surface water. These data show a high correlation between the prediction and the artifact locations, which indicates a high degree of tethering to reliable water sources. They also indicate the distribution is less likely the results of collector bias. Based upon some assumptions of population density and group size, I make some calculations of the size of Paleoindian social groups in Florida and plot those on a map of the Study Area. Finally, based on the artifact distribution and water sources, I divide the Study Area into six, five, or three regions that I use in some of the analyses in latter chapters.

I. Models of Paleoindian Colonization and Settlement Systems

In this section I explore the size and territories of Paleoindian social groups using the ethnographic data reviewed in the previous chapter and models of Paleoindian social systems and territories. No consensus has been reached on the initial entry into North

America (e.g., Strauss et al. 2006; Bradley and Stanford 2004) or the way that Paleoindians spread throughout and colonized North America (Anderson and Sassaman 1996), but the colonization process is important for understanding the next phase of Paleoindian occupation of the continent: settling into the landscape and the development of regional traditions. If the phenomenon of cultural inertia described in Chapter 2 is real, then we would expect the descendants of the Clovis colonizers to maintain their ancestor's social and territorial structures, at least in some form for some time.

Benton (1991) proposed two colonization strategies for entering an empty landscape that are linked to demographics, subsistence strategy, and resource exploitation: transient explorers and estate settlers. Transient explorers are very small groups that bud off from larger groups and travel great distances while maintaining minimal contact with other people. In contrast, estate settlers move incrementally into new territory by breaking off in larger groups, traveling shorter distances before settling down, and maintaining stronger social ties than transient explorers. Benton's formulation captured three of the standard models for the colonization of North America: free-wandering, highly-mobile Paleoindian hunters who moved quickly across the landscape (Kelly and Todd 1988), staging areas from which smaller bands of Paleoindians scouted resources before moving into new areas (Dincauze 1993b), and incremental expansion as population increased and bands splintered and moved into new areas (Anderson 1996).

All of these models assume that Clovis people were the first to enter North America, at least in significant numbers, although evidence is mounting that challenges this assumption (Anderson 2004). Regardless, the Clovis phenomenon rather suddenly appears throughout North America (Feidel 1999; but see Meltzer 2002 for a different view), and given the description of cultural transmission described in Chapter 2, diffusion through an existing population seems an unlikely mechanism for the spread of Clovis culture. At least one option other than the three standard models seems possible: Clovis predecessors were coastal dwellers who made impermanent forays into the interior of the continent, and it took a major impetus, such as dramatic sea-level rise (Balsillie and Donoghue 2004), to drive coastal dwellers up the river valleys and into the continental interior. In any event, the evidence is conflicting on this issue, and none of the models is completely satisfying. I will review the evidence for a pre-Clovis presence in Florida in the next section and will assume that North America was either empty of people or that there was a low-density indigenous population when Clovis people arrived, and any indigenous population made no significant or lasting effect on the cultural repertoire of Clovis people, at least to the degree that we can discern at this time.

Regardless of the presence of a pre-Clovis population, the appearance of Clovis presents problems that are not easy to resolve. In a seminal article, Kelly and Todd (1988) tried to reconcile several of these, such as the apparently rapid occupation of the continent, use of high quality stone and bifaces, and behavioral consistency among the artifacts and sites, and hypothesized that Paleoindians, driven by "regionally abundant but locally unpredictable" food resources (Kelly and Todd 1988:235), became high technology foragers who moved quickly across the unpopulated landscape and colonized the continent. Paleoindians were not territorial or "place oriented;" rather they were "technology oriented," staying in one place only a few years at most before moving on. This hypothesis has been largely rejected, especially for the colonization of the eastern half of the continent.

Anderson (1990:185-189; 1996:50-51) proposed that Paleoindians moved into the East along river valleys where they encountered lush ecosystems with abundant resources that fostered a shift to generalist subsistence practices and fostered population growth. Based upon the density of points and sites, the middle Tennessee Valley appears to be a place where they stopped and stayed awhile. From these "staging areas", they spread along river valleys and coastal plains until the entire eastern half of un-glaciated North America was occupied. As increasing population heightened social tensions within bands, new bands would fission off and move on into unoccupied areas. Central to this model is the need for regular contact with other people to maintain information conduits, social ties, and mating networks (Anderson 1996:39; Anderson and Hansen 1988). Anderson and Gillam (2000) refined this model by employing a least-cost pathways model and looking at two different colonizing logics: "string of pearls," in which new groups bud off from parent groups and incrementally move to new areas, and "leap frog," in which the new groups move much further from the parent group while still maintaining contact. Although the leap-frog logic is risky (Moore and Mosely 2001), it explains the apparent preference for specific settings for Paleoindian sites (Tankersley 1990) and the rapid colonization of the continents. Recent reappraisals of the radiocarbon and calibrated records of the Paleoindian period indicate that the Clovis presence in the interior of the continent lasted from about 200 – 400 calendar years, depending on whether the Aubrey site in Texas is accurately dated (Fiedel 1999, 2004). Anderson and Gillam (2000) showed that given some reasonable assumptions, Paleoindians should have been able to populate North America, at least the areas in which we find their artifacts, within such a time period.

Dincauze (1993a:54-55, 1993b) tried to explain phenomena specific to the East, such as the widely-spaced large sites that contained the earliest point styles for the region, the presence of lithic material from distant sources, and artifact styles that displayed low variability. Building on Anderson's (1990) conception of staging areas, she also proposed that once Paleoindians reached the Mississippi River from the west, they traveled up its eastern tributaries, such as the Ohio, Tennessee, and Cumberland Rivers. Because they did not know the areas, Paleoindians would settle in a single location while more adventurous members would "gear up" before setting off to investigate the surrounding hinterlands, although it is not clear what they would be looking for and why. She proposed that large Eastern sites such as Bull Brook in Massachusetts and Shoop in Pennsylvania were examples of these staging areas.

A. Theories of Paleoindian Settlement Systems

The colonization models described above are not wholly inconsistent and could accurately describe different parts of the colonization process, but because there are no historical or ethnographic analogs, the models are difficult to evaluate. If Clovis people were "free-wandering" hunters of large mammals (Storck 1991), then the impetus to stop at any particular place is unclear and would require a dramatic change in subsistence and settlement behaviors. On the other hand, if the initial colonization was a process of splintering bands expanding into new areas, then the social processes inferred for post-Clovis Paleoindians would simply be a continuation of behaviors, albeit with some modifications since the landscape was no longer empty. Thus, the social behaviors of Clovis colonizers can provide some bases for interpreting data on social and territorial structures for later Paleoindians. While it is possible that Clovis people could have had the inclination to act as Kelly and Todd and Dincauze proposed, Anderson's model shows continuity of cultural behavior through the Paleoindian period, and his emphasis on the constraints created by the need to maintain reproductive viability has support in the behavior of extant hunter-gatherers.

There is some dispute about whether Clovis people had already embarked on a process of regionalization. On the one extreme, Kelly and Todd (1988:235) posited that mobile early Paleoindians did not stop long enough to establish territories or develop regional traditions, and Meltzer (2002:36) argued that strong territoriality for Clovis would have been a disadvantage in a patchy and unpredictable environment, because "natural selection *would favor rapid and extensive exploration* to see what's over the next hill. Under the circumstances we would *expect* rapid dispersal" (emphasis in the original). Meltzer (1989:11) cited the lack of stylistic variability as evidence that initially Paleoindians were not territorial, but this lack of variability has not been demonstrated in a systematic way and is disputed. Several varieties of fluted points were found at the Naco site (Haynes 1982:386), Blackwater Draw (Hayden 1982:118), and in the Williamson assemblage from Virginia (Callahan 1979:23) that may represent distinct design trajectories from different social groups.

In contrast, a process of colonization like that proposed by Anderson would mean that people arrived in a new area with a cultural model of personal and group interaction intact, including what should be done when an area gets crowded or interpersonal tensions get high. If we envision colonization as a process of splintering bands and the freedom to move almost anywhere else (i.e., there was no reason to stop at a less than ideal location) so long as it was not too far to maintain social ties, then we should see the relatively rapid development of regional styles as relatively isolated individuals drew from a limited pool of cultural models. Thus, the regional territories that appear after Clovis and have been posited as adaptational responses to environmental and subsistence changes, may simply be the result of widely separated populations developing their own design trajectories (Fitting 1977).

Regardless of whether Paleoindians had an inherent drive to explore new territory or simply continued to grow in number, splinter, and move, at some point Clovis people stopped moving and began to settle into the landscape and establish regular regions of exploitation, which we infer from the development of new artifact styles, principally projectile points, use of local resources, especially lithic resources, and the differential geographic concentrations of artifacts (Anderson 1995, 1996).

Several different models have been proposed to explain post-Clovis Paleoindian settlement systems (Anderson and Sassaman 1996). Most of them emphasize the exploitation of one or more resources, such as lithic raw material (Gardner 1983), caribou (Spiess and Wilson 1989; Stork 1986), water (Neill 1964; Daniel and Wisenbaker 1989), or a combination of several resources (Curran and Grimes 1989), but regardless of the resource focus, the actual shape of the territory would result from the structure of the environment, the subsistence strategy, and local distribution of resources (Spiess and Wilson 1989; Curran and Grimes 1989). Even so, it is difficult to find consensus on territorial size and shape among researchers. For example, while it is generally assumed that Paleoindians relied principally on caribou for subsistence in the Northeast and followed their migrations (Meltzer 1989), Custer and Stewart (1990:figure 9) hypothesize large territories that were hundreds of kilometers in diameter, while Curran and Grimes (1989) proposed smaller territories in which Paleoindians followed caribou herds along water courses as they migrated seasonally from the coast to the mountains. Similarly, Anderson and Hansen (1988) proposed a series of linear Early Archaic territories along the southern Atlantic coast, while Daniel (2001) proposed two large circular territories for the same region and time period.

The presence of non-local lithic tool material in a region has been used to estimate the size and shape of Paleoindian territories (e.g., Gramly 1988; Custer and Stewart 1990), but it is difficult to determine whether or not the material was traded in or directly acquired (Meltzer 1989; Tankersley 1990:270). In both of the examples in the previous paragraph, the researchers who focused primarily on lithic distribution ended up with the larger territories, which indicates that we may not have a firm understanding of the relationship of regional lithic distribution and band social interaction, and it is possible that several bands could have shared the same resource (Smith 1990:242). Wiessner (1983) indicated that goods can pass through many hands and travel great distances in band societies, and MacDonald (1997) hypothesized that with lower population density, Paleoindians would have travelled longer distances to obtain mates and maintain social ties, which could lead to the distribution patterns we see for raw material in lithic artifacts.

More precise territorial reconstructions require multiple kinds of data, like multiple site types, and this has been possible only in a few regions, such as southeastern Virginia where McAvoy (1992) was able to link quarries, base camps, hunting camps, and isolated projectile points in a reconstruction of oval-shaped territorial ranges of micro-bands that were approximately 80-100 km (50-60 miles) by 50-65 km (30-40 miles) in size.

In contrast to researchers who rely mainly on artifacts and lithic sources to reconstruct territories, Anderson (1995, 1996) proposed that the maintenance of a sufficient pool of mates was at least as important as resource exploitation in configuring Paleoindian settlement systems. He envisioned that Paleoindians employed different interaction strategies as their environment changed during the end of the Pleistocene (Anderson 1995:table 1.1), but at all times Paleoindian bands periodically aggregated at particular locations for the purpose of exchanging information and mates. Through time, this interaction became more restricted to regional and sub-regional culture areas, although occasional meetings between sub-regions occurred. Anderson's model addresses a fundamental constraint on human movement and distribution, which has not been adequately considered in the other settlement models (e.g., Hayden 1982:118; Kelly and Todd 1988), and also describes a process through which cultural models could be shared among regional band members.

II. Paleoindians in Florida

Compared to the rest of Eastern North America, Florida's Paleoindian record, which includes both lithic and organic artifacts (Dunbar 1991; Dunbar and Webb 1996) but not many reported sites, is spotty. Most of the evidence for the Pleistocene presence of humans in Florida is inferred from individual, out-of-context artifacts, which have been reported from many locations in Florida, most often from submerged contexts (Goodyear and Warren 1972; Bullen 1969; Dunbar 1991; Dunbar and Webb 1996; Thulman 2006) and by amateur collectors (Waller 1969; Means and Means 2004; Knight 2004). The paucity of sites appears to be a function of site preservation and site formation processes in which early sites are deeply covered with eolian sands (e.g., Neill

1958), eroded and deflated in river bottoms (Thulman 2006), or perhaps inundated offshore (Faught 2004).

Only a handful of reliable radiocarbon dates have been obtained in Florida that date to the Paleoindian period. An ivory tool from Sloth Hole in the Aucilla River has been dated to 11,050 ± 50 B.P. (Hemmings 2004), a bison humerus that appears to be associated with a bison skull in the Wacissa River was dated at 11,170 ± 130 B.P. (Webb et al. 1983), and the human burial at Warm Mineral Springs that may be associated with Late Paleoindian Greenbriar projectile points was dated at 10,310 ± 130 B.P. (Cockrell and Murphy 1978). Other purported Paleoindian-age dates are problematic. An early radiocarbon date on a "spear" found protruding from a *Geochelone* sp. carapace at Little Salt Springs is problematic since the date on the tortoise was significantly younger than the spear, and the spear may have been simply a stick that fortuitously fell into the carapace. One radiocarbon date on freshwater shell that was in association with megafaunal remains and a Paleoindian point from the Darby and Hornsby springs site was dated at 9,880 ± 270 B.P. (Dolan and Allen 1961), which puts it in the Early Archaic period. Several dates on Early Archaic Bolen sites have been dated at ca. 10,000 B.P. (Hornum et al. 1995; Dunbar et al. 1988; Tesar and Jones 2004), and this seems like a reasonable date to end the Paleoindian period in Florida.

The Vero Beach and Melbourne sites in Florida were some of the earliest reported Paleoindian sites in North America (Sellards 1940). Both were purported to contain human skeletal material and artifacts in association with Pleistocene fauna, and although they were dismissed as intrusive by Aleš Hrdlička at the time, it is unclear now whether they were Paleoindians (Griffin 1952; Milanich 1994). Subsequently, ivory artifacts and lanceolate points that resembled early forms from the West were found in the Ichetucknee River and other locales in Central Florida (Jenks and Simpson 1941; Simpson 1948; Goggin 1950). In the late 1940's and early 1950's, William Edwards (1954) excavated the Helen Blazes site (8BR27) near the headwaters of the St. Johns River. Ten projectile points were found, several of which had concave bases, lanceolate shape, and basal grinding; none was fluted, but the only record of these artifacts is a poor reproduction in his dissertation (Edwards 1954:figure 17). The outlines of the points appear to be Suwannee, Dalton, Greenbriar, and stemmed Archaic types. They were excavated from the same stratigraphic deposits as the Melbourne and Vero material, although the relative position of the Paleoindian and Early Archaic points indicates they may have been in a mixed context (Edwards 1954:table 2).

One large and three small Paleoindian sites with potential stratigraphic integrity have been professionally excavated. Harney Flats (8HI507), located 5 km east of Temple Terrace in Hillsborough County, is the most significant Paleoindian site in Florida (Daniel and Wisenbaker 1987). It was excavated in 1978 during the construction of Interstate 75, and an extensive use-wear analysis was performed on many of the lithic tools (Ballo 1985). Several activity and living areas were identified, but the 17 Suwannee/Simpson and 12 Bolen bifaces could not be stratigraphically separated, which may represent different occupations with little deposition (Daniel and Wisenbaker 1987:38) or simultaneous occupation of the site by people who made both Bolen and Suwannee/Simpson points. Using models of technological organization, Daniel and Wisenbaker (1987:164) proposed that Harney Flats was a residential base camp.

A large biface purported to be a Simpson preform was excavated at the Wakulla Springs Lodge site (Tesar and Jones 2004). This likely Paleoindian tool was found below the Bolen level along with other artifacts that appear to be Paleoindian in age. The Ryan-Harley site in the Wacissa River appears to be a Suwannee-age campsite. Along with lithic tools, the site produced extinct and extant fauna (Dunbar and Vojnovski 2006). Both of these promising sites await further excavation.

Wilfred T. Neill (1958) first excavated the Paradise Park site, adjacent to Silver Springs in Ocala, in the early 1950's, and Hemmings (1975) reexamined it in the 1970's. The site was discovered when several Paleoindian points were brought to Neill's attention during the digging of a borrow pit. Artifacts were found throughout the upper 8.5 feet (2.5 m) of the sand (Hemmings 1975:145-146) and were located in "living floors," which were separated by culturally sterile, or relatively sterile, sand. Like the artifacts from Helen Blazes, the Paradise Park points cannot be located.

The remaining reported Paleoindian sites in Florida are from what appear to be either mixed contexts or ephemeral occupations, or both. The Darby and Hornsby Springs (AL124) sites near the town of High Springs on the Santa Fe River were also excavated in the early 1950's by Edwards and Clarence Simpson (Dolan 1959; Dolan and

Allen 1961). Significant parts of the sites had been bulldozed prior to excavation, although lithic artifacts, including three Paleoindian points, and Pleistocene faunal remains were recovered from some of the many from solution holes in the bedrock limestone. The multi-component Bolen Bluff site (Goggin 1950; Bullen 1958), located on the south side of Paynes Prairie, contained Suwannee and Early Archaic Bolen and Arredondo points, but none of the Suwannee points was found in context. The multi-component Johnson Sand Pit site (8LE73) was discovered and eventually destroyed by a commercial sand mining operation on the edge of the Cody Scarp west of Tallahassee (Tesar 1994). Three Simpson and two "Greenbrier Dalton-like" points were recovered but no Suwannee points were found. The Colorado Site (8HE241) in Hernando County is multi-component lithic workshop with a likely Paleoindian/Early Archaic component but no diagnostic projectile points (Horvath 2000).

The Nalcrest site (Bullen and Beilman 1973) on the edge of Lake Weohyakapka in Polk County is usually included as a Paleoindian site, but the collection of artifacts makes it apparently unique in the state. The multi-component site consists of two collection locations along the bank and extending out 30 m (100 feet) into the lake to a depth of approximately one meter (3-4 feet) (Bullen and Beilman 1973:1); no controlled excavation was done. Four "Clovis-like" fragments, one Suwannee, two Beaver Lake, and four "Dalton-like" points were collected, but the illustrations are too small to determine whether these are accurate descriptions (Bullen and Beilman 1973:table 1, figures 3-4). The bulk of the artifacts are small lithics like those recovered at the Dalton-age Brand site in Arkansas (Goodyear 1974), and it is mainly on this basis that the site is attributed to the Paleoindian period.

Many underwater Paleoindian sites have been identified (Dunbar 1991), in both freshwater and saltwater (Faught and Donoghue 1997), and several have been excavated. In Southwest Florida, human remains were recovered from Warm Mineral and Little Salt Springs (Cockrell and Murphy 1978; Clausen et al. 1975; Clausen et al. 1979), but only a portion of these sites were professionally excavated, and some questions remain about the whether the human skeletal material was interred (Clausen et al. 1975:207; Daniel and Wisenbaker 1987:147). The Aucilla and Wacissa Rivers have produced several important submerged Paleoindian sites, in addition to the Ryan-Harley and Axelon bison sites. The Page-Ladson site (Dunbar et al. 1988), Little River Rise (Willis 1988), and Sloth Hole (Hemmings 1999) on the Aucilla River produced Paleoindian material in deflated, multi-component contexts. Several underwater sites may be megafaunal kill sites (e.g., Palmer et al. 1981; Serbousek 1983; Dunbar and Waller 1983). Although some of these are problematic, such as the possible mammoth kill site in the Silver River near Ocala (Rayl 1974; Hoffman 1983), the evidence of human modification of megafauna bone in Florida is uncontroversial (Dunbar and Webb 1996; Hemmings 2004).

Several sites in Florida have been proposed as potential pre-Clovis candidates: Little Salt Springs (Clausen et al. 1979), Page-Ladson (Dunbar et al. 1988; Dunbar 2005), and the Wakulla Springs Lodge site (Dunbar 2005). The problems with the radiocarbon dates and purported artifact at Little Salt Springs have already been discussed. Page-Ladson is not so easily dismissed, however, and Dunbar (2005) presented a convincing argument that real artifacts in the same level as a cut mastodon tusk are likely pre-Clovis in age. Dunbar (2005) has proposed a new chronology that presents Simpson points as a pre-Clovis knife and other unfluted lanceolates like those found at the Wakulla Springs Lodge site as pre-Clovis points, but this is mainly a typological argument and awaits either radiocarbon dates or an unambiguous stratigraphic sequence.

Florida Paleoindian Settlement Models

Several models have been advanced to explain the distribution of Paleoindian artifacts and sites in Florida. Models developed for other parts of the Southeast are not directly transferable to peninsular Florida because it appears to have had significantly different climatologic and hydrologic regimens, flora, and geomorphology during the end of the Pleistocene, which are discussed in the next section. Settlement models for Florida are hampered by the lack of sites with stratigraphic integrity and must account for what appears to be many small sites concentrated along water courses (Milanich and Fairbanks 1980:38).

Neill (1964) noted the association of Suwannee points with Pleistocene fauna and springs and streambeds and proposed that Paleoindians, like other large Pleistocene mammals, were tied to widely distributed water holes in the arid savannas of Florida. Dunbar (1991:197) proposed that because sites in Florida are concentrated in specific physiographic zones in the tertiary karst areas, “A semi-sedentary Paleoindian lifeway may have existed in Florida, with prolonged occupations around karst rivers and karstified lowlands, and less frequent periods of high hunter-gatherer mobility.” This Oasis Model is an extension of Neill’s insight and proposes that in times of aridity or climate volatility, people will be drawn to and return to locations with dependable water. Because people and many animals cannot travel far without water resources, these water areas would be the foci of human occupation and food procurement. In an environment of limited water, one would expect occupation sites to be located near water sources and logistical camps in outlying areas.

A competing model proposes that Paleoindian points in Florida are associated with food and lithic resources, which reflect a pattern of high mobility and consecutive resource exploitation. Dunbar and Waller (1983) and Dunbar (1991) plotted the distribution of Paleoindian artifacts in Florida and found they coincided neatly with the distribution of areas where karst, which is the local source of raw material for chipped stone tools in Florida, is at or near the surface. Waller (1970), an avocational archaeologist who collected hundreds of artifacts from Florida’s rivers, noted the concentration of Paleoindian points at shallow areas in rivers and in association with the bones of extinct fauna and proposed that these associations were best explained as occurring at times of high water when animals were restricted to a limited number of safe river crossings.

Only one specific model of Paleoindian settlement systems has been proposed for Florida. Daniel and Wisenbaker (1987:chapter 9) reasoned that the Paleoindians who occupied Harney Flats may not have wandered far from their home territory, which contrasts with other areas in the East, especially the Northeast. Their territories may have been oriented east to west along river drainages in Central Florida, including now-drowned watercourses in Tampa Bay (Daniel 1985). They used local cherts (no exotic material was found), which may indicate regional isolation, although Goodyear et al. (1983) believed the lack of exotic cherts in the Tampa Bay area may be a sampling issue.

III. The Availability of Freshwater in Florida during the Paleoindian Period

The Florida models predict that Paleoindians were tied to water resources, and in this section I explore that presumption by estimating the location of surface water resources in the terminal Pleistocene period. Today, a significant percentage of Florida is covered by surface water, but 12,000 years ago Florida was significantly more arid, although the effects of this aridity on potable water availability and the ecosystems are only generally understood. Florida's Paleoindians could have had access to freshwater from springs, lakes, and rivers. A fourth option – hand-dug wells – is not considered here. Although, evidence for Paleoindian-age wells has been found at Blackwater Draw (Haynes et al. 1999), no evidence for wells from this period has been found in Florida.

In order to assess whether Florida's Paleoindians were constrained in their movements by the availability of freshwater, I review in some detail Florida's modern hydrology and its response to drought conditions and over-pumping of groundwater, which are analogs for episodes of lower precipitation and depressed aquifer levels. I then review proxy data for climate and groundwater levels in the Paleoindian period in Florida and reconstruct the water levels in the Study Area. Essential to this reconstruction is the assumption that the geologic structures that control groundwater movement are essentially the same today as they were during the Paleoindian period.

A. Florida's Hydrology

Florida's hydrology can be visualized as a system that cycles water through the atmosphere, sea, and land. All Florida's surface fresh waters are ultimately derived from precipitation, most of which falls in Florida, but some of which falls in Alabama and Georgia (Miller 1997). Once on the ground, water enters the groundwater aquifers through percolation or direct discharge, reenters the atmosphere through evapotranspiration, or runs off to surface waters or the sea. Once it enters the groundwater, it may pass through different aquifers, or seep into surface waters or discharge through springs by artesian pressure (Fernald and Purdum 1998; Miller 1997).

The major influence on Florida's hydrology is its mantled karst platform geology, which is overlain in most places by heterogeneous deposits of sand and clay of varying thickness and permeability (Tihansky and Knochenmus 2001; Lee 2002:1). Karst is created by the action of weakly acidic rainwater and groundwater on sub-aerially exposed rock (Kindinger 1999:306; Lane 1986:12; Hyatt and Gilbert 2004); more permeable deposits allow more chemically aggressive water to reach the carbonates, which accelerates karstification. The heterogeneous distribution of clays in the surficial deposits leads to differential dissolution of the underlying carbonates and creates a patchwork of tight, porous, and open karst (Werner 2000:39).

Aquifers. The typical hydrologic units in Florida in order of descending depth are the surficial, intermediate, and Floridan aquifer systems, although not all are necessarily present at every location, and each may be further divided into subunits (Southeastern Geological Survey 1986). Unconfined groundwater that responds to atmospheric pressure is under non-artesian conditions, whereas confined groundwater that has a pressure greater than the atmosphere and a potentiometric surface that will rise above the water table is under artesian pressure (Wetterhall 1965:7).

In peninsular Florida, the surficial aquifer system (SAS), which is typically unconfined and non-artesian, is ubiquitous except where the Floridan aquifer system (FAS) is unconfined (Miller 1986; Sepúlveda 2002:6). Its presence depends on the existence of an underlying impermeable or semi-impermeable layer, which typically is the Hawthorn Formation in Florida, that retards the movement of water between the SAS and FAS (Miller 1986:43). Where present, the Hawthorn formation contains either an intermediate aquifer or intermediate confining layer depending on its relative permeability. It is typically perforated with karst features, such as sinkholes, that provide direct access from the land surface to the underlying FAS. The intermediate aquifer system is generally absent from the Study Area (Sepúlveda 2002:6).

The SAS is most dependent on rainfall, or more precisely, on effective moisture, which is the difference between precipitation and evapotranspiration, and it exerts the greatest influence on the water levels in most lakes and wetlands. It is typically non-artesian and responds quickly to rainfall, evapotranspiration, and the influence of streams and rivers (Miller 1986). In most places, the SAS recharges the FAS through percolation unless the potentiometric surface of the FAS is above the SAS, in which case the FAS discharges to the SAS. In regions where the Hawthorn unit has higher amounts of clay, such as in the upper Suwannee River basin, the aquifers are essentially independent and dramatic drops in the FAS have little effect on the SAS (Basso 2003).

The FAS is found in a sequence of highly permeable carbonate rocks (Miller 1986:45) that are below the Hawthorn formation, where it is present, and can be divided into an upper and lower aquifer system. The upper FAS is the important hydrologic system for this study, and the lower units will be ignored. When the Hawthorn is present in thicknesses greater than 30 m (100 feet), the FAS is under artesian pressure; when it is thinner than 30 m or absent the FAS is unconfined and responds to atmospheric pressures like the SAS. Figure 3.1 shows where the FAS is unconfined, semi-confined, and confined in the Study Area. The FAS is unconfined in the Big Bend area of the Gulf Coast and the Woodville karst plain and is thinly confined (<30 m) across the middle of the state and in the upper Apalachicola/Chipola basin (Southeastern Geological Society 1986; Fernald and Purdum 1998:51; Sepúlveda 2002:fig 5). The FAS is also directly connected to the surface through sinkholes, funnel sinks or natural wells, solution pipes, springs, and caves (Puri et al. 1967:29).

Figure 3.1: The Floridan Aquifer System in the Study Area. Light gray: unconfined; dark gray: semi-confined, and white: confined. Adapted from Bush and Johnson (1988:plate 2).

Lakes and wetlands. Florida has approximately 7800 lakes with surface areas greater than 0.4 ha (Brenner et al. 1990:364). About 75 percent are less than five meters deep, and few are deeper than 25 m (Brenner et al. 1990:365). Lakes do not have a single morphology (Kindinger et al. 1999), but for purposes of this analysis, lakes are differentiated as those that are directly and those that are indirectly connected to the FAS. Lakes that are directly connected to the FAS are referred to here as sinkholes.

Most of the lakes and sinkholes in Florida were formed by dissolution and subsequent collapse of the karst mantle (Brenner et al. 1990). If the overburden collapses into solution features in the underlying limestone and directly exposes the FAS, then a sinkhole is formed. If the overburden remains after collapse or the solutions feature is plugged, then a lake is formed (Hughes 1967; Lee 2002). Lake hydrodynamics vary in the state, but water levels in lakes are maintained typically by precipitation, surface runoff, and SAS inflow, although longer term fluctuations can be indirectly controlled when artesian groundwater levels retard seepage (Deevey 1988:1319; Brenner et al. 1990).

Wetlands, including treed swamps and herbaceous marshes, are ecosystems that are directly dependent on periodic inundation from ground and surface waters (Ewel 1990; Kushlan 1990). The water levels in wetlands vary seasonally and annually, and in some wet years wetlands may contain extensive areas of open waters. For this analysis, non-riparian wetlands are considered as shallow lakes.

Springs. Springs can be characterized as seeps, which occur when the SAS discharges laterally through the face of an escarpment (Moore 1955:17), and springs, which are artesian, discharge through karst openings, and originate from deeper aquifers. In this discussion, seeps are considered lakes. Springs are organized typically according to the magnitude of their discharge. The FAS is the sources of all first magnitude springs (>100 cfs) and most of the other 700 springs in Florida (Scott et al. 2002:10). Springs discharge when the head pressure exceeds the atmospheric or overlying water pressure and a conduit exists that allows the spring water to reach the land surface.

All springs are found within the regions of the state where the FAS is unconfined or thinly confined (<100 ft) with overlying deposits, the FAS is under artesian pressure, and the land surface is low enough for groundwater to reach the surface (Scott et al. 2004:15). These conditions generally occur in river and stream lowlands in the Ocala Karst District in the north-central section of the peninsula and the Dougherty Karst Plain

District in the north-central part of the panhandle. Figure 3.2 shows the location of the first magnitude springs in the Study Area.

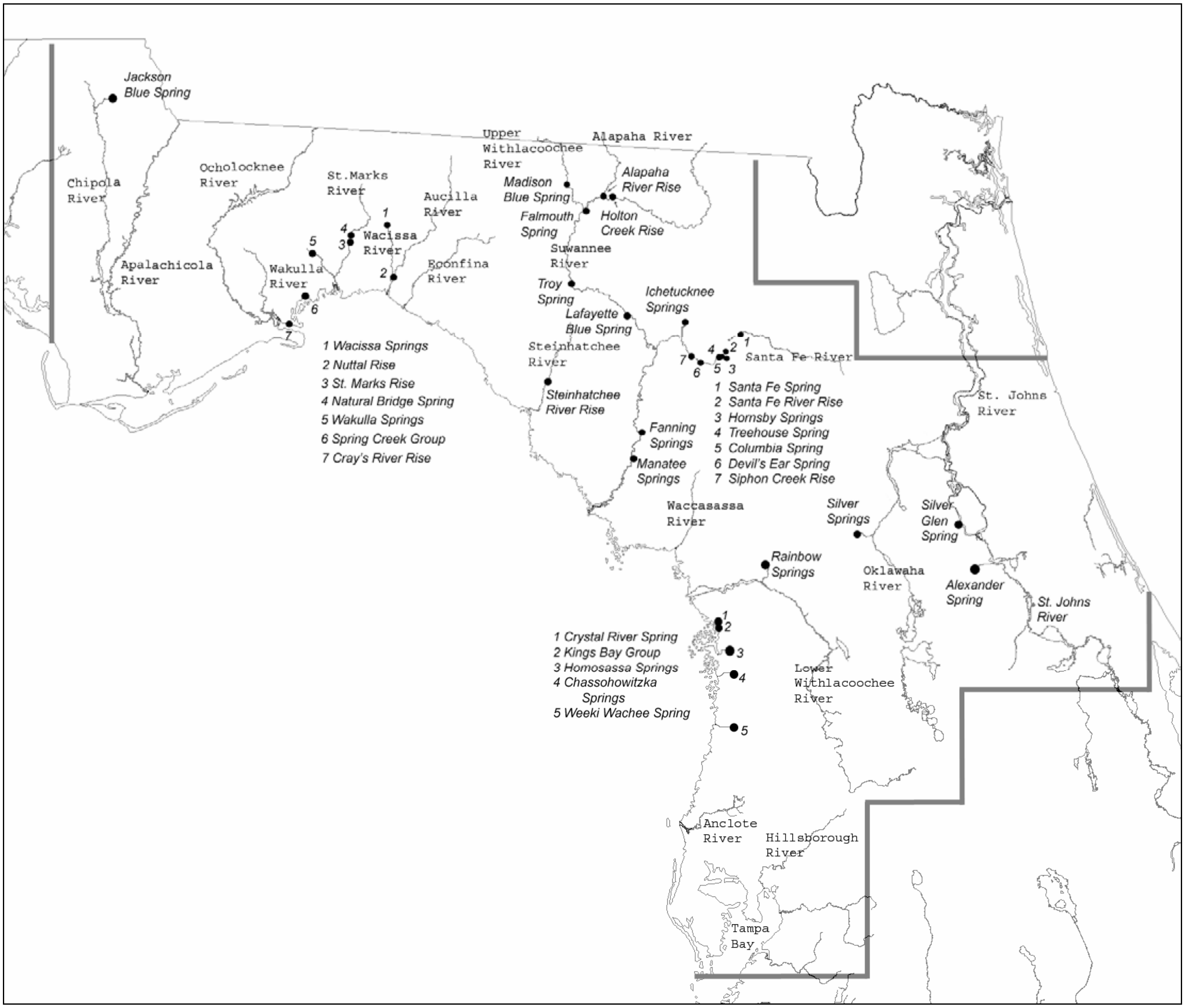

Figure 3.2: Location of first magnitude springs and rivers in the Study Area (Scott et al. 2004).

The FAS is a massive reservoir of water that moderates the occasionally dramatic swings between wet and dry climatic episodes in Florida. Nevertheless, spring flow is ultimately dependent on rainfall, and the magnitude of flow from some springs, such as the Weekiwachee, Rainbow, and Silver Springs, are highly correlated with precipitation (Cherry et al. 1970:80-81, fig. 44).

Springs in and adjacent to river channels are sensitive to changes of only a few inches of head pressure, which can turn the spring into a recharge feature (Lane 2001:10). During high-flow conditions, the Suwannee River between Luraville and Bronson discharges to the FAS, and river water can extend outward from the river at least 3 km, but during low-flow conditions the discharge is reversed (Katz et al. 1997:1247). From 1908 to 1973, the discharge and recharge at Falmouth Springs in Suwannee County (Figure 3.2) ranged from +220 cfs to -365 cfs (Rosenau et al. 1977:table 2).

River rises, in which an underground river reappears on the surface, are counted as springs in Florida, although their magnitude is more directly dependant on surface water volumes. Several first magnitude springs are rises for streams and rivers that disappear at the base of the Cody Scarp and reappear downgradient, such as Spring Creek Group, Santa Fe Spring, St. Marks River Rise, Alapaha River Rise, Holton Creek Rise, Ichetucknee Spring Group, and Siphon Creek Rise (Wilson and Skiles 1988; Scott et al. 2004; Lane 2001). We can expect that these river rises would be significantly affected by a decrease in the volume of surface water in their attendant rivers and creeks.

<u>Rivers and Streams</u>. Rivers and streams are surface waters that flow through defined channels. They are classified by order; lower order streams are smaller and flow down to higher order streams. Precipitation, spring flow, and groundwater can all contribute to this flow, although in Florida, runoff is less of a factor than in other areas of North America due to the porosity of the soil. The response of rivers and streams to low flow conditions depends on the climate, topography (which affects the amount of groundwater in storage), and geology (Giese and Franklin 1996:4), but most lower order streams in Florida go dry for several months in many years, and during most major droughts in Florida, most of the lower order streams stop flowing (Pride and Crooks 1962). During dry periods, low flow in rivers consists mainly of groundwater (Giese and Franklin 1996).

B. Effect of Lower Precipitation and Over-pumping on the Aquifers

The effects of lower aquifer levels can be seen in two phenomena: over-pumping deep aquifer wells and prolonged droughts. Over-pumping that significantly lowers the

FAS can also depress SAS levels where there is communication between the two, which provides the opportunity to observe the effect on surface waters of lower aquifer levels and normal precipitation. In contrast, in prolonged droughts we can see the effects of lower precipitation on aquifers and surface waters. Both conditions were likely present in Florida at different times during the Paleoindian period.

Florida has experienced several severe droughts in the twentieth century caused by extended rainfall deficits. By eliminating its main source of water, prolonged droughts lower the SAS, which lowers lake levels, sometimes dramatically (Clark et al. 1964). Prolonged droughts can also affect rivers and streams. For example, many lower order tributaries stopped flowing and the flow in larger rivers was dramatically reduced during the 1954-1956 drought, which produced an approximate rainfall deficit of 71 cm (28 inches) (Pride and Crooks 1962:tables 2 and 3). The flow in the Suwannee River at Branford dropped to 13.7 percent of normal, Silver Springs dropped to 70 percent of normal, and the St. Johns, Hillsborough, Peace, Manatee, Santa Fe, Steinhatchee, and Aucilla Rivers stopped flowing in several places (Pride and Crooks 1962:11). First magnitude springs show greater resiliency than smaller springs, but even they can be significantly impacted by drought, such as when Hornsby Springs on the Santa Fe River stopped flowing during the 1998-2002 drought, which created a rainfall deficit of about 127 cm (50 in) (Scott et al. 2004:15).

Over-pumping directly affects the FAS, which can decrease surface water flows even during times of average rainfall (Cherry et al. 1970:86) and stop springs from flowing (Peek 1951). While Florida's wetlands are adapted to withstand occasional droughts, over-pumping mimics the effects of a permanent drought. Swamps, freshwater marshes, mangroves, and salt marshes would be most affected, while mesic hardwood hammocks and flatwoods would experience moderate effects, and xeric upland communities would experience little effect (Kinser and Minno 1995). With as little as a .3 m drop (one ft) in the water table due to over-pumping, wetlands can undergo dramatic transformations; wetland soils can become desiccated and will not re-hydrate through rainfall (Dooris et al. 1990). An aquifer drawdown of as little as .75 m (2.5 ft) could change a plant community from wetland to xeric (Kinser and Minno 1995:24).

In sum, lowering water tables by less than one meter for extended periods would dramatically affect Florida's plant communities by eliminating or severely restricting the size and distribution of wetlands. If a drought lasted long enough, even mesic forests would be affected, leaving xeric plant communities in much of the state. Lower order streams would only flow in direct response to precipitation, and rivers would flow intermittently when groundwater tables rose high enough to intersect their channels. Only the largest springs would provide a dependable source of water. Lower river flows would result in the loss of riverine forested floodplains, which would eliminate aquatic habitats and the detritus that are critical to several fish and invertebrates (Light et al. 2002). Florida's entire ecosystem would be dramatically altered in a prolonged drought and lower water tables.

C. Dryness in the Paleoindian Period

Some estimates of surface water availability during the Paleoindian period can be made by comparing surface water levels during that period, which are inferred from proxies for water levels or aridity, with modern conditions. Unfortunately, because of the paucity of data points and the low precision of radiocarbon dates no fine grained chronological or regional reconstructions are possible, and only general trends can be advanced. The data and proxies used in this analysis are sea levels, reconstructed water and peat levels in lakes and sinkholes, the degree of summer insolation, eolian sand movement, and pollen cores. From these proxies, we can infer in general that the SAS was ephemeral or non-existent and the surface of the FAS was significantly below the lowest modern drought levels for much of the period.

Sea and Lake Levels. Balsillie and Donoghue (2004) estimated that sea levels in the Gulf of Mexico were about 95 m lower than modern levels at 12,000 B.P. and rose to about -33 m by 10,000 B.P. During times of lower sea level, the level of the FAS would have been correspondingly lower (Brenner et al. 1990:369), because significant volumes of water would have moved through the porous limestone and into the Gulf. The sea level was lowered for several thousands of years, which should have been sufficient to establish a new, lower stasis in the FAS levels. Several first magnitude coastal springs – Crystal, Homosassa, Chassahowitzka, and Weekiwachee – originate within 15 km of the coast (Cherry et al. 1970), but at times of lower sea levels when the coastal aquifer discharge was further from the modern coast, these and other coastal springs, such as Wakulla Springs, were likely sinkholes (Upchurch and Randazzo 1997:233). Potentiometric head increases as sea level drops (Faure et al. 2002:figure 1), and during a rapid fall in sea level, the water table would maintains a high head differential until the water drained from the aquifer, and a new stasis level was achieved. This higher groundwater gradient coupled with lower pressure from seawater encourages the creation of new springs and seeps at the coast (Faure et al. 2002:52-53). Faure et al. (2002:54) characterized this effect as the creation of coastal oasis – a situation with more inland aridity and higher coastal freshwater availability. The same conditions may not exist on the eastern side of the peninsula where the limestone formations that contain the FAS and the closeness of the paleo-shore line may have retarded the draining of the aquifer.

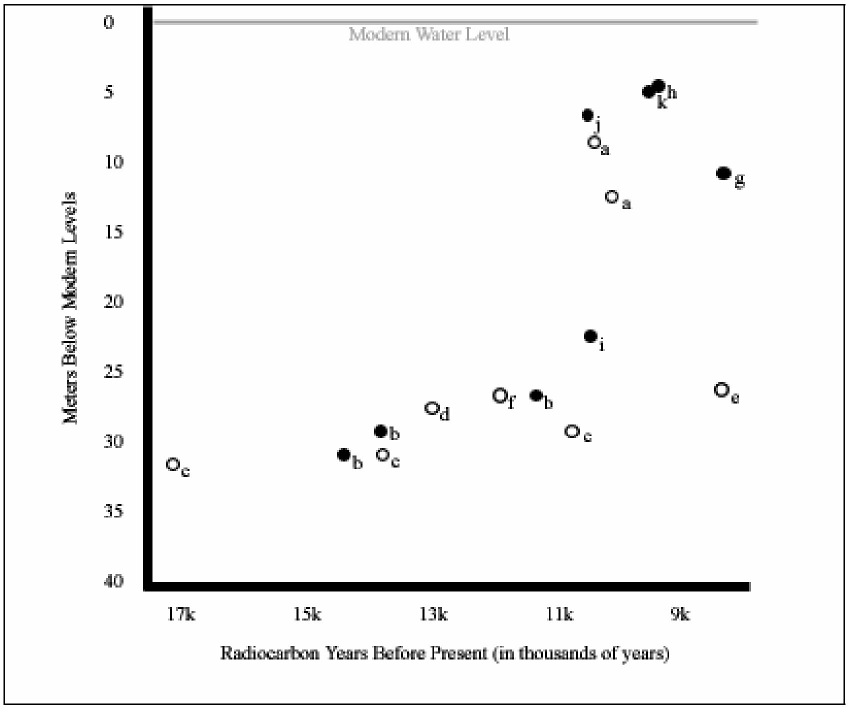

Figure 3.3: Estimates of groundwater tables in Florida during the Paleoindian and Early Archaic periods. The open circles are from southern Florida and the closed circles are from middle and northern Florida and extreme southern Georgia. Citations: (a) Warm Mineral Springs (Cockrell and Murphy 1978), (b) Sheelar Lake (Watts and Hansen 1988), (c) Lake Tulane (Watts and Hansen 1988), (d) Lake Annie (Watts and Hansen 1988), (e) Buck Lake (Watts and Hansen 1988), (f) Little Salt Springs (Clausen et al. 1979), (g) Lake Louise (Watts and Hansen 1988), (h) Camel Lake (Watts et al. 1992:figure 3), (i) Lake Balboa (Hyatt and Gilbert 2004), (j) Windover (Doran 2002:6; Holloway 2002:figure 9.2.), (k) Page-Ladson (Dunbar 2002).

Lake levels are inferred from the presence or absence of peat, which only forms in inundated or saturated conditions (Bond et al. 1986). Based on the age of basal peat layers or the end of depositional hiatuses, Watts and Hansen (1988) concluded that most lakes in Florida did not begin to re-hydrate until ca. 8000 B.P., which indicates that both the FAS and SAS were significantly lower before that time (Watts 1980:404). Figure 3.3 shows the estimated lake and sinkhole levels in Florida during the end of the Pleistocene and Early Holocene periods. Except for Warm Mineral Springs, it appears from these data that at the onset of the Younger Dryas (ca. 10,900 B.P.) water tables in northern Florida dramatically rose, while those in southern Florida did not.

Summer Insolation. The amount of summer radiation, which is influenced by precession of the equinoxes, was a major driver affecting the climate during the end of the Pleistocene (Webb III et al. 1993; Pisias and Imbrie 1986). Summer insolation during the Paleoindian period was higher than modern levels and reached a maximum about 9000 B.P. (Berger and Loutre 1991). Greater insolation should have increased evapotranspiration and lowered the SAS.

Eolian Sand Movement. Drier conditions can also be inferred from the presence and movement of inland dunes during this time. Dune formation may indicate reduced effective moisture in dry environments, such as savanna, grasslands, or semi-desert conditions, and this phenomenon of local dune movement is still seen during droughts in semiarid regions of the central Texas coast (Otvos 2004). The start of dune formation in the Southeast signaled a change from forested to sparse grassland or savannah environments, although the evidence indicates the effect was not regionally correlated (Otvos 2004:116, figure 4; Ivester et al. 2001:300; Otvos and Price 2001:155).

Pollen Studies. The use of pollen as a paleoclimate proxy is based upon the assumption that temporal and spatial environmental changes, such as mean July temperature or precipitation, force biological responses, which are reflected in vegetation patterns (Delcourt et al. 1983:154; Webb III et al. 1993:433). The relationship of climate to vegetation is expressed by transfer functions that relate the pollen distributions to species concentrations using modern analogs (Bradley 1999:376). The transfer functions are developed for all parts of the continent, because they are dependent on local landform and soil conditions. Interpretation is difficult when no close modern analog exists for a pollen spectrum or few transform functions have been developed. Both problems hinder pollen studies in Florida (Watts and Hansen 1988).

Pollen is typically integrated into zones that are meant to represent ecosystem equilibrium, but individual species appear to react independently to climate change rather than as part of a coherent ecosystem (Watts 1980:388), and equilibrium is ill-defined (Bradley 1999:373). Climate reconstructions based on pollen data can have different temporal and spatial scales (Delcourt et al. 1983:figure 1), although they lack sharp resolution at regional and local scales. Temporally abrupt changes in climate would not be as apparent in the pollen record as they are in other proxy records (e.g., Hughen et al. 1996), because, regardless of whether the climatic change is short or long term, forest succession takes from 150 to 400 years in eastern North America (Delcourt et al. 1983:168). Thus, coupled with the error inherent in radiocarbon dating, pollen reconstructions can be no more fine-grained than several centuries.

Several plant communities that have modern analogs have been reconstructed from the pollen data in Florida, and specific climate conditions can be inferred from them. The pine-dominated community, which also contained infrequent live oak, water oak, sweet gum, red maple, and ash, would probably have looked like the pine flatwoods found throughout much of the state (Abrahamson and Hartnett 1990), although the pines were likely sand pines, which are not fire-dependant like the slash or long-leaf pines found in much of Florida today. Pine dominated systems require wetter conditions with cooler summers and warmer winters. Wetter conditions may mean higher humidity and soil moisture rather than higher rainfall (Dunbar 2002:156).

Oak-dominated environments were probably like modern oak-scrub communities that are dominated by evergreen, sclerophyllous oaks with rosemary understory (Myers 1990), some of which may have persisted in parts of Florida since the Pleistocene period (Laessle 1958). Today, rosemary scrub is found only in high dry dunes in Florida, and indicates conditions that are too dry for oak.

Although both are treeless, the Florida prairie was unlike the grasslands of the Great Plains. The Florida version was likely dry with open patches of scherophyllous oaks in prairies of grasses, and composites such as ragweed and *Chenopodium* (Watts 1971:682; Watts and Hansen 1994:67). Ragweed indicates soil disturbance, which may be caused by sand dune movement (Grimm et al. 1993:199). Oak and oak-prairie systems indicate drier conditions with greater summer insolation.

Mesic hammock is a climax vegetation community with mixed hardwood forest, usually found on fertile soil (Watts et al. 1992). Mesic trees include beech, hackberry, ash, and elm, and mesic forests require cooler weather and wetter conditions (Watts and Stuvier 1980; Jacobson, Jr., et al. 1987).

D. Climate Reconstruction

Florida has only five sites with dated pollen cores extending earlier than 9000 years, and only one of these represents the Panhandle (Watts and Hansen 1994), so only a gross reconstruction is possible. Table 3.1 presents the climate inferences for the period of 14,000-10,000 B.P. in northern and southern Florida based on a synopsis of pollen and other proxies.

Significant changes and strong regional differences in vegetation occurred from 14,000 to 12,000 B.P. (Watts et al. 1992). In north Florida, a general warming trend occurred, which coincided with maximum spring temperatures at about 12,700 B.P. The species-rich mesic forests in northwest and north-central Florida present in the early part of this period were replaced by dry oak-hickory stands with juniper, hackberry, and prairie vegetation by the end (Watts and Stuvier 1980:327). Contrary to the general trend in North America, however, is the spike in spruce pollen at Camel Lake sometime between 14,000 and 12,000 B.P. Spruce indicates colder local conditions likely caused by meltwater pulse 1A (Fairbanks 1989), which may have generated cool fogs and airflow off the Gulf (Watts et al. 1992:1064-1065). Conversely, the cool water may have caused drier conditions to the south because the meltwater pulses were also coincident with low pine pollen levels in south central Florida (Grimm et al. 1993:199). From 12,500 – 10,000 B.P., pine forests and herbs with some oaks are present at Sheelar Lake (Watts and Hansen 1988:figure 3, 315).

Table 3.1: A summary of the proxies and the climatological inferences. (a) Watts et al. (1992), (b) Watts and Stuiver (1980), (c) Watts and Hansen (1984), (d) Holloway (2002), (e) Watts 1975, (f) Watts (1980), (g) Brown and Cohen (1985), (h) Watts and Hansen (1994), (i) Fairbanks (1989), (j) Watts et al. (1992), (k) Watts and Hansen (1988).

Date (rcybp)	Northern Florida		Southern Florida	
	Proxies	Inference	Proxies	Inference
14k	Max. summer insolation[a]	*Drier*	Rosemary scrub with some sclerophyllous scrub oak and prairie vegetation at Lake Annie[e,f]	*Drier*
	Mesic forest at Sheelar Lake[b,c]	*Alternating cooler/wetter and drier/warmer periods*		
	Oak, hickory, cedars, Juniper, and beech at Sheelar Lake[c, h]		Sclerophyllous oak and prairie rich species at Lake Annie[e,f]	*Drier*
	Spruce spike at Camel Lake[a]	*Cooler and wetter in NW Florida*[i, j]		
12k	Dry oak-hickory stands with juniper, hackberry, and prairie vegetation at Sheeler Lake[b]	*Drier*	Dry conditions at Little Salt Springs[g]	*Drier*
	Pines with some oaks at Sheeler Lake[k]	*Cooler and wetter*	Pine replaced by oak scrub with hickory at Lake Tulane[c]	
	Frequent fires at Sheelar Lake[h]	*Drier*		*Drier*
			Oak and grasses peak at Lake Annie[e,f]	
10k	Prairie Savannah at Windover[d]			
	Camel Lake dry[c]			

The rich species variety in the north is not seen further south at Lake Tulane, however. In the south-central region, the presence of patchy oak and rosemary scrub indicates the climate was a dry, un-forested environment (Watts 1975:346). Charcoal reaches its greatest percentage from 11,000 to 7000 B.P. at Lake Tulane, although the pine spike at 13,000 B.P. at Lake Annie indicates wetter conditions and lower fire frequency (Watts and Hansen 1988:311). The dunes may have been mobile at this time, indicating dry conditions.

E. Summary

Based on these data, we can make some inferences about the surface water availability during the Paleoindian period in Florida. While the pollen data indicate that

Florida was generally drier than modern conditions, it appears that the climate oscillated between drier and wetter periods, and it was drier south of the Study Area. Lower precipitation would have affected the SAS directly and FAS indirectly. As a general condition in all areas of Florida, I infer that the SAS would have been absent much of the year, although it may have been ephemeral during annual rainy seasons or wetter periods. Without an SAS, the only reliable surface water would have been present in areas where the FAS was accessible from the surface. If the FAS was still under artesian conditions, then some river channels and large inland springs would have produced freshwater.

If modern extreme droughts represent average or above-average hydrologic conditions during the Paleoindian period, then it is likely that no lower order streams flowed during that time except intermittently in response to large rainfall events, and the FAS would not reliably discharge to the surface through most spring vents. Rivers would only flow if the FAS was high enough to intersect the bottom of their channels, which may only have occurred seasonally in wetter periods and not at all in drier periods. Lower sea levels in conjunction with lower precipitation eliminated the discharge from coastal springs.

During the driest times, most lakes would have been significantly smaller or dry, and wetlands would have been limited to the margins of water bodies where they could be periodically inundated. In uplands, most of the vegetation would have been xeric. Significantly lower FAS levels would have compromised artesian conditions, and flows from springs and to river channels would have been nonexistent. Under these conditions, surface water would have only been accessible where the FAS intersected open karst features like spring caves, such as Silver Springs or Wakulla Springs, and deep sinkholes, such as Warm Mineral or Little Salt Springs.

IV. Regional Analysis

In this section, I examine five sub-areas within the Study Area in more detail and infer the presence of surface water during Paleoindian times. As a starting point, I use a predevelopment model simulation of regional Floridan aquifer discharge (Figure 3.4) as an approximation of the river channels most likely to contain surface water during depressed aquifer conditions (Bush and Johnson 1988:plate 10). I refine this simulation with information on first magnitude springs, river-level gauge readings during the 1998-

2001 drought, and potentiometric surface maps. I adopted the Bush and Johnson reconstruction when no information was available to evaluate it. My assessments of the surface water potential are rated low, medium, or high. Low potential areas presently have shallow lakes and wetlands, coastal springs, and smaller first magnitude springs (<100 cfs in drought conditions). Medium potential areas presently have some communication between the FAS and surface water bodies, such as the intersection of the FAS with a river channel or deeper lake, a smaller first magnitude spring (100-200 cfs in drought conditions), or a river rise. High potential areas have river channels that demonstrate high communication between the aquifer and the river and larger first magnitude springs (>200 cfs in drought conditions).

One way to estimate the degree of upward leakage in a river is to look at the amount of water a river gains during extreme droughts, because the only input to a river's base flow will be from groundwater discharge. By comparing the lowest daily mean flow (USGSa 2002:17) in a river at consecutive gauging stations, one can estimate the amount of water flowing to the river from the aquifer, or vice versa, although these gauging stations are widely separated and absent in several rivers. To maintain consistency in the analysis, I used flows from the recent 1999-2001 drought, which set many low-flow records, for estimating the degree of stream-aquifer interaction between gauging stations, even though the minimum average daily flow for that year may not have been the lowest on record. Interpreting these data is not straightforward because the gauging stations are not separated by a standard distance, but they provide some measure of the relative amounts of groundwater base flow.

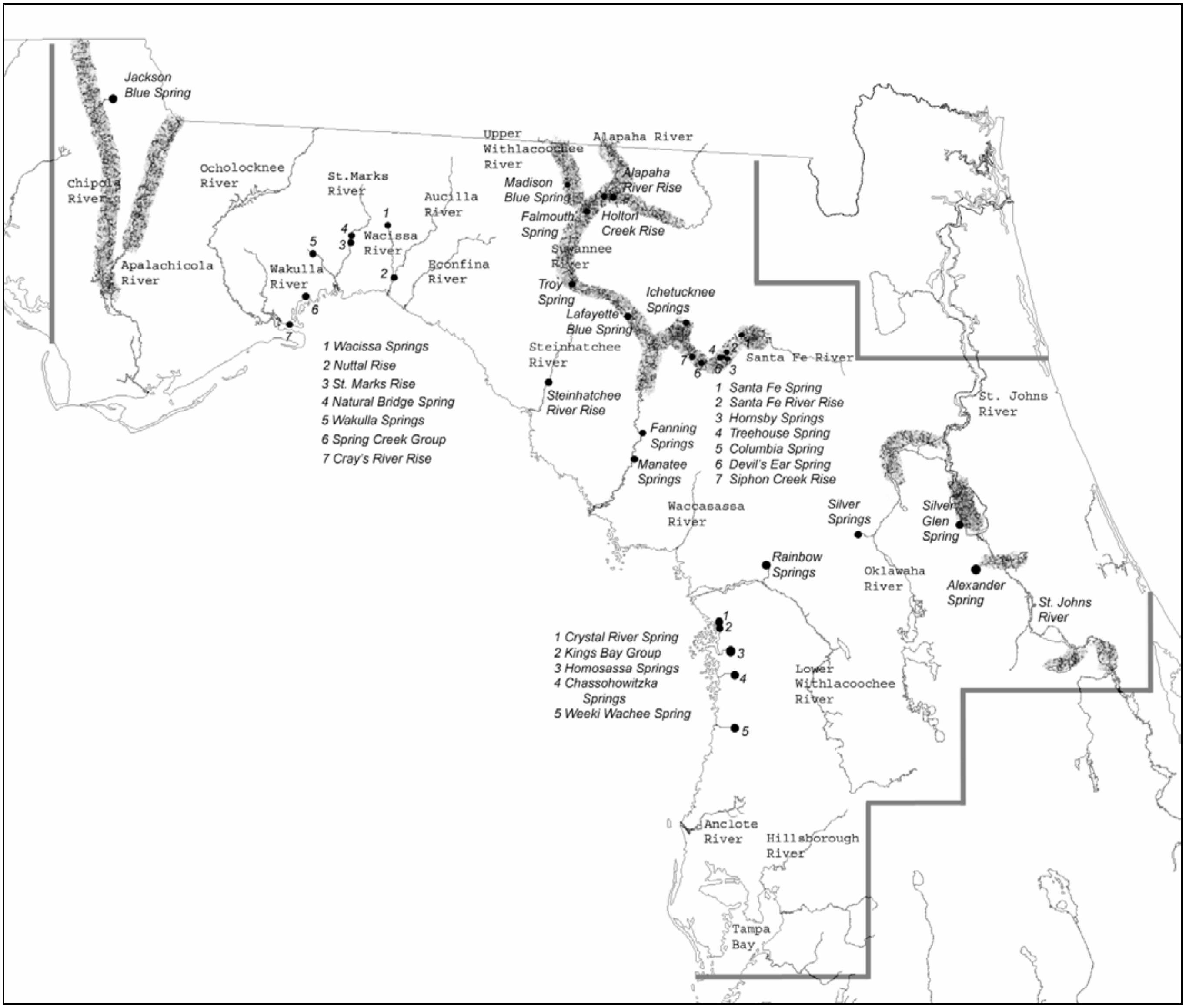

Figure 3.4: The simulation of FAS discharge in the Study Area (modified from Bush and Johnson 1988:plate 10). The areas of high discharge are shaded.

Potentiometric lows are an excellent indicator of groundwater discharge (Crane 1986:81), and the areas of communication between the aquifer and rivers can be seen in the structure of the potentiometric contours; discharge and recharge areas are visible in areas where the contours bend and parallel the river channels (Bermes et al. 1963). Presently, areas of FAS discharge to rivers tend to follow incised river channels of the Suwannee, Upper Withlacoochee, Alapaha, Santa Fe, and portions of the St. Johns and Hillsborough rivers.

A. Hillsborough River Sub-area

This sub-area (Figure 3.5) contains two major rivers, the Hillsborough and Withlacoochee, that originate in the Green Swamp, and a series of smaller coastal rivers. The FAS intersects the Hillsborough River at several locations, but the low flow data (Table 3.2) show that the gain is minimal, and at some points the river discharges to the FAS (Wolansky and Thompson 1987:27).

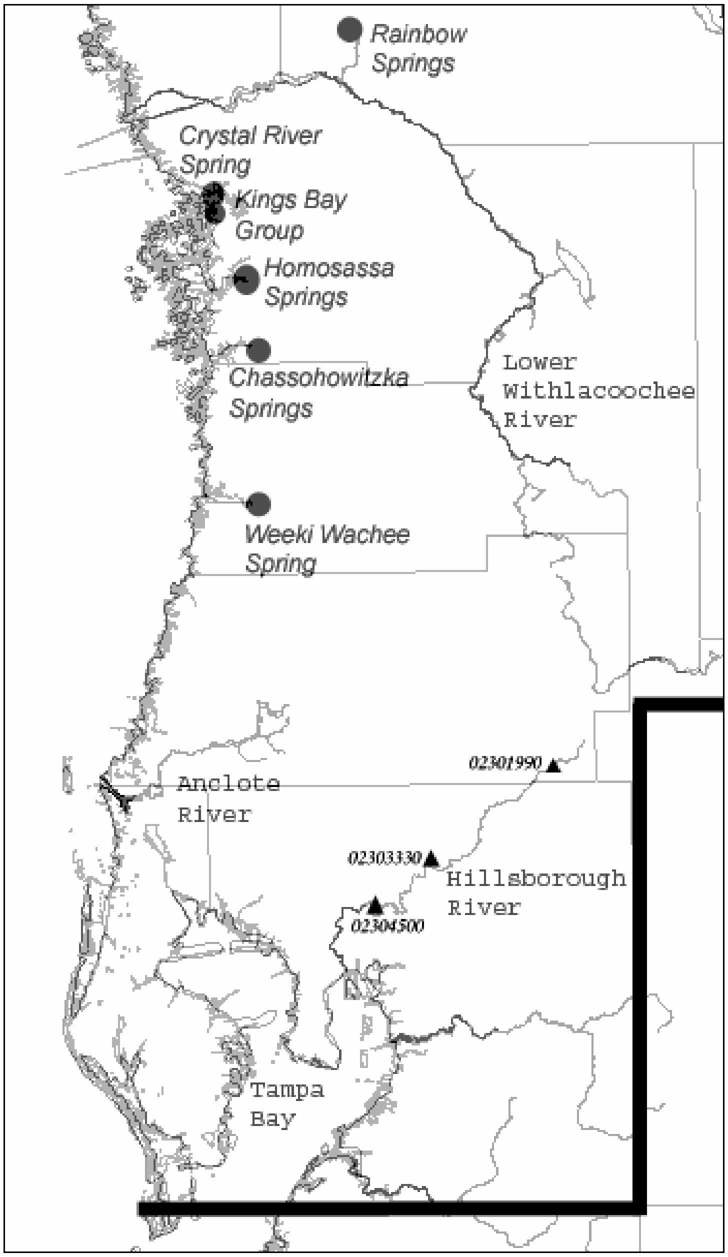

Figure 3.5: The Hillsborough sub-area. The light gray area estimates the region with a moderate potential for surface water.

The Withlacoochee River had no gauging stations operated by the USGS, but other analyses show that the River does not gain significant groundwater flow in its reach (Sepúlveda 2002:table 11). Under normal conditions, the FAS is at or near the surface in the Tsala Apopka Plain (Campbell 1989:22).

Table 3.2: River gauge data in the Hillsborough sub-area (USGS 2002c). (H): Hillsborough.

Gauging Station Location	*Number*	*Flow (cfs)*	*Year*
Zephyrhills (H)	02301990	3.6	2000
Morris Bridge (H)	02303330	21	2000
Near Tampa (H)	02304500	.2	2000

Table 3.3: First magnitude springs in the Hillsborough River sub-area (Scott et al. 2004). In the Size column: (S) smaller, (M) medium, and (L) large based on lowest discharge flows.

Spring Name	*County*	*Highest Discharge (cfs)*	*Date*	*Lowest Discharge (cfs)*	*Date*	*2001 Discharge (cfs)*	*Size*
Chassahowitzka	Citrus	197	1966	31.8	1964	53	S
Homosassa Group	Citrus	165	1966	80	1972	87	S
Kings Bay Group	Citrus	-	-	-	-	-	-
Weeki Wachee	Hernando	275	1964	101	1956	161 (est.)	M
Rainbow Springs Group	Marion	1230	1964	487	1932	634	L

Along the coast, the topography consists of sand hills and swampy lowlands (Cherry et al. 1970:9-11). To the north, most precipitation drains through the sandy soils or is captured by sinkholes (Wetterhall 1965:6), and almost 100 percent of surface flow in the rivers originates from groundwater, whereas in the southern part about 10 percent originates as groundwater (Cherry et al. 1970:17). Several larger sinkholes with significant drainage basins are located in the Brooksville area (Cherry et al. 1970:11).

Sinkholes in Sumpter County are few and typically dissolution holes there are shallow and broad (Campbell 1989:9).

The coastal area contains several coastal streams that originate near the Gulf Coast, the largest of which are the Crystal, Homossassa, Chassahowitzka, Weekiwachee, Pithlachascotee, and Anclote rivers (Cherry et al. 1970:11). These rivers are short but carry significant flows; the northern rivers, which originate as first magnitude springs (Table 3.3), are only 9-11 km in length. The Rainbow River originates in the Rainbow Springs Group (Table 3.3), which is a large first magnitude spring, and meets the Lower Withlacoochee near the coast. There is not much information on this river, but it has been shown to respond to precipitation, and coupled with its proximity to the coast, it may have not had a significant flow in the driest periods.

In sum, the surface water potential would have been scattered in this area. The potential for surface water is low in the Hillsborough River, Lower Withlacoochee River, and the coastal rivers; it is likely that the coastal rivers would have been non-existent, although water may have been available by entering the spring vents. It appears that Rainbow Springs was the only location for reliable surface water. The spring gets a moderate potential based on its proximity to the coast and its direct response to rainwater.

B. St. Johns River Sub-area

This area includes the central portion of the St. Johns River and the Oklawaha River, its major tributary (Figure 3.6). The St. Johns River starts south of Lake Helen Blazes and flows through eight shallow lakes (Snell and Anderson 1970:9), but the river segment between Sanford and Palatka appears to follow a valley formed by an entrenched tributary that was captured during an earlier low sea stand (White 1970:107). This valley, along with the lower reaches of the Oklawaha River and Crescent Lake, are areas of greater solution than the northern and southern reaches of the river (White 1970:108). The FAS discharges through a fault or breach in the aquaclude at the confluence of the Ocklawaha and St. Johns Rivers, but it does not reach the surface north of the confluence.

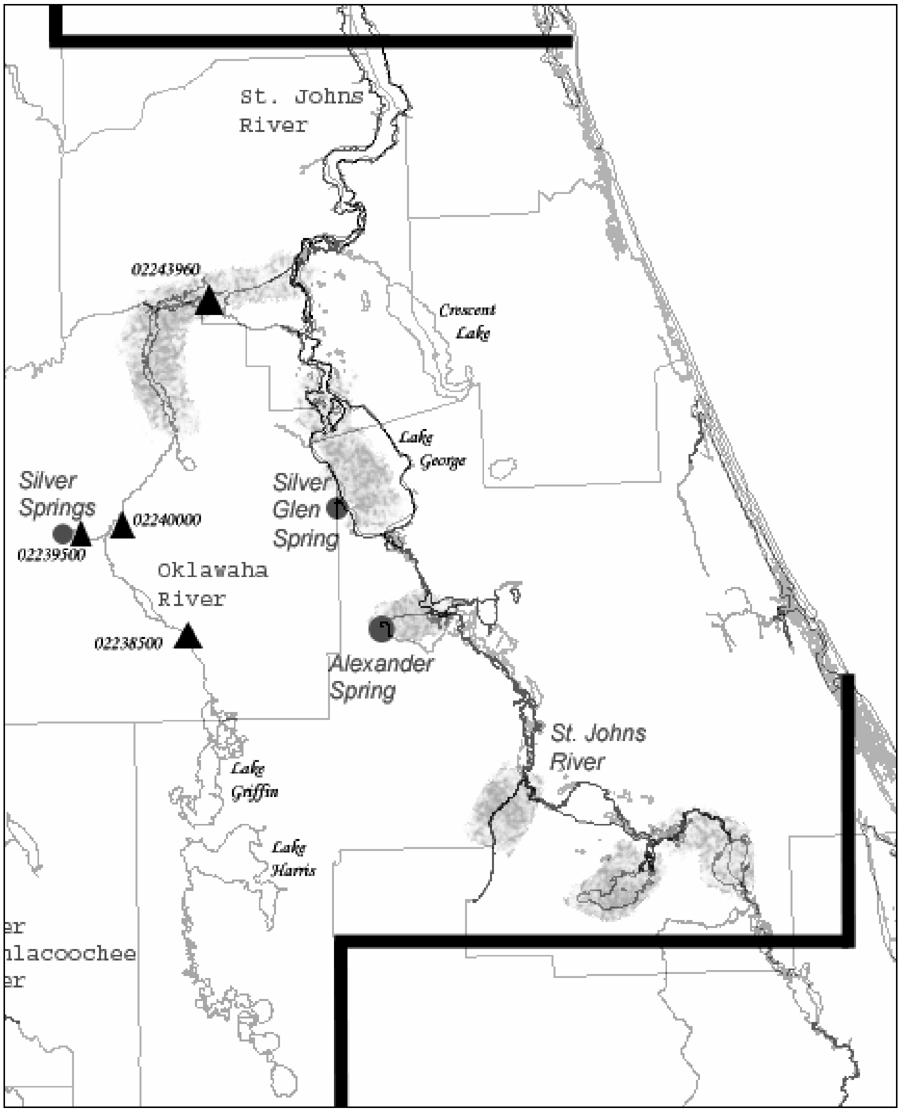

Figure 3.6: The St. Johns sub-area. Areas of greatest potential are dark gray, and areas of moderate potential are light gray.

Potentiometric lows are found at the confluence of the Oklawaha and St. Johns Rivers, including Lake George to the south, and Haw Creek, which drains into the southern end of Crescent Lake (Bermes et al. 1963:60-61, figures 22-24; Snell and Anderson 1970:62). Tidal influences make recent river gauge data for the St. Johns difficult to interpret, but Pride and Crooks (1962:table 2) found no flow in gauges near the towns of Christmas and DeLand during the 1954-1956 drought, which indicates Bush and Johnson may have over estimated the FAS discharge upriver of Alexander Springs.

Table 3.4: River gauge data in the St. Johns River sub-area (USGS 2002a). (O): Oklawaha, (SS): Silver River.

Gauge Station Location	*Number*	*Flow (cfs)*	*Year*
Moss Bluff (O)	02238500	15	2001
Silver River (SR)	02239500	354	2001
Conner (O)	02240000	426	2001
Rodman Dam (O)	02243960	291	2001

Table 3.5: First magnitude springs in the St. Johns River sub-area (Scott et al. 2004). In the Spring Name column: (SJ) St. Johns River, (SS) Silver Springs River. In the Size column: (S) means smaller, (M) medium, and (L) large based on lowest discharge flows.

Spring Name	*County*	*Highest Discharge (cfs)*	*Date*	*Lowest Discharge (cfs)*	*Date*	*2001 Discharge (cfs)*	*Size*
Alexander (SJ)	Lake	162	1935	74.5	1935	94.2	S
Silver Glen (SJ)	Marion	129	1935	90	1933	109	S
Silver Springs Group (SS)	Marion	1,290	1960	539	1957	556	L
Volusia Blue (SJ)	Volusia	214	1960	63	1935	87	S

The Oklawaha River starts in Lake Apopka and flows through Harris, Eustis, Griffin and several other lakes before it meets the Silver River and finally the St. Johns. (Florida Department of Natural Resources 1989:245; Snell and Anderson 1970). The gauge station data (Table 3.4) on the Oklawaha show that most of its base flow derives from the Silver River and that it loses water near its confluence with the St. Johns. The gauge data do not support Bush and Johnson's prediction that the FAS discharges to the Oklawaha in its lower reach, although the effect of the reservoir behind Rodman Dam on the hydrology may cause this area to discharge rather than recharge.

The Orange Creek basin lies within Alachua, Marion, and Putnam counties and holds Orange, Lochloosa, and Newnan Lakes, which are all connected and tributary to the Oklawaha River. The FAS discharges to Lake Lochloosa and occasionally Orange Lake (Clark et al. 1964:56-60, 126.). Silver Springs is the only large first magnitude spring in this sub-area (Table 3.5).

In sum, several areas could have provided reliable surface water. The potential for surface water is high at the confluence of the Oklawaha and St. Johns Rivers, and Lake George. The reaches of the St. Johns north of Palatka and south of Sanford have a low potential. Silver Springs, some of the lakes in the Orange Creek basin, such as Lake Lochloosa, the lower end of Crescent Lake, and St. Johns upstream from Alexander Springs, have a moderate potential.

C. Suwannee River Sub-Area

This area contains two significant rivers and several larger first magnitude springs (Figure 3.7; Table 3.6). The Suwannee River originates in the Okefenokee Swamp in southern Georgia (Malcolm et al. 1994). In its upper reaches, the Suwannee River incises the sands and clays overlying the FAS, but near the confluences of the Withlacoochee and Alapaha Rivers, the Suwannee begins to intersect the FAS where it picks up its base flow (Katz et al. 1997:1241; Meyer 1962:10). The lower Suwannee River below its confluence with the Santa Fe River appears to follow a zone or zones of structural weakness with enhanced porosity, which creates high transmissivities (Crane 1986:73). These areas of high transmissivity exhibit high fluctuations in groundwater levels and periods of backflow from the river to the aquifer.

The Alapaha River runs on the surface north of Jennings, Florida, but approximately forty-percent of the year it drains entirely into several sinkholes, runs underground for 27 km, and reemerges in the Alapaha Rise and Holton Creek springs in the Suwannee River (Ceryak 1977). During drought conditions in 1977, the potentiometric surface of the FAS changed by as much as nine meters in a matter of months in the Alapaha River corridor indicating a fracture zone and an area of high porosity. Other fracture and high porosity zones are found in the bed of the Suwannee downstream of White Springs (Ceryak et al. 1983:59-60).

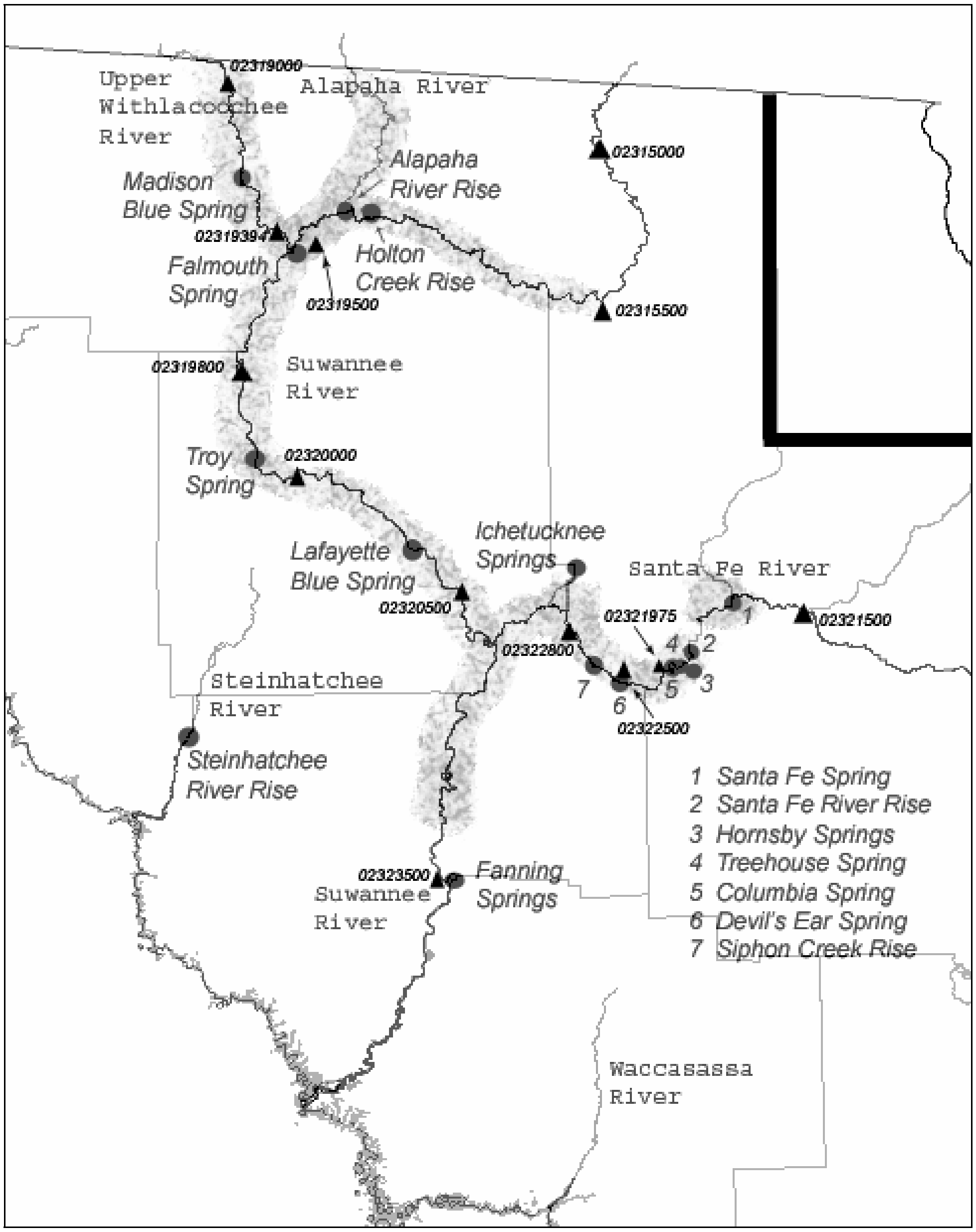

Figure 3.7: The Suwannee sub-area. Areas of greatest potential are dark gray, and areas of moderate potential are light gray. The river gauge data (Table 3.7) show a dramatic increase in flow between White Springs and Ellaville, but perhaps three-quarters of that can be attributed to the Alapaha River Rise (Table 3.7). Likewise, the increase in flow between Branford and Wilcox can be attributed to the Santa Fe River (Table 3.6). Thus, it appears that Bush and Johnson (1988) may have extended their discharge estimation too far down the river (Figures 3.4, 3.7).

Table 3.6: First magnitude springs in the Suwannee River sub-area (Scott et al. 2004). In the Spring Name column: (W) Upper Withlachoochee, (S) Suwannee, (ST) Steinhatchee, (SF) Santa Fe. In the Size column: (S) means smaller, (M) medium, and (L) large based on lowest discharge flows.

Spring Name	*County*	*Highest Discharge (cfs)*	*Date*	*Lowest Discharge (cfs)*	*Date*	*2001 Discharge (cfs)*	*Size*
Madison Blue (W)	Madison	139	1973	71.4	2001	71.4	S
Holton Creek Rise (S)	Hamilton	482	1976	0	2001	0	S
Alapaha River Rise (S)	Hamilton	699	1976	508	1975	594	L
Lafayette Blue (S)	Lafayette	102	1998	45.9	2001	45.9	S
Troy (S)	Lafayette	205	1973	106	2001	106	M
Fanning (S)	Levy	139	1973	51.5	2001	51.5	S
Manatee (S)	Levy	238	1960	110	1956	154	M
Falmouth (S)	Suwannee	365	1933	59.6	1942	159	S
Steinhatchee River Rise (ST)	Dixie	350	1999	-	-	-	-
Santa Fe (SF)	Columbia	149.99	1998	47.9	2001	47.9	S
Santa Fe Rise (SF)	Alachua	-	-	-	-	<75 (2002)	S
Hornsby (SF)	Alachua	250	1972	0	2002	0 (2002)	S
Treehouse (SF)	Alachua	405.96	1998	39.9	2001	39.9	S
Columbia (SF)	Columbia	-	-	-	-	39.5	S
Devils Ear (SF)	Gilchrist	-	-	-	-	206.59	L
Siphon Creek (SF)	Gilchrist	-	-	-	-	120	M
Ichnetucknee Group (I)	Columbia	197.2	1946	186	2001	186	M

The Withlacoochee River originates in Georgia but does not appear to gain groundwater until the Florida border. The area around Pinetta (gauge station 02319000) appears to be a fracture zone and high porosity area (Ceryak et al. 1983:104), and the first-magnitude Madison Blue Springs discharges in this reach of the river (Scott et al. 2004; Table I). The configuration of the potentiometric contours do not reveal an area of high groundwater discharge in the lower reaches of the river (Ceryak et al. 1983:figures 29, 31).

Table 3.7: River gauge data in the Suwannee River sub-area (USGS 2002b). (S) means Suwannee River, (W) means upper Withlachoochee River.

Gauging Station Location	*Number*	*Flow (cfs)*	*Year*
Benton (S)	02315000	6.1	2000
White Springs (S)	02315500	8.2	2000
Ellaville (S)	02319500	720	2000
Dowing Park (S)	02319800	951	2000
Luraville (S)	02320000	1050	2000
Branford (S)	02320500	1420	2000
Wilcox (S)	02322500	1970	2000
Pinetta (W)	02319000	131	2001
Lee (W)	02319394	510	2001

Table 3.8: The flows in the Santa Fe River (USGS 2002b).

Gauging Station Location	*Number*	*Flow (cfs)*	*Year*
Worthington Springs (SF)	02321500	0	2001
US Hwy 441 at High Springs (SF)	02321975	1.4	2001
Ft. White (SF)	02322500	471	2001
Hildreth (SF)	02322800	589	2001

The Santa Fe River, which both gains and loses water along its reach (Katz 1997: 1246), originates in Santa Fe Lake, flows west until it drains into a sinkhole in O’Leno State Park, emerges five kilometers to the southwest at Santa Fe River Rise, and eventually drains into the Suwannee River (Clark et al. 1964:50). The area to the east of O’Leno contains many streams that flow through a swampy area (Meyer 1962:11), but downstream of the river rise, few streams flow to the Santa Fe and groundwater seepage contributes to the flow of the river (Clark et al. 1964:53). Potentiometric contours follow the river channel to the Santa Fe River Rise (Puri et al. 1967:17), which indicates an area of high communication between the river and aquifer. The river gauge data (Table 3.8) shows that the river gains significantly between the Highway 441 bridge and Ft. White. One large first magnitude spring (Devil’s Ear), five small first magnitude, and one river rise discharges along this reach of the river (Table 3.6), which indicates this area had a high potential for reliable freshwater despite the number of smaller first magnitude springs.

The Ichetucknee River arises from the Ichetucknee Springs Group, which is the reappearance of Rose Creek (White 1970), a short distance from its confluence with the Santa Fe River. Although it is a river rise, the springs discharge data (Table 3.6) indicate it did not lose much volume in the 1999-2002 drought.

The Waccasassa River is a small river that originates in the second-magnitude Levy Blue Springs and flows through a series of swamps and small lakes. Most of the flow derives from precipitation although it intersects limestone in its lower reaches (Florida Department of Natural Resources 1989:383; Scott et al. 2004).

Most of the flow to the Steinhatchee River is from wetlands and precipitation, although it intersects a limestone channel in its lower reaches (Florida Department of Natural Resources 1989:353). At times of low precipitation, the river ceases to flow in its upper reaches (Florida Department of Natural Resources 1989:353), and it flows underground for about one mile in the vicinity of Tenille before reemerging at the first magnitude Steinhatchee Rise (Scott et al. 2004; Table 3.6).

Waccasassa Flats and San Pedro Bay (Figure 3.7) have sandy clay layers in their surface geology that retard aquifer recharge, and they would tend to retain surface water in times of higher precipitations (Puri et al. 1967; Crane 1986:75). Most of the surface waters present in Gilchrist County are small, shallow lakes and wetlands with small drainage basins, and during an extended drought, most of these would be expected to go dry (Col et al. 1997:66). Dixie County has few sinkholes and most of the lakes and ponds were likely formed by a rise in the groundwater table in the Holocene (Puri et al 1967:32).

In sum, potential for surface water above White Springs in the Suwannee River is low, but below that point, the potential is high, especially beginning at the confluences with the Alapaha and Withlacoochee rivers. Only the Alapaha River Rise is a large first magnitude spring, but it is unclear how much of its flow is contributed by the FAS when the river goes underground. It is likely that surface water availability was variable in the Suwannee between the Alapaha and Santa Fe confluences and may have been related to the three small first magnitude springs. There is a low potential in the Alapaha River itself and moderate potential in the Upper Withlacoochee River, although the potential may be lower below Madison Blue Spring.

The potential for surface water in the Santa Fe River downstream of Highway 441 (downstream from Hornsby Springs in Figure 3.7) to the confluence of the Suwannee River is high, although the discharge to this reach of the river would have been higher in some locations than others. Six first magnitude springs discharge in a short stretch of the river, and the river gains flow. From the gauge data it appears that discharge to the river drops off downstream of Ft. White. Based on the flow at Santa Fe Spring, I do not think that it was an area of high discharge.

The potential for surface water is low in the Waccasassa River and medium Steinhatchee River below the river rise. The wetlands in the Flats are perched and derived from precipitation. Waccasassa Flats and San Pedro Bay would have held water in the rainy season, but the rest of the area is sandy and does not retain surface water.

D. Aucilla River Sub-area

Little information is available concerning the rivers in this sub-area, and flow data is virtually absent (Figure 3.8). Bush and Johnson's (1988) simulation did not predict a discharge in this sub-area. Only the Aucilla and St. Marks Rivers originate above the Cody Scarp; the rest could be classified as spring-fed coastal rivers, which make their status in the Paleoindian period questionable. The Aucilla River originates in swampy lands in South Georgia and does not enter an incised channel until below Lamont. In its lower reaches, the river disappears underground and breaches the surface in a series of sinkholes until it emerges at Nuttal Rise, where it flows eight kilometers to the Gulf (Florida Department of Natural Resources 1989).

The Wacissa River originates in a cluster of springs (Table 3.9), one of which is first magnitude, south of the Cody Scarp (Scott et al. 2004) and flows 19 km to its confluence with the Aucilla River at the Page-Ladson site (Florida Department of Natural Resources 1989), although it is not clear that it intersected the Aucilla River at this point in the Paleoindian period. The Wacissa River does not have incised limestone banks and other than the spring discharge the degree of its communication with the FAS is unknown, although the potentiometric surface does not indicate the communication is significant (Yon 1966).

Table 3.9: First magnitude springs in the Aucilla River sub-area (Scott et al. 2004). In the Spring Name column: (WS) Wakulla River, (SM) St. Marks River, (A) Aucilla, (W) Wacissa, (G) Gulf of Mexico. In the Size column: (S) smaller, (M) medium, and (L) large based on lowest discharge flows.

Spring Name	*County*	*Highest Discharge (cfs)*	*Year*	*Lowest Discharge (cfs)*	*Year*	*2001 Discharge (cfs)*	*Size*
Wakulla Springs (WS)	Wakulla	1910	1973	25.2	1931	128.9	S
St. Marks Rise (SM)	Leon	-	-	-	-	452	L
Natural Bridge (SM)	Leon	151	2002	79	1963	151	S
Nuttal Rise (A)	Jefferson	-	-	-	-	360	L
Wacissa Group (W)	Taylor	293	2001	64.5	1960	293	S
Spring Creek Rise (G)	Wakulla (offshore)	2000	1974	307	1966	-	L
Cray's Rise (G)	Wakulla	164	2002	82.1	1972	164 (2002)	S

The Econfina River is 56 km long and is separated from the FAS by a six-meter bed of clay and 15 meters of sand (Florida Department of Natural Resources 1989:127). Little information is available on the Fenholloway River. Several small springs discharge to the river (Scott et al. 2004:figure 151), but a large paper mill withdraws so much groundwater from the area that the natural hydrology has been drastically altered. The St. Marks River is a small stream through most of its course upriver of Natural Bridge, where it reemerges and flows 18 km to the confluence with the Wakulla River. It has two first magnitude springs. The Wakulla River originates from Wakulla Springs and flows for 16 km to its confluence with the St. Marks River (Florida Department of Natural Resources 1989). The Ochlocknee River originates in southern Georgia and empties into the Gulf of Mexico. Most of its flow results from rainfall (Florida Department of Natural Resources 1989).

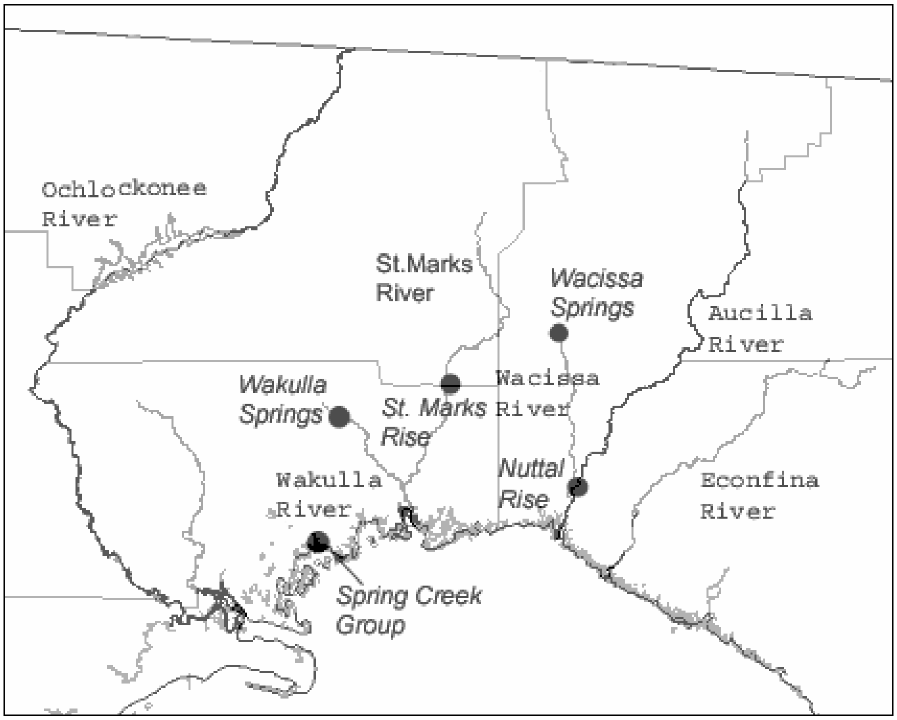

Figure 3.8: The Aucilla River sub-area. Areas of greatest potential are dark gray, and areas of moderate potential are light gray.

In sum, the potential for surface water is low for the Ochlocknee, Fenholloway and Econfina Rivers, and the upper reaches of the Aucilla and St. Marks Rivers. The potential for surface water is moderate for the Wacissa and Wakulla Rivers, and the lower reaches of the Aucilla and St. Marks Rivers. The Spring Creek Rise is probably also moderate.

E. Chipola and Apalachicola Sub-area

The Apalachicola River is the lower expression of a river system that includes the Flint and Chattahoochee Rivers (Torak et al. 1996); the Chipola River is a minor tributary that originates as small streams near the Florida-Alabama border (Figure 3.9). These rivers are west of the Tallahassee Hills, a feature composed of resistant clays, silts, and clayey sands that is not in contact with the FAS (Torak et al 1996). The physiographic regions in Florida that are associated with these rivers include the Marianna Lowlands, which are the southern expression of the Dougherty Plain, a nearly level, interior lowland karst with numerous sinkholes that has a highly active FAS-surface water interaction due to numerous solution channels, swallow holes, and sinkholes. Springs are found both along the river channels and off-channel (Torak et al. 1996:31).

The river gauge data (Table 3.10) indicates that the Apalachicola gains flow in its upper reaches but then loses flow below Blountstown. In addition to these data, the potentiometric surface maps show that the Chipola gains some flow below Marianna, but it is unclear what happens below Altha (Torak et al. 1996:plate 11). Bush and Johnson (1988) predicted that the river gains all the way to its confluence, but south of the Calhoun County line, neither river intersects the deeper FAS (Torak et al. 1996:32, figure 19). In their analysis, Torak et al. (1996:61-62, table 12) found that the Chipola actually gains more groundwater than the Apalachicola because it drains the more transmissive Marianna Lowlands.

Table 3.10: River gauge data in the Chipola River sub-area (USGS 2002b). (A): Apalachicola, (C) Chipola.

Gauging Station Location	*Number*	*Flow (cfs)*	*Date*
Chattahoochee (A)	02358000	4530	2000
Blountstown (A)	02358700	5190	2000
Sumatra (A)	02359170	4860	2000
Marianna (C)	02358789	124	2000
Altha (C)	02359000	342	2000

Table 3.11: First magnitude springs in the Chipola River sub-area (Scott et al. 2004). In the Spring Name column: (C) Chipola River. In the Size column: (S) means smaller based on lowest discharge flows.

Spring Name	*County*	*Highest Discharge (cfs)*	*Date*	*Lowest Discharge (cfs)*	*Date*	*2001 Discharge (cfs)*	*Size*
Jackson Blue	Jackson	287	1973	56	1934	63.7	S

In sum, the surface water potential is high in the Chipola River from Marianna to Altha, although the potential for Jackson Blue Spring is medium. The Apalachicola River has a medium potential in an area from Chattahootchee to Blountstown.

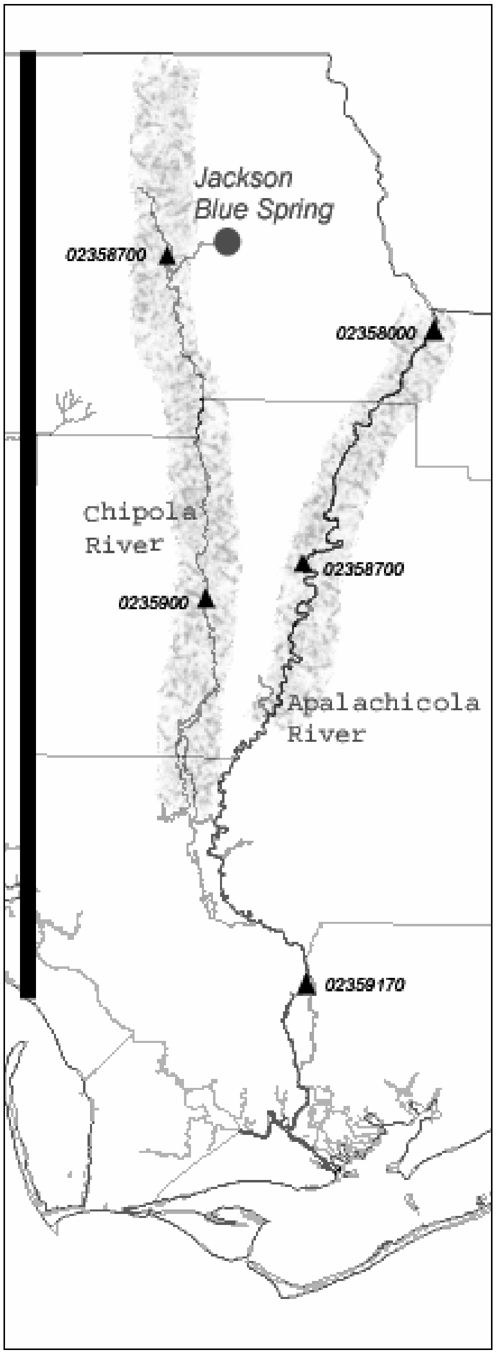

Figure 3.9: The Chipola sub-area. Areas of greatest potential are dark gray, and areas of moderate potential are light gray.

IV. Reconstruction of High and Medium Potential for Surface Water

Based on the previous analysis, Figure 3.10 presents my reconstruction of the areas of high and medium potential for surface water in the Paleoindian period. These areas are limited to rivers and lakes, but it is clear that other locales would have provided water, at least on occasion. Even in the driest periods, deeper sinkholes, which are located throughout the Study Area, would have water.

Notwithstanding the variability in hunter-gatherer regional band size, I tried to estimate a likely range of population and territory sizes in order to provide some scale for Paleoindian territories in Florida. In section four of this chapter, I demonstrate that although variable, Florida's climate was drier than modern conditions. Unfortunately, the pollen data do not have modern analogs so there is no easy way to find modern ecosystems that could stand in for conditions in Florida at that time. Nevertheless, I used Binford's (2001) data and estimated a range of population densities for very dry ecosystems and wetter, but not as wet as conditions in modern Florida, ecosystems. Based on these data, I figured a low population density of 1 person per 100 km^2 and a high density of 10 people per 100 km^2. I then calculated the area needed if the regional band consisted of 500 or 250 people. Figure 3.11 shows the hypothetical regional configurations.

I superimposed the distribution of Paleoindian points on the areas of medium and high potential for surface water (Figure 3.12), which shows a fairly high correlation between the density of artifacts and the areas with the highest potential for surface water. Based upon this distribution and the estimates for the size of regional band territories, we can divide the state into five general regions (Chipola, Aucilla, Suwannee/ Santa Fe, St. Johns, and Hillsborough; Figure 3.13). These regional configurations are further refined in methodology section of Chapter 5.

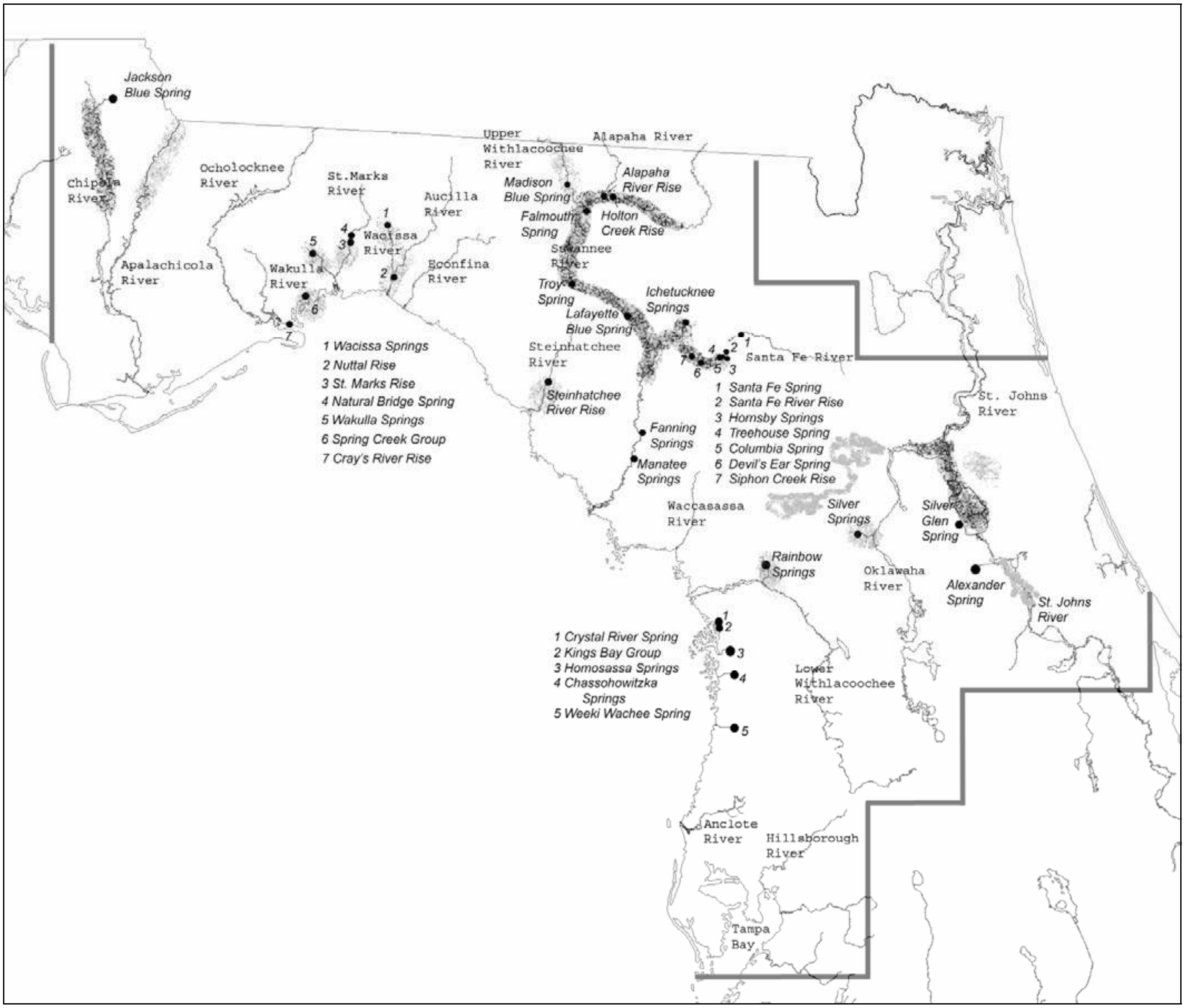

Figure 3.10: My reconstruction of reliable surface water based on high and medium potentials for FAS discharge. The dark gray areas have a high potential; the light gray areas have a medium potential.

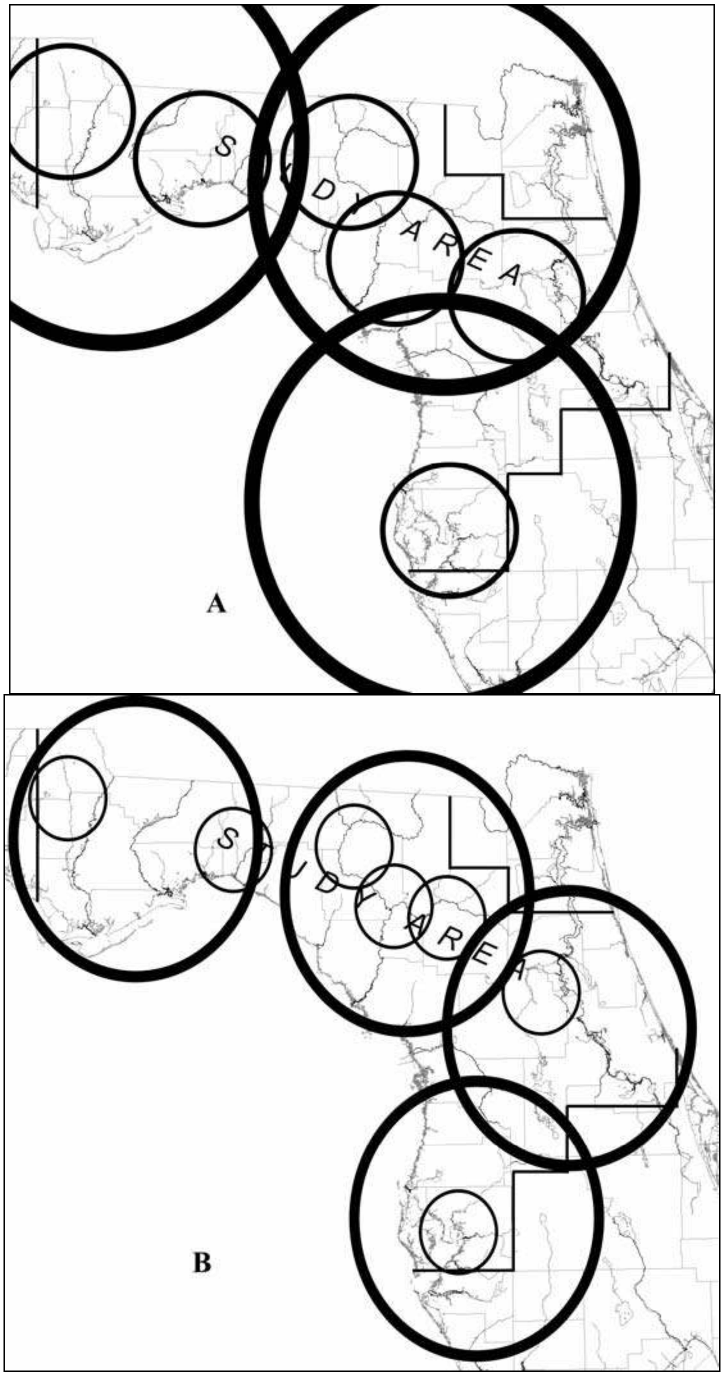

Figure 3.11: A: The scale of regional bands with 500 members at 1 (larger circles) and 10 people per 100 km^2. B: The scale of regional bands with 250 members at 1 (larger circles) and 10 people per 100 km^2. The locations of the circles generally correspond to the density of Paleoindian points discussed in the last section of this chapter. The size of the circles decreases if the number of members of the regional band decreases or the density increases.

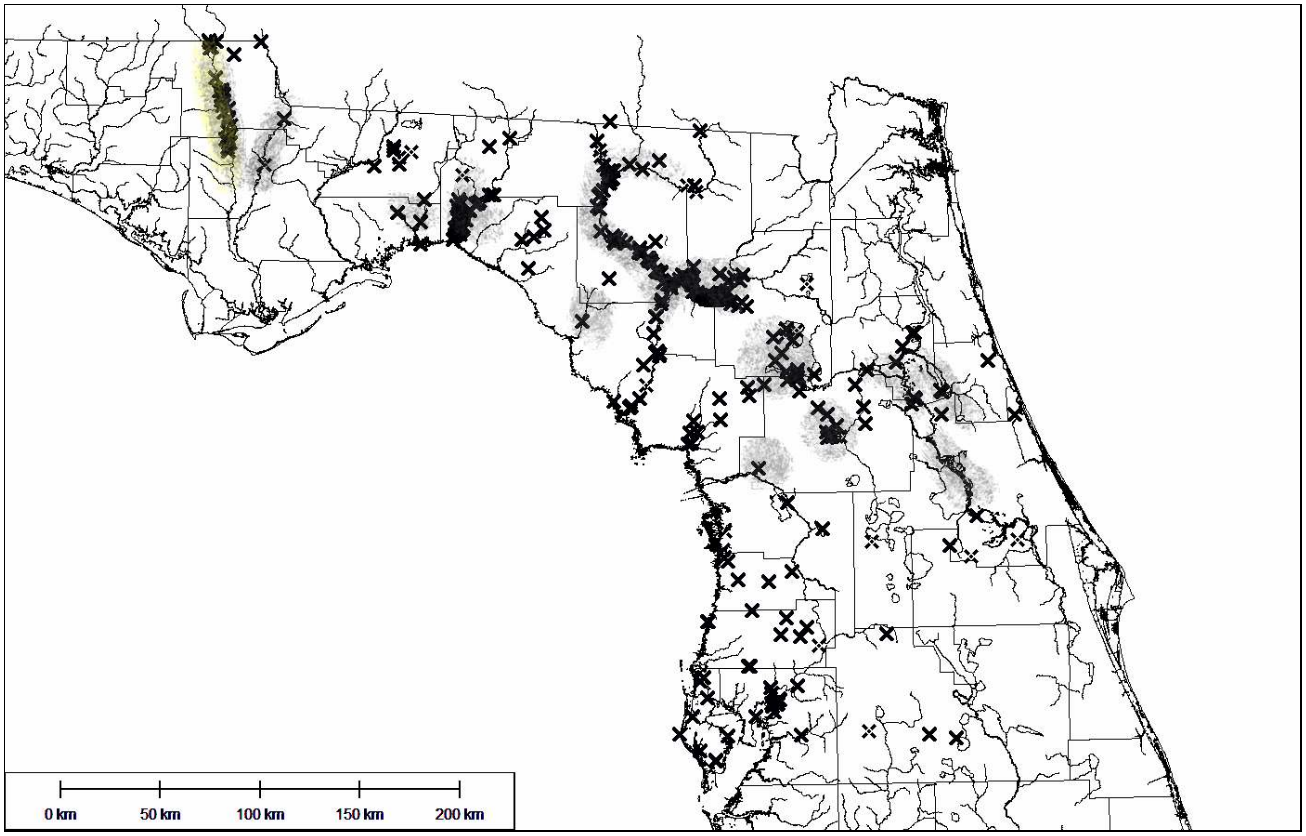

Figure 3.12: The distribution of Paleoindian points and areas of high and medium potential for surface water.

V. Chapter Summary

In this chapter I tied together several disparate theories and data to reconstruct plausible loci of Paleoindian social groups. Based on the ethnographic data, the regional band is the most likely correlate for the social group, because it facilitates regular and periodic interaction among its members and would provide the opportunity for cultural models to spread throughout the

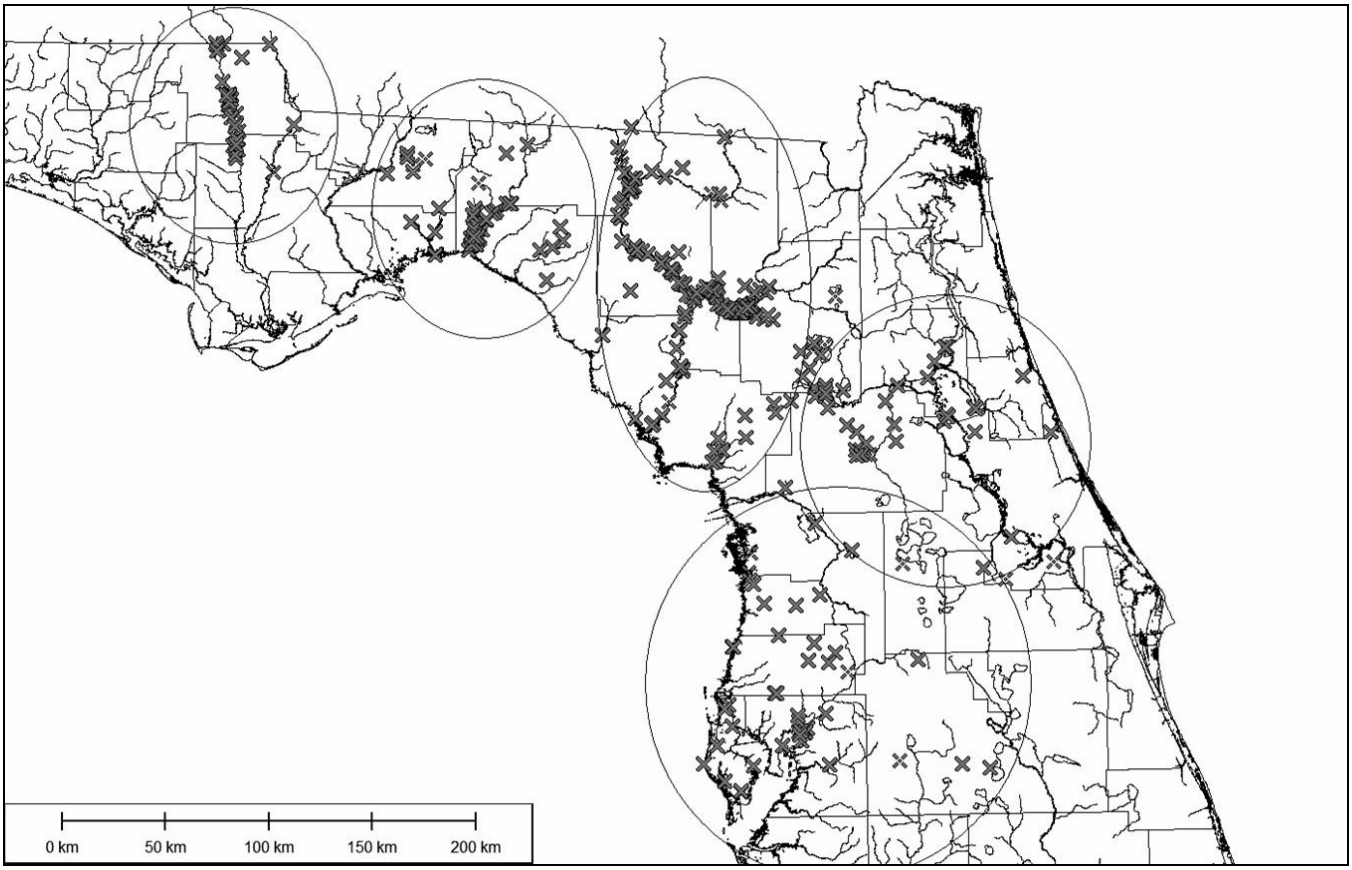

Figure 3.13: The Paleoindian points are clustered into five general areas.

group. The regional band does not limit the opportunities to acquire new models, however. The models of Paleoindian social and territorial structure were not very helpful in translating the concept of a regional band to that period, in large measure because these models are based on the distribution of lithic materials. In contrast to other regions, the Florida models are based on resource loci, which configures territories around water and lithic resources.

In order to test whether Florida Paleoindians were tethered to water sources, I reviewed hydrologic and geologic data for Florida and predicted the river channels and springs with moderate and high potential to provide surface water in the Paleoindian period. The locations where the artifacts in my database were found are highly correlated with these predictions of high and moderate potential. This distribution is not surprising, because surface water and ecosystems requiring wetter subsurface conditions would have been largely absent much from Florida during the Paleoindian period. Thus, plant and animal food sources would have been concentrated in areas of reliable water. Finally, I created a range of estimated territorial sizes for Paleoindian social groups in Florida based upon assumptions of population density and group size.

CHAPTER 4

DATA DESCRIPTION AND ETHICAL ISSUES

In this chapter I describe how the data were collected and discuss their quality and ethical issues related to their use in this research. The data that make up this study consist of 980 Paleoindian projectile points collected from the Study Area (Figure 1.1), and 504 of those with intact bases were used in the statistical analyses. Most of the points, including those from public collections, were collected by non-professionals. I consider and discuss the ethical issues surrounding the use of these data in the context of the Society for American Archaeology's Principles of Archaeological Ethics. My position is that data from stolen artifacts should not be used in research, but that the definition of "stolen artifacts" should be left to public policy makers. I conclude that it is not unethical to use the points in this research. I discuss the criteria used to ensure that the points were made in the Paleoindian period and their location was recorded with sufficient precision. I conclude that the quality of the data is sufficient for this research.

I. Data Collection

Very few projects of this scope can be conducted on artifacts solely in public collections, and private collections are frequently used in regional research projects (e.g., Amick 1995; Dunbar 1991; Lepper and Meltzer 1991; Pitblado 2003; Tankersley 1989). I was fortunate to have the cooperation of 29 private collectors and three public institutions who generously gave me access to their collections. My initial contacts were arranged through Jim Dunbar of the Florida Bureau of Archaeological Research who had gotten to know many collectors over the years. From those initial introductions, I was given leads to other collectors. Most of the people I contacted were happy to assist, and everyone who granted me access was generous with their time and their collections.

The process of data collection was straightforward. Although some collectors lent me their points, most of the time I traveled to their homes with a scanner, laptop, caliper, and data entry forms. I scanned the front and back of the points, four at a time, and measured the thickness along the midline in one centimeter increments and the length of grinding up both edges from the base. These measurements along with location information and notes were entered on the data entry forms. The data were then entered into an Excel spreadsheet. The data are included in Appendix 1.

My instructions to the collectors were that I wanted to scan every Paleoindian point, broken or whole, in their collection that was earlier than Bolen times (ca. 10,000 BP). This included points that are commonly referred to as Clovis, Suwannee, Simpson, Redstone, Dalton and its related forms, Greenbriar, and Hardaway. In addition, I scanned any point that was unidentifiable to type but met the criteria of being lanceolate shaped and basally ground. In retrospect, I think I did not get a good sample of the Late Paleoindian forms like Greenbriar and Hardaway, because there may have been some confusion about the descriptions of those types. Thus, I limited this project to the Early and Middle Paleoindian points, of which Clovis, Suwannee, and Simpson are the common types in Florida from these periods.

All told, I have 1088 points in the database, and 1064 of these meet the criteria of ground edges and lanceolate shape. Of the 1088, 104 came from public collections at the University of Florida, the University of South Florida, and the Bureau of Archaeological Research. Of those 104, most were donated by private collectors; I estimate that about 20 artifacts were excavated by professionals under controlled conditions. Ninety-one of the 1088 have no location information and were not used in any of the analyses.

I divided the points into Early, Middle, and Late Paleoindian chronological units using the criteria described in Chapter 5 (Table 4.1). Nine hundred and twelve Early and Middle Paleoindian points were used in the distributional analysis, but only 504 with intact bases were used in the statistical analyses.

Table 4.1: The number of points per chronological unit. The first row is all points in the database. The points with adequate location information are in the second row.

	Early	*Middle*	*Late*	*Total*
All points	176	817	75	1068
Points with location	165	747	68	980
Points used in statistical analysis	107	385	na	502

II. Ethical Issues

The use of private collections in professional research raises some ethical issues. Practically, this research could not be conducted without the use of private collections. I estimate that over 98 percent of the data used in these analyses ultimately derived from private collections, either presently in the hands of collectors or through museum collections that are the repositories of private collections. Few artifacts were excavated by professional archaeologists or acquired through controlled excavations by avocational archaeologists. Finally, it appears that no Paleoindian site in Florida was discovered by professional archaeologists; all were reported by collectors.

This fact – that virtually all the data used in this project were ultimately derived from collectors – presents the question squarely: notwithstanding its archaeological value, are the data "tainted" such that they should not be used in professional research. It seems that few would argue that all information derived from non-professionals is verboten, but several academic archaeologists have intimated their discomfort with the notion that large private collections of artifacts should be used in an academic endeavor. Others have expressed no such qualms. No professional standards have been established for the use of private collections, which is a good indication that no consensus exists among professionals about the ethical issues.

A. The Legal Status of Artifact Ownership in Florida

The legal status of artifacts collected in Florida can be categorized in the following ways:

1. <u>Artifacts collected on private land</u>. Other than human burials, Florida does not prohibit the collection of artifacts on private lands. However, artifacts collected without the property owner's permission are illegal.

2. <u>Artifacts collected on state uplands</u>. All of these artifacts are illegal.

3. <u>Artifacts collected on state owned bottomlands in salt water</u>. All of these artifacts are illegal.

4. <u>Artifacts collected on state owned bottomlands in freshwater</u>. Since over 70 percent of the points in my database were collected from river bottoms, I will focus the discussion of legality on the fourth category. Not all freshwater bodies are owned by the state; only those that were navigable in 1845 at the time Florida became a state or that

were acquired later. Some highly productive archaeological sites are located on privately owned river bottoms, such as the Little River section of the Aucilla River. As a matter of general property law, all artifacts located on freshwater state-owned river bottoms are property of the state, unless the state transferred ownership of the artifact. The state has the authority to transfer ownership, but it typically must do that explicitly. Ambiguities arise as to the ownership of artifacts that were either transferred improperly or by implication.

In 1968, Florida passed an antiquities act that made the unauthorized collection of artifacts from state land a misdemeanor, which the state promptly and consistently failed to enforce against collectors who picked up isolated, out of context artifacts from river bottoms. In 1993, the act was amended to make unauthorized collection a first-degree misdemeanor and third-degree felony, both serious crimes. However, the State Archaeologist at that time decided that such aggressive enforcement against most collectors was inappropriate, and in 1996 Florida instituted an Isolated Finds Policy (IFP) to authorize the casual collection of "isolated" artifacts from state-owned river bottoms as long as the collector reported the find to the state (Knight and Munroe 2004). If the state did not claim the artifact within 90 days of the report, ownership was transferred to the collector. Problems with the policy were soon apparent, not the least being the ambiguous definition of an "isolated find." Although 150 individuals reported a total of 10,720 artifacts between June of 1996 and June 2005, when the IFP was formally ended, it is likely that this represents a small fraction of the all of the artifacts collected during that period. The general consensus is that the IFP was a failure; only a small percentage of collectors participated, artifacts were removed from known archaeological sites, and prosecuting violators was problematic. Importantly, it placed all artifacts collected during that period in legal limbo.

In retrospect, it is clear to me that most of the artifacts used in this project are arguably state-owned property, but it is also clear that before June of 2005, the State of Florida made a policy decision that this class of artifact was not valuable to the State and, at least by implication, released its claim of ownership to them.

B. Society for American Archaeology Ethical Statement

The latest foray by the Society of American Archaeologists (SAA) into the ethical challenges facing archaeologists was in the early 1990's. An Ethics in Archaeology Committee was formed and in 1994 proposed six Principles of Archaeological Ethics (Lynott and Wylie 1995). The Principles were open for discussion and eventually adopted by the SAA. In 1995, the SAA published *Ethics in American Archaeology: Challenges for the 1990's*, which contained background, discussion, and commentary on the proposed principles. Apropos to this project are the first and third principles.

> Principle No. 1: Stewardship
> The archaeological record, that is, is situ archaeological material and sites, archaeological collections, records, and reports, is a public trust. The use of the archaeological record should be for the benefit of all people. As part of the important record of the human cultural past, archaeological materials are not commodities to be exploited for person enjoyment or profit. It is the responsibility of all archaeologists to work for the long-term preservation and protection of the archaeological record. Although archaeologists rarely have legal ownership of archaeological resources, they should practice and promote stewardship of the archaeological record. Stewards are both caretakers and advocates for the archaeological record. As they investigate and interpret the record, archaeologists should also promote its long-term conservation. Archaeologists should use their specialized knowledge to promote public understanding and support for the long-term preservation of the archaeological record.
>
> Principle No. 3: Commercialization:
>
> The Society for American Archaeology has recognized that the buying and selling of objects out of archaeological context is contributing to the destruction of the archaeological record on the American continents and around the world. Commercialization of objects from the archaeological record results in these objects being unscientifically removed from sites, destroying contextual information that is essential to understanding archaeological resources. Archaeologists should abstain from any activity that enhances the commercial value of archaeological objects not curated in public institutions, or readily available for scientific study, public interpretation, and display.

In commentary on the Principles, Wylie (1995:19) discussed the issue of what to do with "looted data," by which she meant "material acquired in an unscientific and destructive manner." The question is not straightforward because the definitions are slippery, and the intent and implications are murky. There are several axes along which ethical considerations can be evaluated. First, there is the act of acquisition, which ranges from illegal looting to sanctioned professional archaeological excavation. Second, there is the value of the archaeological information, a practical consideration, which runs from no provenance or information to excellent archaeological context. Third, there is the legal status of the artifact. Some are illegal to possess, others are not, and others may have changed status from illegal when acquired but subsequently legitimized when donated to an institution. Fourth, there is the availability of the artifact for future study. Some artifacts are squirreled away, and some are readily available, but title to some CRM material, which is professionally excavated, is retained by the private landowners and may or may not be accessible in the future. Fifth, is the possibility that the use of the artifact in professional research may lead to its legitimization or encourage further looting.

The commentaries in *Ethics in American Archaeology* highlighted the conflicts between different principles and laid open the problems with ambiguous ethical statements like Principles #1 and #3. For example, Murphy et al. (1995) took the position that the third Principle of Commercialism should be read broadly to prevent involvement of any archaeologist in the "commodification" are artifacts, which is defined as the direct or indirect facilitation of the application of monetary value to artifacts or the transfer of their ownership from public to private ownership. Indirect involvement includes "monetary appraisals, conservation, authentication, dating, and validation of archaeological materials intended for sale" (Murphy et al. 1995:39). They went on to assert that professional archaeological participation in commercial shipwreck salvage operations or CRM activities through which artifacts are retained by private landowners is unethical because "it contributes to the destruction process through professional legitimization" (Murphy et al. 1995:40). In sum, their main point was that the justification of "any data is better than no data" is simply a rationalization for the violation of the principle of stewardship.

Broad statements of policy are fine, but the devil is in the details, and some of the problems with the aggressive interpretation of Murphy et al. were discussed by Hamilton (1995), who rightly cautioned that the implications of policy must be carefully considered fully. He pointed out that the position of Murphy et al. runs counter to much of the legally sanctioned work done by both CRM and government archaeologists who are simply following the law. For example, the ban on using data from artifacts that are no longer available for study would put off-limits all artifacts that are repatriated under the Native American Graves Protection and Repatriation Act along with much of the data generated in CRM projects.

Wylie (1995:21, note 1) pointed out that the competing interests in the formulation of archaeological ethics are analyzed under different principles of ethical formulation. Consequentialist ethical positions evaluate actions based on the results they produce as opposed to deontological positions that work from first principles regardless of the outcomes. Much of the debate can be seen as a conflict between these competing approaches to ethics in archaeology.

C. Discussion

My own feelings are mixed. The level of disagreement among professionals shows that they cannot agree even on a framework for discussion of the issue. I approach this problem with the understanding that no solution will be ideal by considering firstly the practical effects of ethical principles on the archaeological information and secondly the legal status of the artifact.

First, I can dispense with arguments that out-of-context data is virtually valueless in a scientific inquiry and therefore can be practically ignored (e.g., Murphy et al. 1995). This position is shallow and elitist; who among us has the foresight to decide up front what value data may have in the future? The value of such data depends on the research questions (Wylie 1995:19), and it is incorrect to state categorically that such data are useless (Pyburn and Wilk 1995).

Second, I also easily can reject the argument that the publication of archaeological data tends to create or improve markets in the artifacts that are the basis of those data as a ground for not using data from private collections. Wylie (1995:18) calls this the "salvage principle," which she defined as a justificatory principle that analysis of looted material is acceptable because "some data is better than no data." In my own work, it is clear that collectors who participate can say, and have said, that their actions contribute to furthering science. They take the position that "if I don't pick it up, then someone else will, and at least I share my data."

However, just as publishing looted data may legitimize the looted material, the same can be said for publishing any archaeological data. Wylie (1995) described the establishment and growth in the market for Ban Chiang ceramics from Thailand after archaeologists published their work on the site. The same reaction was seen in the market for endscrapers in Arkansas after archaeologists published on the artifact.

It is not likely that my work encourages collection – no one is collecting to improve my database – but it is likely that my work does lend some legitimization and rationalization to private collection. All of our actions as archaeologists may produce adverse actions in others, but whether another individual is prompted to loot should not be a consideration in deciding whether to publish research.

Third, the argument that artifacts with limited or no availability for future study should not be used in scholarly research also appears unfounded to me. Several practical implications of the argument have already been mentioned. In addition, the failure to publish such data seems to run afoul of the Stewardship principle, which advocates preserving the archaeological record and using it for the public's benefit. The limited availability of artifacts that are used in professional research goes to the issue of replicability and reliability of the results rather than their use in the first instance.

The axes of consideration discussed by Wylie (1995) all involve issues of public policy: who owns artifacts, when must archaeological investigations be done, what constitutes an illegal artifact, and does using the data encourage illegal activity. Although imperfect, I believe that most issues of public policy should be set by the public through their public officials. It is the responsibility of the government to evaluate competing interests and allocate burdens and benefits in society. These assessments are codified and expressed the social balancing of the costs and benefits to the competing interests. We may not like it, but legislation, rules, and the rulings of state administrators are the purest expression of the moral assessments of society. As Wylie (1995) and others (Zimmerman 1995; Murphy et al. 1995) have said, archaeological interests should not be the only interests considered in deciding the ethics of archaeology. While Zimmerman was thinking specifically of Native American interests, the same logic holds for including everyone with an interest, which would include collectors (Hamilton 1995:60).

In the end, I think the ethics of using data from private or public collections should turn on the legal status of ownership. If the artifact was stolen, then the information from that artifact should not be used in research until its ownership is legal. The bottom line is that most of the actions of private collectors are legal or at least tolerated behavior by the government. Although some decry using the law as a backstop for ethics, the questions about commercialization are legal issues that involve principles of ownership and the value of archaeology to society in general.

So how does this apply to this research? I choose to let the state sort out the ownership issues. Before June of 1995, the stated and unstated policy of the State of Florida was that the collection of isolated artifacts was a tolerated activity. I am not aware that any of the artifacts in my database have been looted from known archaeological sites on state property or otherwise stolen. Thus, I feel that my use of these private collections is not unethical.

III. Data Quality

The quality of the data in any study is of fundamental concern, but especially in this project where the vast majority of the data was initially collected from uncontrolled contexts. For this research, the data had sufficient quality for determining the geographical distribution of Paleoindian points in Florida if the points were real Paleoindian points, they were found near the location they were discarded, and the find-spot was reported accurately to me. They were also useful in the statistical analyses if, in addition to these criteria, the base was an intact expression of a cultural model and the attributes are accurately measured.

A. Chronological Integrity and Authenticity

The basally-ground lanceolates that make up my data likely were made only during the Paleoindian period. There is no evidence that basally-ground lanceolates were made during any other prehistoric period in Florida (Bullen 1975), and I am confident that these criteria ensure the points likely are Paleoindian in age.

Authenticity is a problem in my research because the research design does not assume that any of the existing typologies are accurate and that all forms will display variation around a central tendency. Thus, all basally-ground lanceolates were included in the data regardless of whether they matched descriptions for a Clovis, Simpson, or Suwannee point. For this reason, I took pains to eliminate fakes.

The proliferation of flintknappers is a phenomenon that is largely ignored and unrecognized by professional archaeologists. In a recent analysis, Whittaker (2004) estimated there are about 5,000 professional and amateur flintknappers in the United States, who produce from 750,000 to 1.5 million points per year, which he considered to be a conservative estimate. The prices for authentic chipped stone points have created a vigorous market and trade in faked points. This is not to say that all or most knappers sell their points as real artifacts, but once a point enters the market, there is no way to stop someone from eventually passing it off as authentic.

I heard some collectors bemoan the presence of fakes in the market. Two collectors had purchased most of their collection, and both were cognizant and careful about provenance. One collector described a situation in which a dealer could collect a point that had been dropped into a river by a flintknapper and then honestly claim it was found in the river. Traditional indices of authenticity – patina and date of collection – are now suspect. Fakers have become quite sophisticated in producing patina and other surface indications of age, and fakes have been made in the United States for decades (Whitaker 2004).

The data in this research could include fake Paleoindian points, so I used several criteria to exclude them from the database. First, I assumed that none of the collectors purposefully foisted fakes on me. Since most of the points were provided by the original collector or can be traced to the original collector, fakes most likely would have been purchased with unknown pedigrees. Although several collectors had purchased a significant number of points in their collection, very few could not be traced to an original collector whom the owner trusted. Everyone is wary of fakes these days, and a couple of points were described to me by the collectors as suspect. I eliminated those from the data. Since the main motivation for faking artifacts is monetary, I assumed that most fakes will be exemplary specimens with well-executed faux patination. Thus, it seems that broken points that were purchased are likely authentic, because it is unlikely that a forger would invest the time and effort to patinate a point that would not be worth much. Finally, collectors who pay high prices are cautious about ensuring the artifacts are authentic, which should at least limit the fakes in their collections. I realize that this last criterion is not foolproof, but it is some evidence of authenticity. In any event, these criteria should minimize the number of fakes in the database.

B. Provenience

The precision of the provenance provided to me varied by collector. My only request to them was that they be as precise as they felt comfortable doing. Some were very precise in describing the location of the artifact, while others were vaguer. Most of the locations were given within one kilometer of the find spot, and many were within a few meters, but some were described as an entire river. Some of the locations were guessed based upon the nature and color of the patina, because some patinas are distinctive enough to locate a point to the particular river. For example, points from the Chipola River points are typically orange and glossy. There also appears to be a difference between points found in the Suwannee and Santa Fe rivers, although this distinction can be subtle. As long as the provenience was precise enough to identify the river of origin and did not involve guesswork, it was included in the typology.

The provenience information was translated into latitude/longitude, which was approximated for most of the points. Precise location information is not necessary for the research since it is primarily concerned with variation between regions rather than within regions. Thus, accurately assigning a particular point to a particular river was sufficient. Vague descriptions of location, such as “upper Suwannee,” were given arbitrary locations within that region. Since a regional provenience is sufficient, I feel confident that although they may have moved significant distances in the last 12,000 years, all of the points were found within the same region in which they were discarded.

C. Ensuring the Integrity of the Cultural Model

Because this research concerns the variation of cultural models, I had to ensure that the points I was using in the statistical analyses were an accurate representation of a model. In addition to the social processes of interest in this research, artifact variation could arise from reworking the projectile points, damage during use, or post-depositional processes, and I attempted to minimize the effects of these sources of variation. To minimize the likelihood that the morphology of the attributes were modified through use or reworking, I limited the analysis to the bases of the projectile points. It generally is accepted that the bases of Paleoindian points were not modified after they were hafted, and it appears that many in the database were resharpened while still hafted. Thus, the area below the blade should preserve the expression of the cultural model. Discerning this part of the point is straightforward in most cases. Resharpening rejuvenates the dulled edge of the blade by removing the margin through retouch, which reduces the width of the blade. If the point is still hafted, resharpening should leave a distinct disjuncture between the retouched and unretouched edges that were covered by the haft, and that disjuncture is easily apparent in many points in the database.

The base of the point could also be modified through post-depositional processes or damage during use that removes some of the margin of the base. Most damage is obvious (e.g., a missing ear), but in cases that were not obvious, I assessed the likelihood of post-manufacture damage by looking at the symmetry of base (assuming symmetry was a goal in the manufacture) and the size of the flake scars on the base in relation to the other flake scars. In all cases, damaged bases only were rejected if the damage affected the measurements. If the base was grossly asymmetrical, then it was rejected. Otherwise, it was rejected only if it looked like flakes were removed after the point was completed. For example, if one ear was shorter than the other, I inferred that it was damaged if the flake scars on the shorter ear were longer or larger than the adjacent flake scars on that ear or the scars on the other ear. In such a case, I inferred that some event other than manufacture created the larger scar.

D. Accurate Measurements

All the measurements were taken with instruments that were accurate to 0.1 millimeters. The thickness measurements were taken with a handheld caliper with extensions on the jaws that allowed me to measure the midline of the point. The rest of the measurements were taken from the scanned images with digital calipers in the Photoshop computer program. I checked the digital calipers against the handheld calipers and saw no variation in the measurements at a 0.1 mm level of precision.

IV. Selection of Artifact Attributes

The choice of variables is fundamental to the development of the typology and dependent on the methodology used to derive the classes (Read 1974). I did not know whether variability would be manifested in size or shape or both, so I employed a method that allowed the use of both measurement and ratio variables. Some researchers feel that the analyst should include as many variables as possible (Spaulding 1953), while others think that a parsimonious number, such as the minimum necessary to describe morphology, is appropriate. Read (1982) has shown that for cluster and principal components analyses, the use of redundant measurements will overemphasize some elements and affect the outcome. One obvious drawback of relying on a small set of design attributes rather than the entire artifact design is that one cannot be certain that the correct attributes have been chosen. Thus, I used many variables in the analysis, because I needed to maximize the opportunities for discerning variation since it may have been subtle and EDA does not prohibit the use of correlated or redundant measurements. By using related but different measurements, I increased the chances of finding variation if it existed, and it was not be problematic so long as redundant measures were not used to bolster the strength of an interpretation of variation. Measurement attributes and simple ratios cannot successfully capture all the aspects of complex shapes, so the use of several measures that were moderately correlated should have allowed me to better infer the pertinent structures that differentiate the social groups, if any were present. In addition, the use of many attributes increases the opportunities for other analysts to use the data.

The choice of attributes is a matter of practicality and appropriateness. The following is a list of primary and derived measurements I used in the research. Primary measurements that also had a quality assessment (good or poor) are designated with an asterisk. The points that had good quality in all categories (except total length, which was not used in the analysis) were used in the subset of points for the typology. All the attributes were measured in millimeters. The angle attribute was recorded in degrees. Figure 4.1 shows how the measurements were taken.

Primary measurements:

*TL**: This is the total length from the baseline (which is an imaginary line that connects the bottom of the base of both ears) to the tip. In instances when a small part of the tip was missing, I estimated the length to the point where the tip would have been. Total length is affected by resharpening and was not used in any analysis.

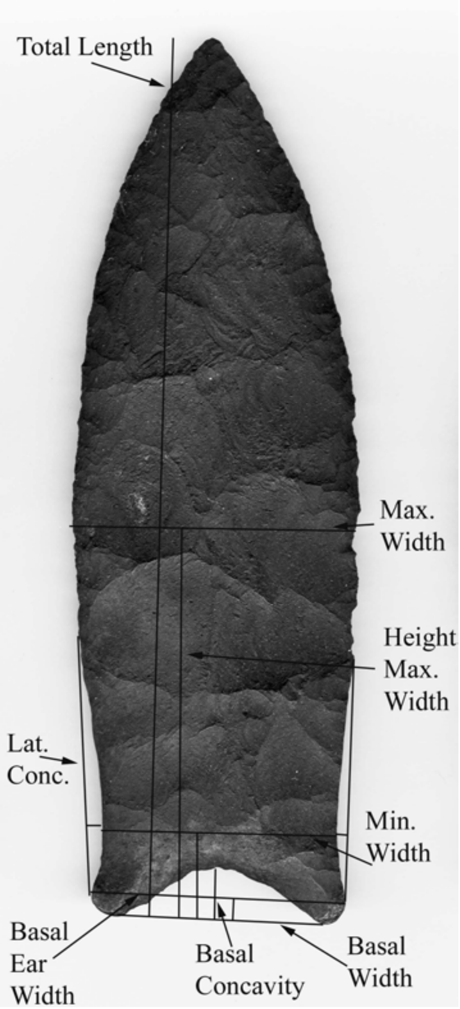

Figure 4.1: The measurements taken in Photoshop. “Lat. Conc.” is Lateral Concavity, which is measured on both sides of the point.

MW: Maximum Width of the point measured above the base. The maximum width is approximately parallel with the base line. Resharpening can affect both the size and location of maximum width and the other measurements that depend on its location on the point. Figure 4.2 shows the effect of resharpening on this measurement.

*MWH**: Height of the Maximum Width measured from the baseline to the line of maximum width. Resharpening can affect this measurement (Figure 4.2).

*BW**: Basal Width is distance between the lowest point on both ears. If one ear is missing, then the BW is estimated by doubling the distance between the lowest points on the intact ear to the approximate center line of the point.

*BEW**: Basal Ear Width is the measure from the outside point of both ears. If one ear is missing, the BEW is estimated by doubling the distance from one ear to the approximate centerline.

HEW: Height of the Basal Ear Width measured from the baseline to the midpoint of the BEW.

BS: Basal Skewness is a qualitative assessment of the symmetry of the ears. N means they are symmetrical, S means they are skewed, U means unknown because one or both of the ears is missing.

EDES: Ear DEScription is a qualitative assessment. RO is round ear, pointed out. PO is pointed ear, pointed out. RD is round ear, pointed down. PD is pointed ear, pointed down. U is unknown. This is an unreliable variable since it is difficult to decide close cases and variability of ear shape and direction on the same point.

MinBW: Minimum Basal Width is the narrowest width above the ears and below the maximum width that is close to parallel to the baseline.

HMinBW: Height of the Minimum Basal Width is height of the minBW from the baseline.

BCV: Basal Concavity is measured from the baseline to the top of the center of the basal concavity.

Ear:* Assessment whether 0, 1, or 2 ears were damaged.

*LA (RA)**: Length of Left Axis is a straight line measured from a location on the edge of the middle of the point to the tip of the ear. The point on the edge may or may not be the Maximum Width point. The tip of the ear had to be estimated when it was missing. This measurement can be affected by resharpening.

LI (RI): Left Indentation is measured from the Left Axis to the deepest depth of the axial concavity. This measurement can be affected by resharpening.

LASkew (RASkew): Left Lateral Axis Skew is a qualitative measure of whether the LI is in the approximate center of LA or skewed toward the base of the point.

GL (GR): Length of grinding from the outer edge of the ear up the left side (this side designation is arbitrary).

REWORK: This is a qualitative assessment. Was the point reworked? Y is yes, N is no, U is unknown.

Tip: This is a qualitative assessment. P is pointed, R is rounded.

Flen1 (FLen2): Flute length. Fluting is a problem to measure in many instances, because there is no single definition of fluting and sometimes it is difficult to differentiate fluting from basal thinning, both of which presumably were intended to facilitate hafting the point to the shaft. Despite the central role that fluting plays in the definition of Paleoindian points, there is remarkable breadth in its definition. Fluting, which is limited to the Paleoindian period is a specialized flake that may or may not have been used to reduce the thickness of the point (Tankersley 1994), while basal thinning appears be a generalized flaking technique for thinning the base of the point. The general consensus is that a flute is a single large, parallel-sided flake driven from the base and taken from one or both faces of the point. However, Clovis points can have multiple short, narrow flakes taken from one face or a large expanding, rather than parallel-sided, flake (Howard 1995). Some of the Clovis flutes can be as short as 5 mm in length making them difficult to distinguish from basal thinning flakes (Tankersley 1994:table 3). Post-Clovis Paleoindian points, such as Folsom and Cumberland points, have significant flutes that travel most of the length of the point. These flutes were removed with a different technique than that used to remove a Clovis flute (Patton 2005). However, Florida's Paleoindians did not develop or adopt these techniques.

I approached the issue of fluting from two perspectives. First, I broadly defined fluting to include one or more basal flakes that showed a different morphology than other flakes removed from the point. Thus, I considered the length, shape, and spacing of basal flake scars in deciding whether the flintknapper intended to use a different flaking technique on the base than he intended for the rest of the point. Second, I differentiated between unambiguous (robust) flutes and those that were ambiguous (weak).

T10 – T100: Thickness measurements at 10 mm increments measured from the top of the basal concavity down the center line.

Notching: This is a nominal assessment of whether the point shows a definite notch above the ears. Questionable assessments were included in the un-notched category.

Derived attributes:

Ear fatness (BEW-BW): (Basal Ear Width minus Basal Width) divided by 2.

Ear size: (Ear fatness * HEW.)This is an approximation of the size of the ear.

Ave Thick: This is the average of T10 – T100 of the increments excluding the tip end. An assessment was made about when to cut off the measurements for the average. The average did not include the part of the point that tapered. Tapering starts when the thickness decreases by more than one millimeter from one interval to the next and then continued decreasing. For example, if the measurements were 7, 6, 4.5, and 3, then 7 and 6 were included in the average. If the measurements were 7, 5.5, 6, 4.5, and 3, then 7, 5.5, and 6 were included in the average.

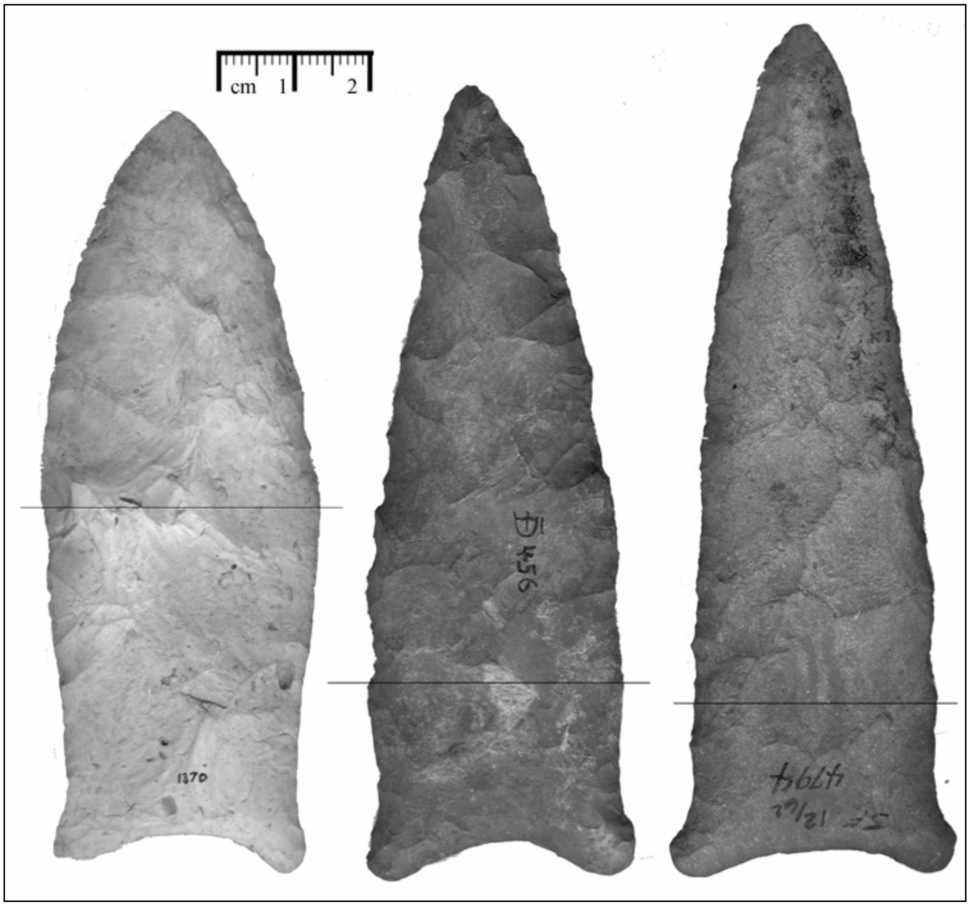

Figure 4.2: Three Middle Paleoindian points showing how the relative position of the attribute maximum width changes with resharpening.

STD Thick: The average of the absolute deviations from the mean for each thickness point that was used in the calculation of the average thickness.

Lateral Index: ((Left Lateral Indentation divided by Left Lateral Axis) + (Right Lateral Indentation divided by Right Lateral Axis)) divided by 2. This variable can be affected by resharpening.

Hypo: This is the hypotenuse of a triangle that runs approximately down the center of a basal ear. It is as the hypotenuse of a right triangle measured from the HminBW and ½ of the BEW. Figure 4.3 shows the location of this variable.

Angle: This is the angle of the hypotenuse measured from the center of the minBW. Figure 4.4 shows the location of this variable.

Midlength: This is the distance between the maximum width and the minimum basal width. It is derived by subtracting the height of minimum basal width from the height of the maximum width.

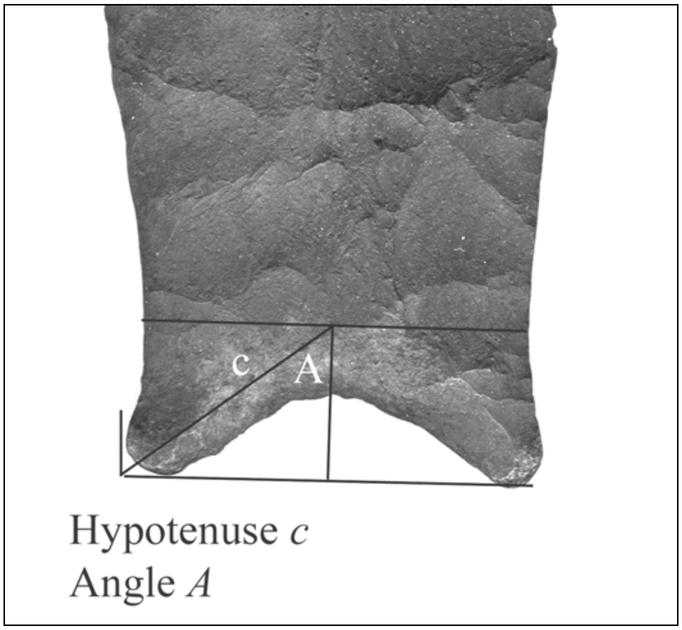

Figure 4.3: The location of the Hypo and Angle derived measures.

Ratio attributes (the value of the first attribute is divided by the second):

Minimum basal width / basal ear width (mbw/bew): This ratio measures the degree to which the base flares. Values of 1.0 represent a straight sided base. Lower numbers mean the base is more flared.

Minimum basal width / height of minimum basal width: (minbw/hmbw)

Hypotenuse / basal concavity (hyp/bcv)

Minimum basal width.basal ear width / hypotenuse (mbw.bew/hyp)

Basal ear width / height of basal ear width (bew/hew)

Basal ear width / hypotenuse (bew/hyp)

Height of minimum basal width / basal ear width (hmbw/bew)

Hypotenuse / height of basal ear width (hyp/bew)

Angle / basal ear width (ang/bew)

Some of these measurements are not straightforward. For example, minimum basal width is difficult to measure on a point with straight sides. While that may not matter for the measurement itself, other measurements or derived ratios that depend on where minimum basal width was measured, such as height of minimum basal width, hypotenuse, or angle, will be affected. Since Photoshop measures to the nearest 0.1 mm, I was usually able to find the appropriate place to measure, although it could create values that are inaccurate in the sense that they do not capture variation that is comparable to other points. Triangular, straight-sided, and tapering points presented the greatest problems. Figure 4.4 illustrates the problem.

V. Summary

In this chapter I reviewed issues related to the data including its quality and the ethics of its use. I established strict criteria to ensure that the data were limited to real Paleoindian projectile points that that would inform the research. To that end, I only included points whose find-spots could be located with sufficient precision to allow a regional analysis of their distribution. I also was satisfied that the measurements were sufficiently precise to accurately capture the Paleoindian cultural models.

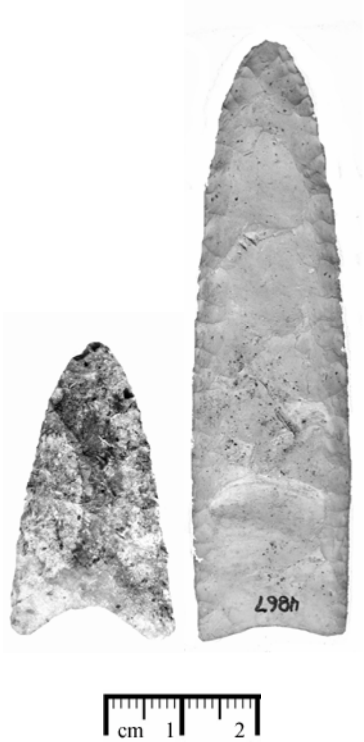

Figure 4.4: Triangular and tapered points that illustrate the difficulty in locating dimensions such as minimum basal width or maximum width.

I also reviewed several ethical issues surrounding the use of points from private collections. The issues are complex and multidimensional and do not lend themselves to easy resolution. My opinion is that we should avoid the use illegally-obtained property in our research, but that the definition of what is illegally-obtained is a public policy issue that should be left to the public policy makers in the government. This is not to say that all archaeologists should necessarily adopt this ethical statement as their personal position; each person should set their own ethical boundaries.

CHAPTER 5

METHODOLOGY

In this chapter I develop a methodology to operationalize the model of variation in material culture developed in Chapter 2 and discuss the way it will be used on my dataset. I start by reviewing the pertinent aspects of the model, in particular how variation would manifest itself in artifacts, and how it would be distributed in time and space. I show that in order to discern social groups the method must result in a typology that discriminates attribute variation over those dimensions. I then review some of the previous attempts to develop typologies by other researchers, including consideration of the appropriate units of analysis and statistical techniques for extracting structure from the data. After considering the effects of resharpening on point morphology, I decided to limit the attributes to those that measure variation in the haft. I rejected a strictly objective mathematical approach in favor of exploratory data analysis, which depends on a visual assessment of attribute variation. I then justify dividing the data geographically and temporally before applying the methodology.

Because I am making no *a priori* assumptions about the amount of socially acceptable variation, I decided to analyze the spatial dimensions in four ways. To cover that possibility, I made and tested four different initial partitions of the data, which increased the chances of finding significant variation in my data, before looking at the spatial variation. The first partition assumed there were few constraints on socially-acceptable variation, i.e., people had wide latitude in deciding how to make points. The second assumed that the social constraints applied to the shape of the haft and that individuals had more freedom to change the size of the haft. Thus, I would expect to find inter-group variation in shape and intra-group variation in size. The third assumes the converse – that social constraints applied to size rather than shape, and in this instance I would expect to find inter-group variation in size and intra-group variation in shape. The last assumes that both size and shape were socially constrained, and I would expect to find regional variation in both dimensions. These data were analyzed in several regional configurations with the analysis of variance and Tukey-Kramer HSD statistical tests for determining significant differences between regions. At the end of the chapter I review the method and its justification.

Too often archaeologists employ analytical methods on archaeological data without due consideration of the underlying archaeological theory that the methods are supposed to elucidate. Without concordance between method and theory (Carr 1985), data analysis may be little more than an exercise in statistical manipulation and pattern recognition. Because structure can be extracted from random data (Vierra and Carlson 1981), the indiscriminant application of statistics can lead to the misleading conclusion that social process created the structure. A common pitfall is that analysts use mathematical techniques, especially statistics, as if there were simply tools for extracting information from data without recognizing that these techniques are actually theories about relationships within the data (Read 1985). Without considering statistical theory, the analyst may extract structure that does not inform his research question. Thus, my guiding principles in developing the methodology were (1) there must be concordance between theory and methodology, and (2) all other things being equal, simpler is better.

I. Theory Review

In this section, I briefly review the pertinent aspects of the theory developed in Chapter 2, particularly the nature of a cultural model and the variation of its expression in artifacts. Artifacts show both consistency and variation over time and space, which is a natural consequence of learning, expressing, and modifying cultural models. Cultural models of artifacts and their attributes are ideational units that people learn, keep in their minds, and then try to copy when they make an artifact. During manufacture, people may also make intentional changes to the artifact models to suit their personal inclinations. Consistency arises when members of a group focus on a limited number of models. Variation arises through errors in learning, differential skills, and individual modification. The variation in artifacts and attributes is not necessarily normally distributed.

If we assume that an initial population in a region shares a single cultural model, then we would expect that models and their expressions as artifacts would tend to become more divergent through the process of design trajectory as the population settles into different areas within the region. We would also expect that social groups that have less interaction that leads to opportunities to share models would express greater variation between them than those that have more contact. Assuming that people in band-level societies have more contact with others in closer proximity, we would expect to see greater variation between more distantly-separated social groups. The model of design trajectory predicts that material culture variation between associated social groups may be subtle and will likely be manifested in one or more artifact attributes rather than the entire artifact. However, if the sample size is small, apparent spatial variation may be a result of sampling rather than the result of a social process.

II. Concordance between Method and Theory

Concordance must be present on several levels (Carr 1985). In this case, the analysis will only be meaningful if concordance exists between the phenomenon (Paleoindian social group structure), the theoretical structure that predicts the phenomenon (that different social groups will manifest differences in artifact design), and the data used to inform the analysis (Paleoindian projectile point bases). I already have shown in Chapter 2 that the social phenomenon should be informed by artifact variability, but it remains to be demonstrated that my data are relevant and the technique is appropriate for uncovering the pertinent structures in the data.

A. Data Concordance

To be relevant, the data (variation in Paleoindian projectile point bases) must have resulted only from the processes that created social differentiation during the Paleoindian period. If the variation could have resulted from other processes, then the conclusions of the analysis will be ambiguous and unsupported. Thus, the data must be limited to Paleoindian points, the variation must have arisen solely from the expressions of the cultural model, and the data must contain the variation that the model of social differentiation predicts. In Chapter 3, I discussed the criteria I used to eliminate fakes and damaged points from the data.

From the discussion of design trajectory in Chapter 2, we saw that regional differences can arise when small changes are made to different design attributes by different people in different places. Thus, in my analysis it was appropriate to look at size and shape attributes, because that is how the regional variation could be manifested.

Some researchers emphasize that shape is best analyzed by examining the entire artifact and that a description of the entire form is critical for an accurate analysis, but the reason it is critical has not been clearly explained. Several methodologies have been developed to simply and completely describe an artifact mathematically, although none seems ideal. Hoffman (1985) used a polar coordinate system that measured the distance from the center of the artifact to points on its the edge. Tyldesley et al. (1985) plotted the circumference of an artifact as a cyclical curve that measures the distance from the centroid of the artifact to a point intersecting the edge. The curve is then characterized as four values (or more depending on the complexity of the curve) and analyzed in a multivariate cluster analysis. The authors noted that artifacts with irregular profiles complicate the analysis, and there is no way to emphasize some attributes over others; all variables are treated equally.

Several researchers have used image capture techniques in which the outline of the artifact is captured with a camera and the image is analyzed with a computer. Kennedy and Lin (1988) described a technique that breaks an artifact into a general shape component and a textural component, although it is unclear how the technique would work on complicated shapes such as projectile points. Tompkins (1993) developed a method based on eigenshapes, in which the coordinates of the outline are expressed as a function. His description of the analysis was not lucid, but it appears that several shape functions are required to characterize a projectile point. These functions are then run through a principal components analysis. Lenardi and Rushmeier (2005) used an image capture method that translates the outline of an artifact into a shape descriptor.

While all these methods for describing the entire shape may more accurately capture shape than the use of ratios and size measurements, it is not clear that they facilitate, enhance, or improve either the development of typologies or the comparison of assemblages. It appears that none has been rigorously tested. In addition, using the entire shape means that changes in shape due to post-depositional damage and resharpening are not eliminated, which affects the concordance between the data and the social processes that created variation. Further, Lenardi (personal communication 2005) indicated that the statistical methods for analyzing 2-dimensional shapes are very complicated and beyond the abilities of most researchers, which runs afoul of my second principle.

B. Analytical Technique

The analytical techniques must differentiate certain dimensions of the data that are pertinent to the research problem. In short, the methodology must be able to discern approximations of the cultural model and the subtle variations of the expressions of that model and parse out temporal and spatial dimensions.

A typology is an appropriate way to discern approximations of cultural models. A typology is a classification system that extracts meaningful structure or an organizing principle from a dataset (Read and Russell 1996), and it is meaningful if it creates an organization of the dataset that informs the research questions for which the typology is created. All classification systems, including typologies, must define an ideational class into which entities can be assigned (Read 1989a). Ideational classes are culturally specific categories and thus correspond to the cultural models I am trying to uncover, while the entities assigned to the ideational classes are simply culturally acceptable expressions of the model (i.e., artifacts). Thus, typologies are an appropriate way to approximate both the cultural variation and cultural model created by a social group. Unfortunately, no consensus has been reached on an appropriate methodology for either discerning classes or assigning artifacts to those classes (Christenson and Read 1977; Aldenderfer and Blashfield 1978; Read 1989a:160).

Ethnographers can query their informants about class definition, but the archaeologist must discern the class from the entities that make up the class, a difficult and potentially circular effort. Since classes are culturally specific, historically contingent, and arbitrary, some researchers assume that typologies are only valid if they coincide with the emic categories employed by the artisans who made the artifact (e.g., Read 1989a:159), which can be problematic because there is not strict isomorphism between the ideational class and the morphology of the material units that are included in the class. By way of illustration, the ideational class “chair” may include stools, benches, and upholstered recliners in one culture but not another.

However, concern for emic classification is a problem only if it is necessary for the research problem, and I submit that it is not necessary for all research problems for which typologies are an appropriate analytical tool. In my model of collective style discussed in Chapter 2, emic classification of significant variation is derived through a calculus based on inherent variation in a sample of observed behaviors. This is in essence a typology, albeit one that is not derived mathematically. Although the archaeologist’s typology likely will be less accurate than one derived by a participant, the processes for creating both kinds of typologies are more or less the same and do not require knowing emic categories beforehand. It is not the articulation of an ideational class that comports with an emic class that is important; it is simply important that the variation exists that can discriminate between groups of people, and it does not matter whether a stool is a chair – it only matters that all stools fall within a distribution of variation for a class. In other words, if I, as an archaeologist, define a stool as "a seat with legs and no back" and a chair as "a seat with legs and a back" and I have artifacts that fall within those class definitions, then it does not matter for the analysis that the artisans who made the stools did not differentiate them from chairs. It is not important for creating the archaeological typology that the artisan perceived the difference between a stool and a chair so long as there are cultural rules for making chair/stools that restrict the membership of the ideational class (ex., "seat with legs, with or without a back"). I discuss this issue because in at least one of my analyses, I run the risk of conflating different tool classes into a single class.

In the end, we must focus on what a typology represents. In my research, the typology is an assessment of collective style derived from a small subset of artifacts. Individuals who looked at these same artifacts 12,000 years ago arguably used generally the same process for evaluating who made the artifacts. The differences are that I am assisted by mathematical techniques, and I can only infer which aspects and attributes are important for evaluating collective style from the artifacts themselves. So my judgment that the color of the artifact likely is not important but the shape of base and symmetry are important is grounded in my personal interpretation of the entire database and the interpretations of other researchers of other collections. In the end, a typology is always open to further refinement and alternative interpretations. It is always a work-in-progress and a heuristic device for informing future efforts.

C. Class Creation

Because I will be inferring ideational classes from groups of artifacts, the method of grouping is crucial. If the technique for grouping artifacts is suspect, then the resultant classes from those groups are also suspect. In this section I will review different ways that ideational classes can be conceptualized and three methods for creating groups:

contingency tables, cluster analysis, and exploratory data analysis. A fourth technique, principal components analysis, is discussed in a later section.

Grouping methods attempt to either reduce internal variation within the group, increase external variation between groups, or both. For artifacts, this is accomplished typically by analyzing the values on variables or attributes, such as length, width, and thickness. There are two general approaches to class creation, which depend on how the variables are treated (Read 1989:171-173). A paradigmatic class is created when all variables are given equal weight for all classes, and a taxonomic class is created when variables are considered sequentially and all variables may not be given equal weight. Cluster analysis creates paradigmatic classes, and contingency tables test the validity of those classes, while exploratory data analysis can create taxonomic classes.

Paradigmatic classification assumes that the sequence for using variables in an analysis does not matter, so that the number of subclasses is dependent only on the number values a particular variable has. For example, if an artifact has three variables, length, width, and thickness, and each variable has two alternative values, long/short, wide/narrow, and thick/thin, then eight paradigmatic classes can be created: long/wide/thick, long/wide/thin, long/narrow/thick, long/narrow/thin, short/wide/thick, short/wide/thin, short/narrow/thick, and short/narrow/thin. Table 5.1 shows a paradigmatic classification.

Table 5.1: A paradigmatic classification.

		Thin	*Thick*
Narrow	*Long*	Narrow/long/thin	Narrow/long/thick
	Short	Narrow/short/thin	Narrow/short/thick
Wide	*Long*	Wide/long/thin	Wide/long/thick
	Short	Wide/short/thin	Wide/short/thick

Taxonomic classification partitions the data at successive stages in the analysis and does not assume that all values will be used in defining a class. For example, a first division in the data may differentiate between long and short artifacts, the second division may partition the long artifacts into wide and narrow, and the third division may divide the long/narrow artifacts into thick and thin. If short artifacts and long/wide artifacts are not divided further, then four classes of artifacts are established: long/narrow/thin, long/narrow/thick, long/wide, and short. Figure 5.1 shows the result of this taxonomic classification. Unlike paradigmatic classifications, taxonomic classifications are affected by the order in which variables are considered (Read and Russell 1996:669).

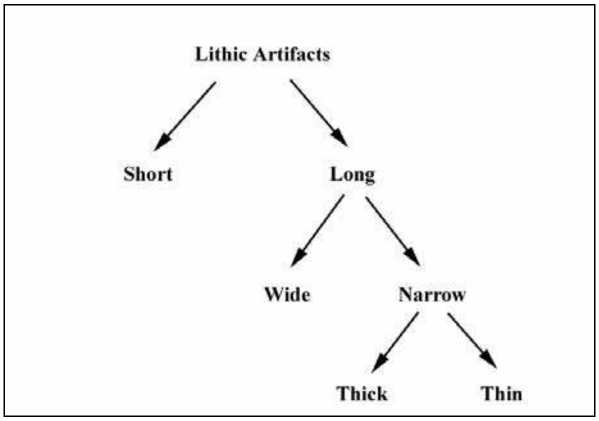

Figure 5.1: The taxonomic classification tree.

Both paradigmatic and taxonomic methods will create classes, but the question of their validity remains. It seems to me that the taxonomic approach more accurately reflects the process of classification that people employ in all domains (e.g., Conklin 1962) and does not assume that all variables are important. Thus, it satisfies my first principle by creating concordance between the theory of classification and the method of classification. The branching nature of taxonomy also seems to capture the process of making a lithic tool, when at each stage of a reduction sequence or a *chaîne opératoire*, the flintknapper has a choice, albeit culturally constrained (e.g., Andrefsky 1998:figure 4.7). In the previous example, the flintknapper may never consider further altering long/wide points into thick and thin versions because it is not culturally appropriate, a situation that is considered in a taxonomic, but not paradigmatic, approach.

Contingency Tables. Albert Spaulding (1953) was the first archaeologist to systematically apply objective methods to the classification of archaeological material in an effort to create replicability of the results. He (1954:392) defined a type as a non-random pattern of association, but this was apparently the result of his choice of the chisquare contingency table as the appropriate analytical method (Doran and Hodson 1975). The use of contingency tables, which assess whether the distribution of variables is different than what would be expected by chance, is actually an assessment of the validity of paradigmatic categories (Read 1989a). The technique has practical limitations once more than a few variables are included and requires the conversion of continuous variables to nominal scale variables, which is not always straightforward (Doran and Hodson 1975:169).

Numerical Taxonomy. A numerical taxonomy assigns members to undefined groups using an algorithm that is some measure of the "closeness" of the members and exclusion of non-members (Doran and Hodson 1975:chapter 7). It captures the concept that a class is a collection of related members. Cluster analysis, which is the mathematical technique for creating a numerical taxonomy, typically links units based on a measure of their similarity, and it appears to come in two basic flavors. Agglomerative hierarchical procedures successively link units into clusters and then merge clusters until a single cluster remains. The analyst can then determine which solution (i.e., the number of clusters) provides the best fit. One of the problems with this technique is that once a unit is linked to a cluster, it cannot be unlinked, so that different solutions cannot be evaluated by removing and reallocating cluster members. In contrast, in k-means cluster analysis the analyst determines initially the number of clusters, and the algorithm arranges and rearranges the units until an optimal solution is found. However, k-means analysis requires an initial estimate of the correct number of clusters, which is usually not known.

Several researchers use clustering methods (e.g., Aldenderfer and Blashfield 1984), although the technique has been criticized as not having a sound theoretical basis (Christenson and Read 1977; Read 1989b:171). Different clustering methods use different criteria and algorithms to create internal cohesion or external differentiation, each of which can lead to different results. As of yet, there is no way to distinguish which technique is best, because the results cannot be verified (Read 1989b). Thus, the cluster analysis can extract structure from data, but there is no way to know what the structure represents; there is no concordance between the statistical theory and the archaeological theory. Despite its theoretical and methodological limitations, some analysts advocate for its continued use in an initial exploration of the data (Alderderfer and Blashfield 1984).

Exploratory Data Analysis. Sophisticated statistical techniques can be seductive, but there is no inherent reason why simpler techniques cannot be just as effective at finding structure in data. Regardless of whether the approach is simple or complex, most analysts agree that the data should be scrutinized as an initial step in any analysis (Whallon 1987). One of the concerns with using statistics that summarize data, such as the mean and standard deviation, is that interesting structures in the data may be obscured. Exploratory data analysis (EDA) avoids this problem by embracing variation in the data and avoiding methods that summarize data. It is more a method of data analysis rather than a single technique (Hartwig and Dearing 1979). EDA "emphasizes a step-by-step visual approach to understanding the structure of each variable, then each pair of variables, and finally, groups of variables" (Hartwig and Dearing 1979:69-70). Visual representations of the data, such as stem-and-leaf plots, histograms, box plots, and scatter plots, allow the location, spread, and shape of the distribution to be characterized. Structure can be revealed by transforming variables, removing outliers, and manipulating the scale and axes of the graphs (Whallon 1987).

In sum, no methodology is totally objective; all methods require the analyst to exercise some discretion. Cluster analysis is suspect, because no concordance between the method and archaeological theory has been demonstrated. Contingency tables and cluster analysis presuppose a paradigmatic classification, but I think a taxonomic classification better characterizes both the processes and results of artifact manufacture and native classification systems. EDA appears to be the better approach and was followed here.

Principal Components Analysis. Unlike cluster analysis, principal components analysis (PCA) has a strong mathematical and theoretical foundation, but it is not strictly speaking a method for clustering data (Shennan 1997:chapter 12). Rather, PCA looks for underlying dimensions in the data that cannot be measured directly (Vierra and Carlson 1981:273) and reduces the information in a large set of variables to a smaller number that should be easier to examine in univariate and bivariate analyses. PCA has the added advantage of tying the PCA variable to the artifact so that each artifact can be analyzed in terms of its PCA score. In the analysis of archaeological data, the first principal component is usually some measure of size, but the subsequent components are sometimes difficult to interpret. By looking at the loading of each variable in the component, both positive and negative (Doran and Hodson 1975:196), some interpretation is possible, although it can be ambiguous. In some cases, a component may have a single high loading variable, in which case the values of that variable sometimes can be used in the analysis in lieu of the component (Whallon 1982). The component values depend on the variables analyzed, and redundant variables that are highly correlated will skew the PCA by over-emphasizing certain variables over others. Read (1982) advocated the initial use of a correlation matrix to identify highly correlated variables and their removal prior to running the analysis. I eliminated variables that had a correlation value that exceeded 0.7. Although this level of correlation may be high for some purposes, such as accurately capturing the shape of an artifact, it was sufficient for my purposes since I am more interested in how the artifacts can be differentiated. In addition, outliers should be eliminated before running the PC analysis, because they will skew the results. JMP has several tests for identifying outliers, and I used the Mahalanobis distance measurements to identify them.

Because shape can be subtle and not easily captured by simple ratios, PCA is a legitimate technique for reducing the dimension of the data and further exploring its structure. Once the principal components are derived, they can be used like any other variable in an exploratory manner. Thus, I used PCA to derive additional variables that were used in the analysis, but the analysis was run after eliminating highly correlated variables and outliers.

D. The Use of Subjective Checks of the Results

One criticism of this method will be my reliance on visually inspecting and subjectively evaluating the results of mathematical divisions of the data to assess their validity. However, it has become clear since Spaulding first tried to create an entirely objective method for creating typologies that the archaeologist always is required to exercise judgment at one or more junctures in the analysis (Doran and Hodson 1975). Individual judgment is necessary because structure can be extracted from random data (Vierra and Carlson 1981), and this effect is compounded in small databases where breaks in the data can create structure when structure does not seem warranted. The question then becomes whether the break is due to a small or skewed sample or represents the variation around a different cultural model. There appears to be no way to resolve this issue mathematically. While there is no denying that humans can discern variation that cannot be easily captured by measurements, ratios, or principal components (Carr 1985), I do not favor the use of individual judgment alone in deriving a typology; it should be used in conjunction with and guided by mathematical techniques.

E. Chronological Structure

I had the option of treating the data as one or several chronological units. The model of design trajectory predicts that variation will become more marked through time, so if the data was treated as a single unit, the lack of variation in earlier forms could swamp and disguise variation in later periods. Thus, it was appropriate to differentiate the data chronologically. I could do that by assuming that certain artifact or attribute forms were chronological markers and then making the first taxonomic division based upon those criteria. Because these point and attribute forms are not dated in Florida, I used analogous forms in dated contexts from other regions of North America. It did not matter for the preparation of the typologies whether these forms were in the correct chronological sequence, only that they represented distinct forms that were used at the same time in all places in the Study Area. Chronological sequence would matter for assessing the validity of the inferences in the model of design trajectory that variation should increase through time (Figure 2.2), however.

I used the attributes “fluting” and “notching” (Figure 5.2) to divide the points into three chronological groups: early (fluted), middle (unfluted/unnotched), and late (unfluted/notched). Table 5.2 shows the number of points in each chronological unit. As a practical matter, there were few late Paleoindian points in the subset used for the typology, so only early and late points were considered here. Thus, the taxonomic divisions in this research based on chronology were fluted and unfluted/unnotched.

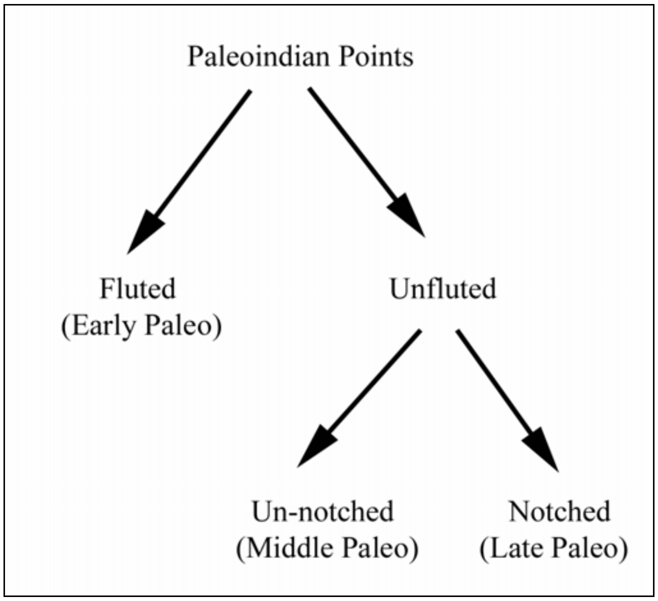

Figure 5.2: The chronological taxonomy.

Table 5.2: This table shows four possible configurations for how the emic typologies could have been conceptualized depending on the relative importance of size or shape in the manufacture of an artifact.

Analytical Approach	*Size*	*Shape*	*Relative number of types*	*Intra-group variation*	*Inter-group variation*	*Intial Data Partitions*
1	Unimportant	Unimportant	Few	Unknown	Unknown	None
2	Unimportant	Important	Some	Size	Shape	Size
2	Important	Unimportant	Some	Shape	Size	Shape
4	Important	Important	Size/Shape	Size/Shape	Size/Shape	

F. Spatial Structure

Unlike the chronological division, the spatial division did not have to be inferred; all of the points in the database came from Florida, and all those used in the typology subset could be attributed to a particular region. The research requires that the artifacts were analyzed in a way that could find spatial distribution of variation if it existed, so the spatial division of the data was appropriate. Based upon my estimates of the size of social groups and the clusters of artifacts in Chapter 3, the discrimination of the spatial distribution into six groups appeared to be a reasonable heuristic division (Figures 3.11, 3.12). However, because there were only three Early Paleoindian points in the Hillsborough region, these were included in the St. Johns region and only five regions were tested. I also tested the data partitions with spatial distributions of five and three regions for the Middle Paleoindian points because they produced a significant number of regional differences.

It is not a reasonable assumption that each chronological division captured only single type of point, however. Rather, it was possible that more than one point type could have been present in each chronological unit. These types could represent temporal changes or functional differences. One way to find these types, if they exist, would be to analyze the chronological unit as a single class. If different classes are identified within the chronological unit, then variation would be analyzed between the spatial units for each class.

G. Size or Shape

As discussed in Chapter 2, some cultural rules set general constraints that will be expressed differently in different conditions, and it is impossible to know how a cultural model may be adapted in any particular circumstance. In addition, groups can differ in which rules they emphasize, and these rules are themselves cultural models. For example, if an individual made a projectile point but needed to fit it in an off-size shaft, he had four options: modify only the point haft to fit the shaft, modify the entire point to both modify the haft but also maintain the overall shape, modify the shaft, or discard the point and start again. The first two options resulted from two different approaches or rules for manufacturing points. The first emphasized the need to maintain the size of the blade of the point, and the second emphasized the need to maintain the overall shape of the point. In the first option, cultural variation may have been more acceptable in the shape but not the size of the artifact, and in the second option the opposite was true. In the second case, Lemonnier (1986) would characterize shape as an inflexible step in the *chaîne opératoire*. Thus, size measures rather than ratio measures may be more important in determining the range of variation for a cultural model, but ratios may be more important for defining spatial variation between groups with different cultural models. Alternatively, one social group may favor smaller tools than another social group, and the shape is relatively unimportant. In that case the individual may have chosen to keep the size of the blade unaltered and reduce the size of the haft of the point thereby changing the shape (i.e., the ratio of certain attributes) of the point. In that instance, shape would define the intra-group variation and size would characterize the inter-group variation.

Based on these alternatives, I made some general predictions about where the inter-group variation should lie and adapted the analyses accordingly. Table 5.2 illustrates these predictions.

The data were analyzed in the following ways based on Table 5.2.

Analysis #1 – neither size nor shape important. The first approach assumed that individuals had wide discretion in modifying both the shape and size of the cultural model. Thus, I made no partitions of the data so that the regional variation, if any exists, will be maintained.

Analysis #2 – shape important. The data in each chronological unit were partitioned based on some measure of the shape of the artifacts, such as angle or minimum basal width/basal ear width.

Analysis #3 – size important. The data in each chronological unit were partitioned based on some measure of the size of the artifacts, such as hypotenuse or minimum basal width.

Analysis #4 – shape and size important. The data in each chronological unit were partitioned based on either size or shape attributes until no further partitions were appropriate.

H. Inter-regional Variation

The hypothesis that Paleoindians in the different regions of the Study Area made artifacts differently was tested both visually and with the use of appropriate statistical techniques, when appropriate. The first partitions were made by using EDA to look for visual evidence in scatter plot and box plot comparisons of geographic separation in attribute values. If such separation was identified, then a one-way analysis of variance (ANOVA) was run on the attribute, assuming the data supported the ANOVA test assumptions.

ANOVA is the appropriate statistical test to run when investigating the relationship of a dependant variable that is interval (i.e., one of the attributes) with an independent or group variable that is categorical with more than two categories (i.e., the geographical divisions) (Iverson and Norpoth 1976; Drennan 1996). ANOVA tests the null hypothesis that the differences in means of the dependant variable in each category of the group variable could have come from the same population or populations with the same mean. The null hypothesis assumes that each of the samples from the independent variable were taken randomly from a single population, and ANOVA compares the variation in the inter-group means with the variation in the intra-group. An *F-statistic* is used to estimate the probability that the samples were taken from the same population. An *F-statistic* greater than 1.0 means that the inter-group variation is greater than the intra-group variation.

ANOVA requires several initial assumptions about the spread of the data. First, the observations in each group must be independent. In this research, the individual points were the observations, and they were independent. Second, the sample must be randomly drawn from the population, which I assumed in this case. Third, the variance of the dependent variable must be approximately equal in each group (otherwise the mean is a questionable summary statistic), although the method is somewhat robust in the face of violations of this assumption. Levene's test of homogeneity of variance is a test of equal variances, and I used it to test the assumption of homogeneity of variances. It tests the null hypothesis that the variances are equal at a significance level of $\alpha = .05$ level. If the variances are not equal, then Welch's ANOVA for unequal variances is the recommended test, which I used in that instance. Fourth, the method assumed that the populations in each category were normally distributed, which was assessed by looking at stem-and-leaf plots or histograms and running the Shapiro-Wilk test for goodness-of-fit. If the entire population or any of the regional subpopulations was not normally distributed, then the data was transformed until they satisfied the Shapiro-Wilk test or I determined that they could not be transformed, in which case no ANOVA was run on the attribute. If the test assumptions were met, the standard ANOVA was run on the attributes and PCs.

ANOVA simply establishes the probability that one or more of the means of the samples were significantly different at the $\alpha = .05$ level, but it does not identify the sample means that are significantly different. Several post-hoc tests can be used to determine which means are significantly different, and some are more conservative than others, meaning they are less likely to produce Type I errors (falsely rejecting the null hypothesis). I considered several post-hoc tests, including the Bonferroni test, and decided that the Tukey-Kramer HSD (Honest Significant Difference), which produces a q-statistic that tests the probability that the samples with the largest and smallest means came from the same population, was the most appropriate. In some instances, the Tukey-Kramer test did not discriminate regions even though the ANOVA showed a significant result. I used the Tukey-Kramer HSD test if the ANOVA produced a significant result.

In Chapter 2, I stated that the distribution of the variation of a cultural model and the archaeological subset of that distribution was not necessarily normally distributed. Thus, ANOVA, which requires a normal distribution, may seem like an inappropriate statistical test for finding differences in those models. However, I tried to be conservative in my analysis, and ANOVA is more robust than non-parametric methods. Further, the use of ANOVA limits the number of variables that can be tested since only those with normal distributions or those that can be normalized are appropriate for the test. By using ANOVA I only tested a limited number of variables with the most robust statistical test under the circumstances, thereby increasing my confidence in the results.

III. Methodology

My methodology resulted in the creation of taxonomic groups by employing exploratory data analysis to find multi-modal variation in the attributes of unmodified bases of Paleoindian points, including interval and nominal measurements, ratios, and principal components.

To some degree, my methodology followed the method developed by Read (1982) and others (Christenson and Read 1977; Read and Russell 1996). Read advocated a step-wise approach to the creation of taxonomies of lithic artifacts that embraces the simpler analytical approach of exploratory data analysis. He parsed artifacts by looking for “natural” breaks in the distribution of attributes and then checking the validity of the grouping by separating the points in corresponding groups and looking at the results. If the differentiation looked good, then each of these groups was further analyzed in the same process. By repeating the process until no further separation was appropriate, the method created a typology with taxonomic classes.

It appears that this approach has not been used on a database or a problem like the one involved in this research, however. Read differentiated a small set of artifacts from a single site that appear to display clear morphological differences. In contrast, my database has approximately 500 artifacts from an unknown number of sites and a time spread of approximately 1600 calendar years. Thus, I made several modifications to Read's method.

A. Summary of the Methodology

These are the specific methodological steps. All statistics and graphs will be prepared using the JMP Statistic program:

1. Identification of the data subset that will be used in the typology. Only points with attribute ratings of "good" and specific location information will be used. These points were given a temporal (early, middle, late) and spatial (Chipola (C), Aucilla (A), Suwannee (SS), Santa Fe (SF), St. Johns (SJ), Hillsborough (H)) designation.
2. Univariate analysis. Summary statistics, histograms, box-plots, and stem-and-leaf diagrams were prepared for each variable and examined for multimodal distributions within each chronological unit. Promising variables, which were those with multimodal distributions, were used to partition the data following a taxonomic approach, in which different variables were examined at each partition.
3. Bivariate analysis. Both the standardized and unaltered values of the attributes were compared in scatter plots to look for patterns in the distribution. If patterns emerged, then the data were again analyzed following the taxonomic approach.
4. Principal Components Analysis. JMP has an outlier subroutine, which identifies outliers in preparation for the PCA analysis. Once the outliers were removed, the attributes were then run through a correlation matrix to remove redundant variables, and a PCA was run on the remaining variables. Components with eigenvalues greater than approximately .95 were added to the variables in the analysis, and the univariate and bivariate analyses were run again.
5. A uniform set of 21 or 22 attributes (depending on whether three or four principal components were saved) was run on all combinations of the data. These included nine measurements (minimum basal width (minbw), height of minimum basal width (hmbw), basal ear width (bew), height of basal ear width (hew), ear size (earsize), hypotenuse

(hypo), angle (angle), average thickness (avt), standard thickness (stdt), basal concavity (bcv)), nine ratios (minimum basal width/basal ear width (mbw/bew), height of minimum basal width/basal ear width (hmbw/bew), basal ear width/ height of basal ear width (bew/hew), minimum basal width.basal ear width/hypotenuse (mbw.bew/hyp), hypotenuse/basal ear width (hyp/bew), angle/basal ear width (ang/bew), basal ear width/basal concavity (bew/bcv), minimum basal width/height of minimum basal width (mbw/hmbw), hypotenuse/height of basal ear width (hyp/hew)), and the principal components.

6. The artifacts in the chronological units were analyzed with the tools described above to determine whether classes within the units exited. If a separate class existed, then the artifacts in that class were further analyzed using ANOVA to determine whether spatially discrete and statistically significant variation existed.

7. The criteria for judging the validity of the effort was whether the classes "make sense" by looking at the variation within each class. The "does it make sense" standard meant that a partition of the data includes points that appeared to fall within the same class but did not include points that could form their own class. If an additional class appeared warranted, the variable distributions for that class were reviewed to see whether there were natural breaks that justified further partition of the data. Clearly, this exercise was somewhat subjective, and the results will be arguable, but I will be able to support the decisions through a combination of objective tools and subjective assessment. Thus, if the ANOVA analysis showed a significant difference between groups but the actual means differed by a seemingly insignificant amount (ex. < 1mm), then that small difference was considered in the evaluation of the significance.

IV. Inferences from the Results

The results were tabulated by region, regional configuration, and data partition (i.e., Analysis #1-4) to show which attributes were significantly different in the ANOVAs and the Tukey-Kramer tests. In addition, the means for those attributes were presented in a table so that the degree of significant variation between regions can be evaluated. The number of significant ANOVAs was totaled by data partition and regional configuration in a series of tables. The total number of significant ANOVAs for all data partitions in the six region configuration (and five region configuration for the Early Paleoindian points) was used as an index of differentiation, which was used to infer the relative strength of social group integration or segregation, and were plotted spatially to illustrate the pattern of differentiation.

The intent of the analysis is not simply to list the differences but also to describe what the results mean. To that end, I translated the relative differences in the mean values of the significant attributes into descriptions of the relative differences between the bases of the points. For example, the values were translated into statements like "the bases for the Chipola region are generally narrower, with straighter sides and smaller ears." Sets of four or more significant ANOVAs between two regions in the same data partition and regional configuration were considered as a single attribute-cluster, which likely captured more complex shape and size differences. These clusters are tabulated and described in separate tables.

The following general considerations apply to all results:

1. All significant ANOVAs involve either pairs of regions or sets of regions. Thus, the significance of any particular result must always be considered as the relative difference between regions.
2. A significant ANOVA is simply a test of difference between mean values of an attribute. If the attribute is transformed in order to conduct the test, the significance of the result lies in the actual mean of the attribute rather than the mean of the transformed values. Thus, the mean of the untransformed attribute was always be listed in the tables and referred to in the discussion.
3. A result was meaningful if the ANOVA was significant and the difference in means was consequential, i.e., it would have been noticeable by someone. This was a subjective evaluation and was different for each attribute. For example, a difference of 2 mm in the basal width of a point may not have been noticeable but a 2 mm difference in the length of an ear may have been. In general, smaller actual differences are more noticeable if they are seen in contrast to another variable. For example, the difference between a 2 mm and 3 mm basal concavity was probably noticeable, while that difference in the basal width probably was not.
4. The statistical tests produced three levels of confidence in the inferences. The lowest level of confidence was inferring the absence of social groups from the absence of

significant ANOVAs. The next higher level was inferring from significant ANOVAs but no significant Tukey-Kramer results, and the highest level was inferring from significant Tukey-Kramer results.

5. Confidence in the results increased if the results were replicated. Single ANOVAs that were present in only one regional configuration and one data partition presented the lowest level of confidence in the result. ANOVAs that were replicated in additional regional configurations in the same data partition had a higher level of confidence. ANOVAs that were replicated in additional regional configurations in different data partitions had the highest level of confidence.

6. ANOVAs in Analysis #1 indicated the difference had general applicability to all the points in the affected regions since Analysis #1 had no initial data partitions. ANOVAs in the other analyses indicated the difference had more specific applicability, which depended on how the data was initially partitioned.

7. A greater number of significant ANOVAs between regions indicated a higher degree of social group segregation. A lower number of significant ANOVAs indicated a higher degree of social integration.

8. A set of four or more ANOVAs was called an attribute-cluster. Depending on which ANOVAs were significant, an attribute-cluster can represent a more complex array of differences.

9. Significant ANOVAs could represent the use of different kinds of points by the same group in different regions. Thus, what looked like social differentiation may be functional differentiation.

10. It was possible in all cases that the results were spurious or the tests were not sensitive enough to find social groups that were present.

Patterns of Significant ANOVAs

Regional organization was inferred from the pattern of the significant ANOVAs, and each pattern led to one or more inferences. The appropriate inferences that could be drawn from the pattern are listed in Table 5.3 and the level of confidence in the inferences is discussed.

Table 5.3: A summary of alternative inferences that can be drawn from different analytical results. The resolution of the alternatives is also presented.

Result	Alternative Inference #1	Alternative Inference #2	Resolution
No Significant ANOVAs in either chronological unit.	A single social group was present.	More than one social group was present but they did not produce different point bases.	It will be difficult to differentiate between these inferences without more information, such as tests on other artifacts. In any event, an inference of "one social group" is relatively weak.
No significant ANOVAs in the Early unit but several in the latter unit.	The early period had stronger regional integration which changed through time to produce stronger regional segregation in the latter period.	All social groups used the same cultural model for a point form in the early period, even though they continued to maintain their separate identities.	It will be difficult to distinguish between these inferences without more data that looks for differences in other artifacts. The first inference is predicted by the model of design trajectory.
Significant ANOVAs in the Early unit but not in the latter unit.	The social structure changed to produce stronger integration of social groups in the latter period.	All social groups incorporated a new cultural model for a point form into their cultural repertoires, even though they continued to maintain their separate identities.	It will be difficult to distinguish between these inferences without more data that looks for differences in other artifacts. The first inference is not predicted by the model of design trajectory.
Significant ANOVAs in both units.	The social structure was segregated in both periods, which may indicate continuity of social group identity through time depending on the results.	None	An inference of continuity would be strongest if the same attributes had significant ANOVAs in the same regions in both units. Then we could infer the temporal stability of a cultural model for making points in a particular way, which is predicted by the models.
The index of difference was the essentially the same for all regions.	There was strong social group segregation.	There was strong social group integration.	Each inference depends on how many of the total number of ANOVAs were significant. If the percentage of significant ANOVAs was low, then we can assume the groups were integrated. If the percentage was high, then we can assume they were segregated.
The index of difference varies significantly between regions.	Regions with the highest indices were centers of strong social group segregation, and regions with lower indices were social groups that shared cultural models with both of the strongly segregated groups.	Regions with the highest indices were centers of strong social group segregation, and regions with lower indices were areas of territorial overlap between those regions.	Each inference would leave a different pattern of distribution in attribute values in the intermediate area. If a separate social group occupied the area, then the distribution will be unimodal. If the area was shared by two groups, then the distribution will be bimodal.

The index of differentiation is an indication of the degree of social integration: the higher the index, the higher the level of social differentiation. The index could have two general results.

<u>The index of differentiation was essentially the same for all regions</u>. This result could be inferred to mean (a) there was strong social group differentiation, or (b) there was strong social group integration. Each inference depends on how many of the total number of ANOVAs were significant. If the percentage of significant ANOVAs was low, then we can assume the groups were integrated. If the percentage was high, then we can assume they were segregated.

<u>The index of difference varies significantly between regions</u>. This result could be inferred to mean (a) regions with the highest indices were centers of strong social group segregation, and regions with lower indices were social groups that shared cultural models with both of the strongly segregated groups, or (b) regions with the highest indices were centers of strong social group segregation, and regions with lower indices were areas of territorial overlap between those regions. This result concerns the interpretation of a distance-decay pattern of difference in which regions with low indices are bracketed by two areas with high indices. The inferences depend on whether a separate cultural group lived in the intermediate region. The first inference means that the intermediate group adopted aspects of the artifact design from both of its neighbors. The second inference means there was no intermediate group in the region and the area was used by both of the strongly segregated groups.

Each inference would leave a different pattern of distribution in attribute values in the intermediate area. If a separate social group occupied the area, then the distribution will be unimodal. If the area was shared by two groups, then the distribution will be bimodal. We can resolve this question by looking at a histogram and stem-and-leaf plot of the distribution of a variable in the intermediate area that is significant between the highly segregated groups. For example, if the Chipola and Santa Fe regions were significantly different in basal ear width, we can look at the histogram and stem-and-leaf plot for basal ear width in the Aucilla region. If it is unimodal, the Aucilla was likely a separate group that shared cultural models with both the groups in the Chipola and Santa Fe regions. If it is bimodal and the peaks approximate the means of the Chipola and

Santa Fe regions, then we can infer the Aucilla was an overlap area. The strength of the interpretation based on the distribution of the attribute values is greater if the sample size is large.

V. Summary

In this chapter, I reviewed the methodology and its justification. By using only the bases of the points, I ensured that an unmodified cultural model is the focus of the analyses. After reviewing different approaches to the creation of a typology, I concluded that a paradigmatic taxonomy developed through exploratory data analysis was most appropriate for these data. I used ANOVA and Tukey-Kramer statistical tests because they are more robust than non-parametric tests and thus will bolster the inferences made from the results.

I employed several techniques to maximize the opportunity to discern regional variation. I made an initial partition of the data based on chronology and four additional partitions based on attributes that measure size, shape, and a combination of size and shape. For the Early Paleoindian points, I also tested the all of the data partitions for points with robust flutes. I tested the Early Paleoindian points in a five region configuration and the Middle Paleoindian points in six, five, and three region configurations. The combination of several regional configurations, different initial data partitions, and multiple attributes increased the likelihood that the method would find regional variation if it existed. Finally, I reviewed the inferences that could be drawn from different analytical results and discussed how alternative inferences could be resolved.

CHAPTER 6

RESULTS

In this chapter I present the results of the analyses. In the first and second sections I describe the analyses of the Early and Middle Paleoindian chronological units, respectively. In each section, I describe the results of the four analytical approaches outlined in the last chapter (Table 5.1). In the Early Paleoindian chronological unit, all analyses were also run on the subset of points with robust flutes. In the Middle Paleoindian chronological unit, ANOVAs were run on two additional regional configurations. In the five-region configuration, the Suwannee and Santa Fe regions were combined. The three-region configuration combined the Suwannee-Santa Fe, Chipola-Aucilla, and Hillsborough-St. Johns groups. The Early Paleoindian unit produced five significant ANOVAs out of a possible 195 tests. The Middle Paleoindian unit produced 122 significant ANOVAs out of a possible 332 tests. These results are in accord with the predictions of the models that regional variation should become more apparent through time.

The analytical descriptions that follow only include the ANOVA results that were significant at the $\alpha = .05$ level. Each subsection presents the number of points in the analytical unit and their geographical distribution, a taxonomic tree-diagram showing how the data was partitioned, the results of the principal components (PC) analysis, and a description of the higher loading variables for each PC that was saved. The results for each of the four analyses are presented in two summary tables. The first table for each section summarizes the significant ANOVA and Tukey-Kramer results, and the second lists the means for the attributes that showed significant differences. The means of the applicable attribute, listed in parentheses following the names of the significantly different regions, were rounded to the nearest degree for the angle attribute, two decimal places for the principal components and ratio attributes, the nearest square millimeter for earsize, the nearest tenth of a millimeter for average thickness, basal concavity, standard thickness, and height of basal ear width, and the nearest millimeter for rest of the parameters.

The statistical tables and figures are included in Appendix B. A more detailed description of each significant result is included in Appendix C and includes each significant ANOVA with the results of the post-hoc Tukey-Kramer HSD test, and, if applicable, the results of significant Levene's test for unequal variances and a description of any transformations of the data.

I. The Early Paleoindian Points

The early chronological unit contained a total of 107 points. Table 6.1 shows the geographic distribution of these points. Seventy-one of the Early Paleoindian points had robust flutes, and 36 had weak flutes. Because there were only three Early Paleoindian points from the Hillsborough region, which is too small in number for a meaningful ANOVA, these were incorporated into the St. Johns region. For each analysis, I looked at the entire Early Paleoindian unit and then at a subset of these points that had robust flutes. My initial efforts differentiated three classes of points based on shape: spatulate-shaped, narrow, and "other," which is a catchall category that contained the rest. But upon further examination, it appears that the "other" class was probably reworked spatulate forms. Figure 6.1 shows points from the spatulate and other categories.

Table 6.1: The regional distribution of Early Paleoindian Points. * The Hillsborough group was included in the St. Johns group for the analysis in the Early Paleoindian chronological unit because of the small sample size.

Chipola	*Aucilla*	*Suwannee*	*Santa Fe*	*St. Johns*	*Hillsborough**
20	15	34	22	13	3

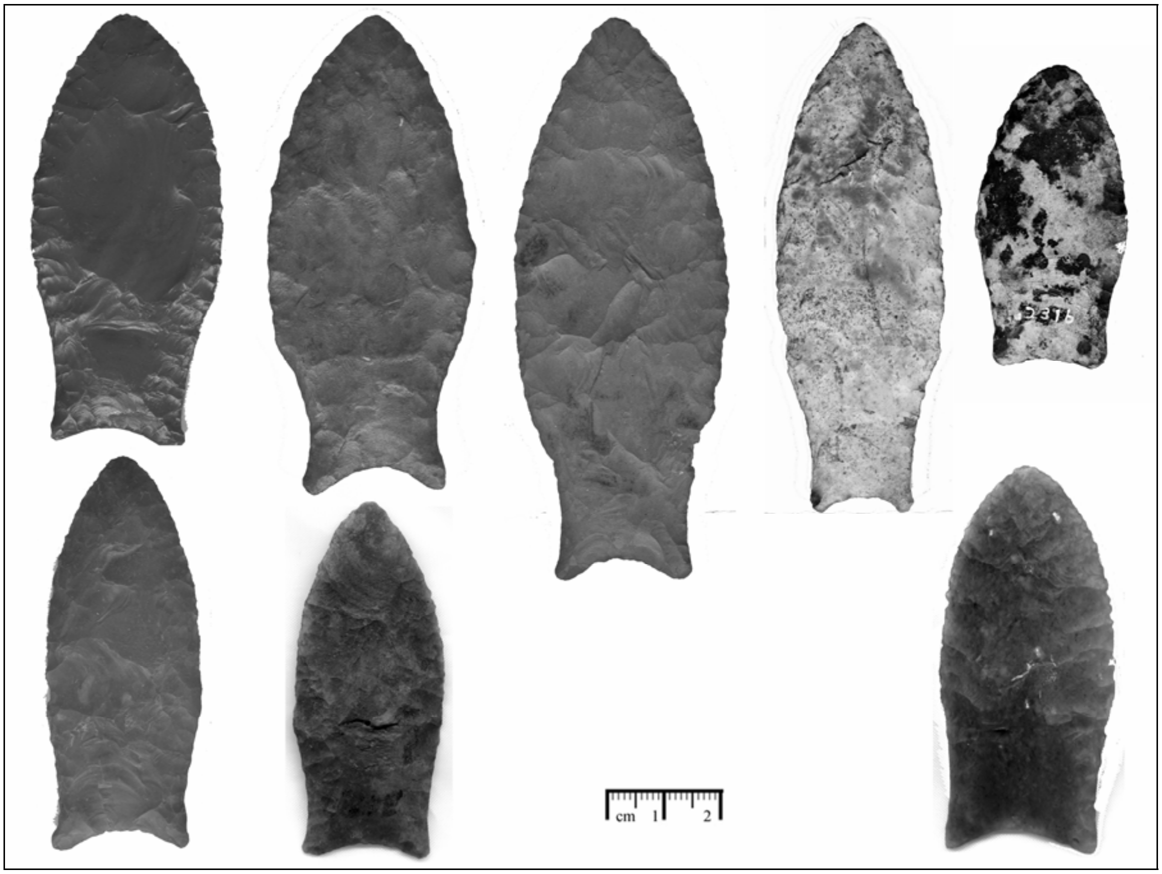

Figure 6.1: The variety of Early Paleoindian points. It appears that points in the bottom row may simply be resharpened versions of the more spatulate forms in the top row.

A. Analysis No. 1: neither size nor shape important

In this analysis, I looked at the regional variation with no initial data partitions. I performed a PC analysis on the entire Early Paleoindian database, and three principal components were saved after removing redundant variables and 10 outliers (Table B.6.1). PC 1 has higher loadings on the hypotenuse, PC 2 is mostly influenced by the minimum basal width/basal ear width ratio and the standard thickness, and PC 3 is some measure of basal concavity, angle, and average thickness. None of the attributes or PCs in the Early Paleoindian data showed any significant difference in the ANOVA analyses. Table 6.2 presents the distribution of the points without and with robust flutes.

Table 6.2: The distribution of Early Paleoindian points without and with robust flutes.

	Chipola	**Aucilla**	**Suwannee**	**Santa Fe**	**St. Johns**
All	20	15	34	22	16
Robust	13	11	18	17	12

Points with Robust Flutes I also examined the subset of 71 of the Early Paleoindian points that included only those with robust flutes. The principal components analysis produced four components with eigenvalues that exceeded 0.9 (Table B.6.2). Hypotenuse is the highest loading factor on PC 1, standard thickness and the minimum basal width/basal ear width are the highest loading factors on PC 2, angle has the greatest influence on PC 3, and basal concavity has the greatest influence on PC 4.

Tables 6.3 and 6.4 summarize the results of Analysis No. 1. The detailed description of the results is in Table C.6.1.

Table 6.3: Summary chart of the significant ANOVA results and Tukey-Kramer tests for Analysis #1 for the Early Paleoindian points with and without robust flutes. Key: PC (principal component). The letters following the attribute were taken from the Tukey-Kramer tables. Different letters indicate significant differences.

	Chipola	**Aucilla**	**St. Johns**	**Santa Fe**	**Suwannee**
All					
Robust			PC3 B	PC3 A	

Table 6.4: Summary chart of the significant ANOVA results and Tukey-Kramer tests for Analysis #1 for the Early Paleoindian points with and without robust flutes. Key: PC (principal component). The mean values follow the attribute names. .

	Chipola	**Aucilla**	**St. Johns**	**Santa Fe**	**Suwannee**
All					
Robust			PC3 -0.62	PC3 0.51	

B. Analysis No. 2: shape important

In this analysis, the initial division is based on shape. Two class divisions were made from the Early Paleoindian points based on the distribution of the lateral index attribute: straight-sided and curved-sided. Table 6.5 presents the distribution of the points without and with robust flutes. Figure 6.2 is the taxonomic tree showing this partition. The lateral index is a measure of the amount of indentation on the side of the point. Points that are straight-sided have a lateral index of 0, which means they have no indentation. As an interesting consequence of the ratio, points with a high index have a long side and very small indentation, which means they are almost straight, and I included these two disparate measures together. I made the cut-off at 30:1, which means that the length is 30 times the size of the indentation. The remaining points have a curved side, meaning they show some degree of indentation along the lateral margins of the base. Figure B.6.1 is a histogram of lateral index showing how the points were partitioned. Figure 6.3 shows examples of the straight-sided and curve-sided points.

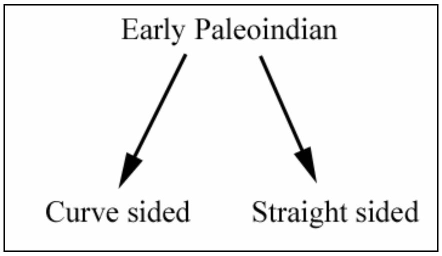

Figure 6.2: Taxonomic tree for Analysis #2 of the Early Paleoindian points.

Table 6.5: The distribution of straight-sided and curve-sided Early Paleoindian points in Analysis #2. For the analysis in this section the Hillsborough group was included in the St. Johns group because of the small sample size.

		Chipola	**Aucilla**	**Suwannee**	**Santa Fe**	**St. Johns**
All	***Straight***	5	6	12	7	5
	Curved	15	9	22	15	11
Robust	***Straight***	5	5	6	5	5
	Curved	8	6	12	12	7

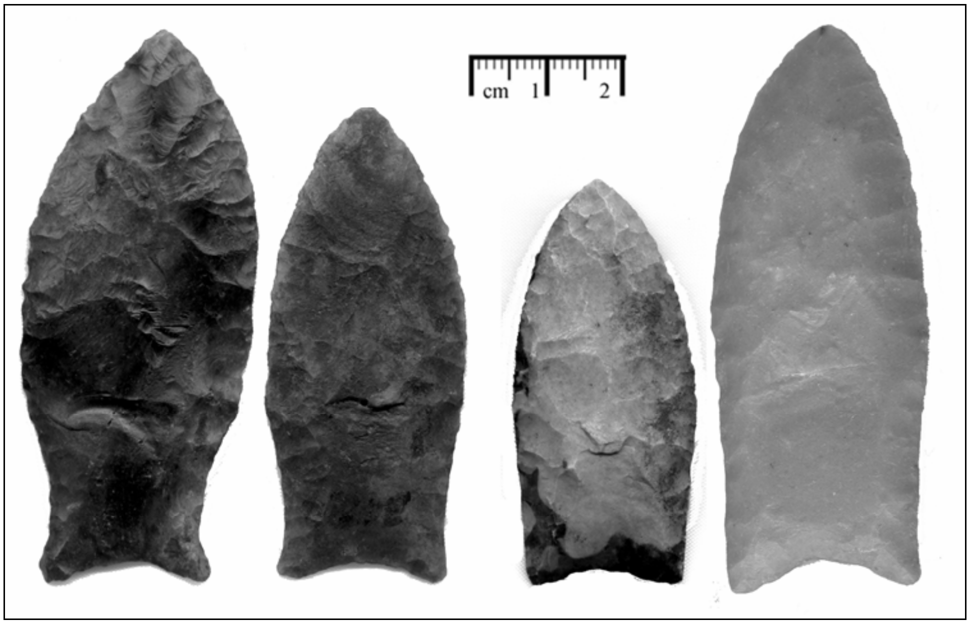

Figure 6.3: Curve and straight-sided Early Paleoindian points. From left to right: Santa Fe, Oklawaha, Silver Spring, Suwannee near Luraville.

The curve-sided points produced four PCs (Table B.6.3). PC 1 was most influenced by hypotenuse, PC 2 by minimum basal width/basal ear width, PC 3 by basal concavity and standard thickness, and PC 4 by angle. No geographic division was apparent in either the curve-sided or straight-sided subsets.

Robust Early Paleoindian Straight-sided and Curve-sided Points. The subset of 71 Early Paleoindian points with robust flutes was then divided into straight and curve-sided points using the same criteria employed for the entire dataset. Although the sample sizes were small, I created a principal components analysis on the curve-sided points, which produced four components (Table B.6.4). PC 1 was most influenced by hypotenuse, PC 2 by basal concavity, PC 3 by angle, and PC 4 by standard thickness. The ANOVA on average thickness for the curve-sided points showed significant results.

Tables 6.6 and 6.7 summarize the results of Analysis No. 2. The detailed description of the results is in Table C.6.2.

Table 6.6: Summary chart of the significant ANOVA results and Tukey-Kramer tests for Analysis #2 for the Early Paleoindian points with and without robust flutes. Key: Avt (average thickness). The letters following the attribute were taken from the Tukey-Kramer tables. Different letters indicate significant differences.

		Chipola	**Aucilla**	**St. Johns**	**Santa Fe**	**Suwannee**
All	***Straight***					
	Curved					
Robust	***Straight***					
	Curved	Avt B	Avt A			

Table 6.7: Summary chart of the significant ANOVA results and Tukey-Kramer tests for Analysis #2 for the Early Paleoindian points with and without robust flutes. Key: Avt (average thickness). The mean values are listed after the attribute.

		Chipola	**Aucilla**	**St. Johns**	**Santa Fe**	**Suwannee**
All	***Straight***					
	Curved					
Robust	***Straight***					
	Curved	Avt 6.2mm	Avt 6.6mm			

C. Analysis No. 3: size important

In this analysis, the initial division is based on size. I used maximum width to differentiate the points even though I found that in some instances the attribute is affected by reworking the point. However, I used the attribute to distinguish very narrow points, and in this instance I think the attribute captured differences in point size that are related to the original design. After looking at the assemblage, it was apparent that some of the points were significantly smaller than the others, and this is seen in the histogram of maximum width (Figure B.6.2). The stem-and-leaf plot showed that there is a natural break at 21 mm, and I made the break at that point. Table 6.8 shows the distribution of the small and large points with and without robust flutes. Figure 6.4 is the taxonomic tree, and Figure 6.5 is a sample of small early Paleoindian points.

Table 6.8: The distribution of small and large early Paleoindian points with and without robust flutes with maximum width <21 mm in Analysis #3.

		Chipola	**Aucilla**	**Suwannee**	**Santa Fe**	**St. Johns**
All	***Small***	1	1	5	2	2
	Large	19	14	29	20	14
Robust	***Small***	1	1	2	2	2
	Large	12	10	15	16	10

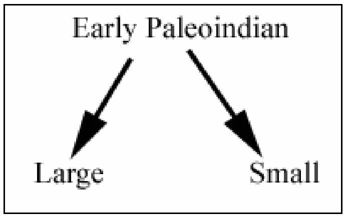

Figure 6.4: Taxonomic tree for Analysis #3 for the Early Paleoindian points.

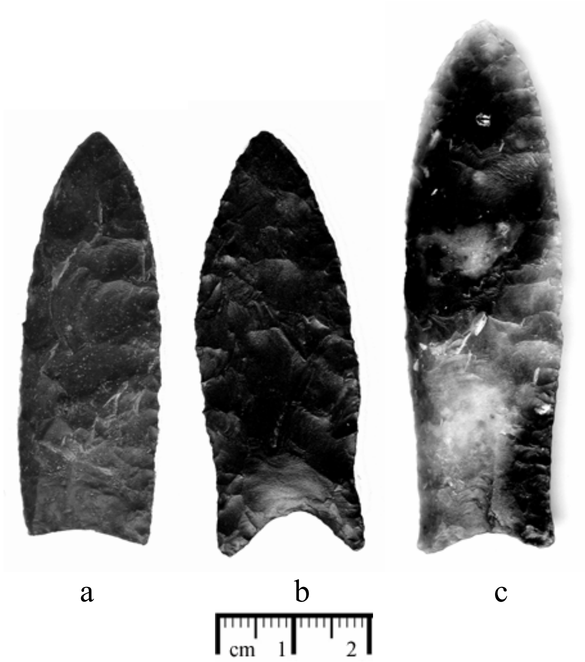

Figure 6.5: Three small Early Paleoindian points. (a) Santa Fe River, (b) Fanning Springs on the Suwannee River, (c) Silver River in the St. Johns River region.

I ran a PC analysis on the subset of large Early Paleoindian points, which created three components (Table B.6.5). The first PC has a high loading for hypotenuse and lesser loadings for angle and average thickness, PC 2 has higher loadings for standard thickness and minimum width/basal ear width, and PC 3 has higher loadings for earsize and basal concavity. The subset of small points was too small to run a meaningful PC analysis. None of the attributes in the subset of large points had a significant ANOVA result.

Robust Early Paleoindian Large Points. I also looked at the robust subset of Early Paleoindian points and divided them along the same dimensions of maximum width. The sample of small robust points is too small to draw any conclusions about regional differences.

A principal components analysis was done on the subset of large robust points and four principal components were saved. The principal components analysis (Table B.6.6) produced three components. PC 1 had its highest loading on hypotenuse, PC 2 was strongly influenced by standard thickness and to a lesser degree by minimum basal width/basal ear width, and PC 3 by angle and to a lesser degree by minimum basal width/basal ear width and basal concavity. None of the attributes produced a significant ANOVA.

D. Analysis No. 4: shape and size important

In the fourth analysis, I made the first partition based on size and the second partition based on shape. A third partition of the large, straight-sided points was made on the depth of basal concavity. Figure 6.6 is the taxonomic tree for this analysis.

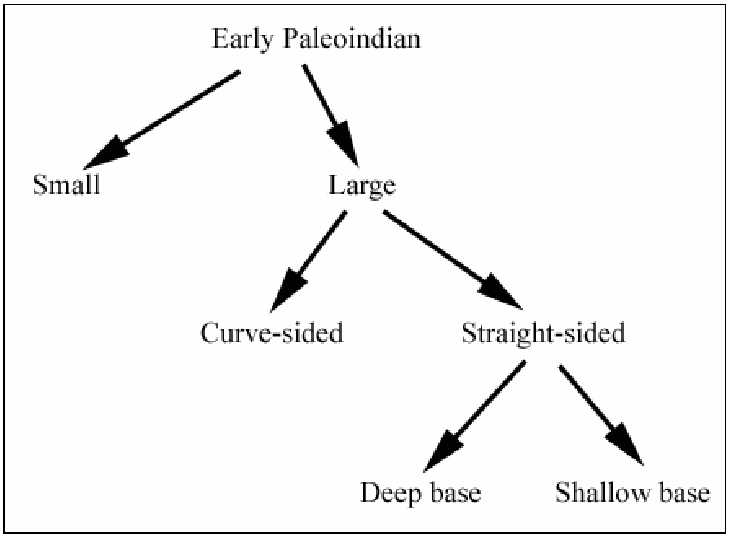

Figure 6.6: Taxonomic tree for Analysis #4 of the Early Paleoindian points.

1. First Division – Small and Large Points. Since the differences between large and small points were so dramatic and could arguably reflect a functional difference, I made the same division based on size used in Analysis No. 3.
2. Second Division – Large Curve-sided and Straight-sided Points. The subset of large points was then divided between straight-sided and curve-sided points based on the histogram of lateral index (Figure B.6.1). This is the same division that was done in the second analysis. Table 6.9 shows the geographical distribution of these points.

Table 6.9: The distribution of curve-sided and straight-sided, large, Early Paleoindian points in Analysis #4 with the division between the two classes based on the lateral index.

		Chipola	**Aucilla**	**Suwannee**	**Santa Fe**	**St. Johns**
All	***Straight***	5	5	10	5	5
	Curve	14	9	19	15	9
Robust	***Straight***	5	4	4	5	5
	Curve	7	5	12	11	5

I ran principal components analyses on both subsets. The curve-sided points produced four PCs (Table B.6.7). PC 1 was most influenced by hypotenuse, PC 2 by standard thickness, PC 3 by minimum basal width/basal ear width, and PC 4 by basal concavity and earsize. The straight-sided points produced three PCs (Table B.6.8). PC 1 was most influenced by hypotenuse, PC 2 by standard thickness, and PC 3 by earsize. The ANOVA showed no significant differences on the straight-sided points, but average thickness on the curve-sided points was significantly different. The detailed description of the results is in Table C.6.3.

Robust Flutes. I also looked at the subset of points with only robust flutes. The number of points was too small to perform an ANOVA on the straight-sided points. I ran a PC analysis (Table B.6.9) on the curve-sided points, which produced three components. PC 1 is mostly influenced by hypotenuse and minimum basal width/basal ear width, PC 2 is mostly influenced by basal concavity and earsize, and PC 3 is mostly influenced by angle and standard thickness. The ANOVA confirmed significant differences for average thickness and PC 3 in the curve-sided points.

The results are summarized in Tables 6.10 and 6.11. The detailed description of the results is in Table C.6.4.

Table 6.10: Summary chart of the significant ANOVA results and Tukey-Kramer tests for Analysis #4 for the Early Paleoindian points with and without robust flutes. Key: Avt (average thickness), PC (principal component). The letters following the attribute were taken from the Tukey-Kramer tables. Different letters indicate significant differences.

		Chipola	**Aucilla**	**St. Johns**	**Santa Fe**	**Suwannee**
All	***Large-Straight***					
	Large-Curved			Avt A	Avt B	
Robust	***Large-Straight***					
	Large-Curved			Avt A	Avt B PC3 B	PC3 B

Table 6.11: Summary chart of the significant ANOVA results and Tukey-Kramer tests for Analysis #4 for the Early Paleoindian points with and without robust flutes. Key: Avt (average thickness), PC (principal component). The mean values follow the attributes.

		Chipola	**Aucilla**	**St. Johns**	**Santa Fe**	**Suwannee**
All	***Large-Straight***					
	Large-Curved			Avt 7 mm	Avt 6 mm	
Robust	***Large-Straight***					
	Large-Curved			Avt 7 mm	Avt 6 mm PC3 -0.99	PC3 0.42

3. Third Division – Large- Straight-sided Deep and Shallow-Based Points. The straight-sided points were divided into deep and shallow-based point classes. Figure B.6.3 is a histogram of the basal concavity of this subset of points. This division also captures a qualitative measure of the point tip. The deeper-based points have pointier tips

than the shallower-based points (Figure 6.7). The shallower-based points are likely classic Clovis points. The geographic distribution is shown in Table 6.12. The sample was too small to run a meaningful ANOVA.

Table 6.12: Distribution of the deep and shallow-based Early Paleoindian points in Analysis #4.

	Chipola	*Aucilla*	*Suwannee*	*Santa Fe*	*St. Johns*
Shallow	3	3	6	3	4
Deep	2	2	4	2	1

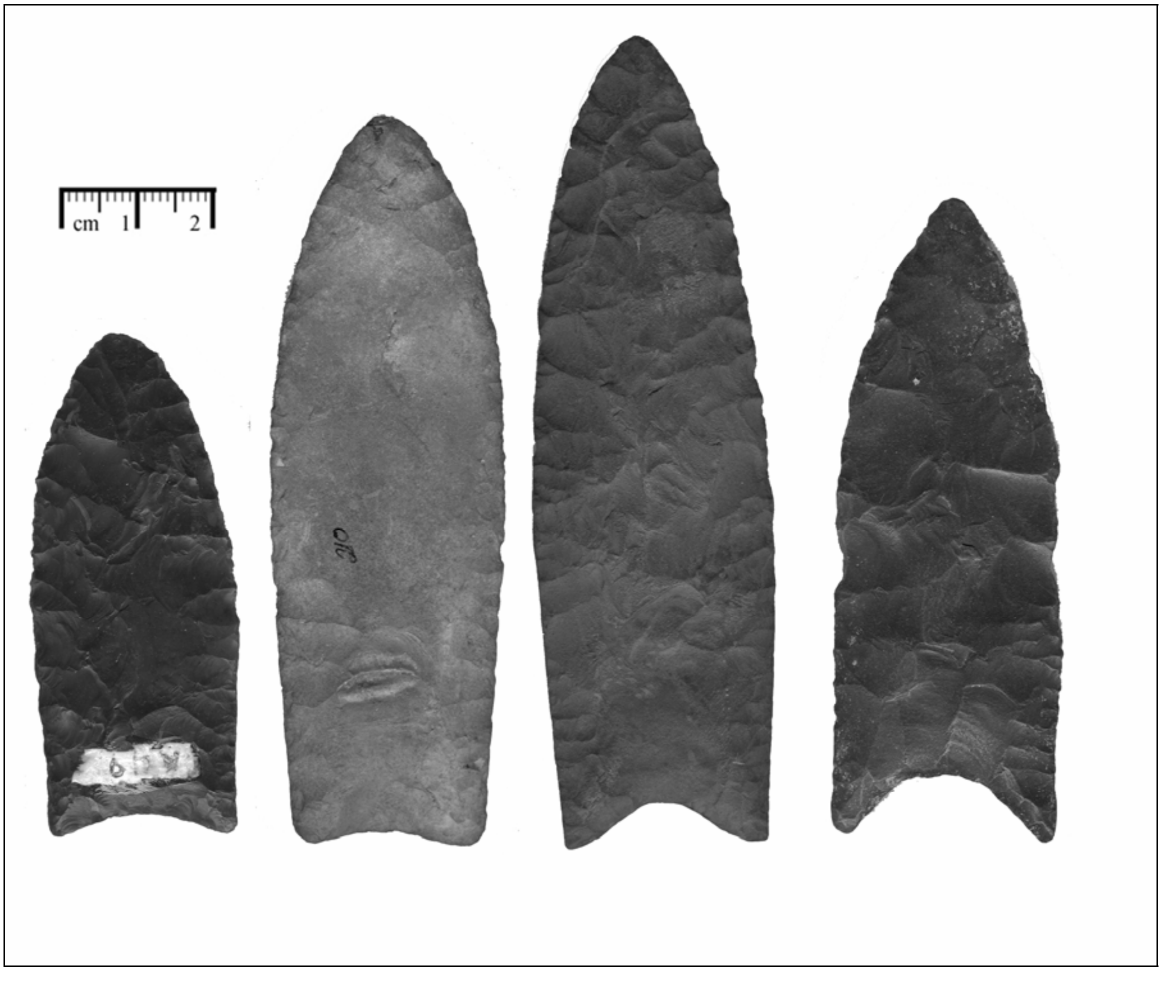

Figure 6.7: Deep and shallow-based points from the subset of robust, large straight-sided Early Paleoindian points. From left to right: Aucilla, Aucilla, Wakulla Springs run, Chipola.

E. Summary

The analyses of the Early Paleoindian chronological unit produced some regional variation that is related to the relative thickness of the points. Three of the five significant results were between the Santa Fe and St. Johns regions, which may represent early regional differentiation. The implications of these results are discussed in greater detail in the next chapter.

II. The Middle Paleoindian Points

The Middle Paleoindian chronological unit contains 385 points. Table 6.13 shows the regional breakdown for the entire subset for each regional configuration. The unit is analyzed in the three regional configurations. Each regional configuration is discussed in turn in the four analyses. The Middle Paleoindian unit produced 122 significant ANOVAs.

Table 6.13: Regional distribution of the points in the Middle Paleoindian points in Analysis #1.

	Chipola	*Aucilla*	*Suwannee*	*Santa Fe*	*St. Johns*	*Hillsborough*
6 region	37	44	97	121	44	45
5 region	37	44		218	44	45
3 region	81			218		89

A. Analysis No. 1: Entire sample

In this analysis, the entire Middle Paleoindian subset was tested for spatial differentiation without an initial partition. The PC analysis identified three PCs (Table

B.6.10). PC 1 is mostly influenced by hypotenuse, average thickness, and earsize, PC 2 is mostly influenced by standard thickness and angle, and PC 3 is highly influenced by minimum basal width/basal ear width and to a lesser extent by basal concavity. The outlier analysis removed 33 points, and the ANOVAs on all attributes and PCs were run on this subset of 355 Middle Paleoindian points.

In the six region configuration, 12 significant results from the ANOVA were identified for basal ear width, earsize, hypotenuse, angle, minimum basal width, average thickness, standard thickness, PC 2, hypotenuse/basal ear width, height of minimum basal width/basal ear width, angle/basal ear width, and minimum basal width.basal ear width/hypotenuse. In the five region configuration, eight significant results from the ANOVA were identified for hypotenuse, angle, minimum basal width, average thickness, PC 2, hypotenuse/basal ear width, height of minimum basal width/basal ear width, and minimum basal width.basal ear width/hypotenuse. In the three region configuration, eight significant results from the ANOVA were identified for angle, minimum basal width, height of basal ear width, PC 3, hypotenuse/basal ear width, height of minimum basal width/basal ear width, hypotenuse/basal ear width, and minimum basal width.basal ear width/hypotenuse. Table 6.14 summarizes the significant ANOVAs and Tukey-Kramer results from this analysis for all regional configurations. Table 6.15 lists the mean attribute values for all the significant tests. The detailed description of the results is in Tables C.6.5 – C.6.7.

Table 6.14: Summary chart of the significant ANOVA results and Tukey-Kramer tests for Analysis #1 for the Middle Paleoindian points for all regional configurations. Bracketed names show how the regions were combined. Key: ear (earsize), angle (angle), hypo (hypotenuse), mbw (minimum basal width), avt (average thickness), stdt (standard thickness), hew (height of basal ear width), PC (principal component), hmbw.bew (height of minimum basal width/basal ear width), bew.bcv (basal ear width/basal concavity), hyp.mbbw (hypotenuse/minimum basal width.basal ear width), ang.bew (angle/basal ear width). The letters following the attribute were taken from the Tukey-Kramer tables. Different letters indicate significant differences. Asterisks mean the ANOVA found significant differences, but the Tukey-Kramer did not discriminate regions, and the inclusion of the attribute is based on the greatest difference in means.significant differences. Asterisks mean the ANOVA found significant differences, but the Tukey-Kramer did not discriminate regions. In that case, the inclusion of the attribute is based on the greatest difference in means.

Table 6.14 continued

	Chipola *[Aucilla]*	**Aucilla**	**Hillsborough** *[St. Johns]*	**St. Johns**	**Santa Fe** *[Suwannee]*	**Suwannee**
Analysis #1 Six Regions	ear B		ear A		ear A	
	hypo B				hypo A	
	angle B		angle A		angle A	angle A
	mbw B	mbw A	mbw A		mbw A	mbw A
		avt C		avt A	avt AB	avt BC
		stdt B	stdt A	stdt B		stdt B
	PC 2 B	PC 2 B	PC 2 A			
		ang.bew A*	ang.bew A*			
	hyp.mbbw A				hyp.mbbw B	
	hmbw.bew A		hmbw.bew B		hmbw.bew B	hmbw.bew B
	hyp.bew B		hyp.bew A		hyp.bew A	hyp.bew A
Analysis #1 Five Regions	hypo* A	hypo* A				
	angle B		angle A		angle B	
	mbw B	mbw A	mbw B		mbw B	
		avt B		avt A	avt A	
		PC2 B	PC 2 A			
	hmbw.bew A		hmbw.bew B		hmbw.bew B	
	mbbw.hyp A	mbbw.hyp B			mbbw.hyp B	
	hyp.bew B		hyp.bew A		hyp.bew A	
Analysis #1 Three Regions	angle B		angle A		angle A	
	mbw B				mbw A	
	hew B		hew A		hew A	
			PC 3* A		PC 3 * A	
	hmbw.bew A		hmbw.bew B		hmbw.bew B	
			mbbw.hyp A		mbbw.hyp B	
	hyp.bew B		hyp.bew A		hyp.bew A	
	hyp.hew B		hyp.hew A		hyp.hew A	

Table 6.15: Summary chart of the mean attribute values for the significant ANOVA results and Tukey-Kramer tests for Analysis #1 for the Middle Paleoindian points for all regional configurations. Bracketed names show how the regions were combined. Key: ear (earsize), angle (angle), hypo (hypotenuse), mbw (minimum basal width), avt (average thickness), stdt (standard thickness), hew (height of basal ear width), PC (principal component), hmbw.bew (height of minimum basal width/basal ear width), bew.bcv (basal ear width/basal concavity), hyp.bew (hypotenuse/basal ear width), mbbw.hyp (minimum basal width.basal ear width/hypotenuse), hyp.hew (hypotenuse/height of basal ear width). The mean values follow the attribute names. Asterisks mean the ANOVA found significant differences, but the Tukey-Kramer did not discriminate regions. In that case, the inclusion of the attribute is based on the greatest difference in means.

Table 6.15 continued

	Chipola *[Aucilla]*	**Aucilla**	**Hillsborough** *[St. Johns]*	**St. Johns**	**Santa Fe** *[Suwannee]*	**Suwannee**
Analysis #1 **Six Regions**	ear 5 mm^2 hypo 16 mm angle 50° mbw 23 mm PC 2 -.17 hyp.mbbw .07 hmbw.bew .44 hyp.bew .67	mbw 27 mm avt 5.9 mm stdt .5 mm PC 2 -.33 ang.bew 1.91*	ear 8 mm^2 angle 58° mbw 26 mm stdt .6 mm PC 2 .42 ang.bew 2.18* hmbw.bew .32 hyp.bew .60	avt 6.8 mm stdt .5 mm	ear 8 mm^2 hypo 18 mm angle 55° mbw 27 mm avt 6.5 mm hyp.mbbw .06 hmbw.bew .35 hyp.bew .62	angle 57° mbw 26 mm avt 6.4 mm stdt .5 mm hmbw.bew .36 hyp.bew .62
Analysis #1 **Five Regions**	hypo* 16 mm angle 50° mbw 23 mm hmbw.bew .44 mbbw.hyp .07 hyp.bew .67	hypo* 18 mm mbw 27 mm avt 5.9 mm PC2 -.33 mbbw.hyp .06	angle 58° mbw 26 mm PC 2 .42 hmbw.bew .32 hyp.bew .60	avt 6.8 mm	angle 55° mbw 27 mm avt 6.5 mm hmbw.bew .36 mbbw.hyp .06 hyp.bew .62	
Analysis #1 **Three Regions**	angle 52° mbw 25 mm hew 2.1 mm hmbw.bew .4 hyp.bew .65 hyp.hew 14.51		angle 56° hew 2.4 mm PC 3* .28 hmbw.bew .34 mbbw.hyp .06 hyp.bew .61 hyp.hew 12.78		angle 55° mbw 27 mm hew 2.4 mm PC 3 * -.01 hmbw.bew .36 mbbw.hyp .07 hyp.bew .62 hyp.hew 13.38	

B. Analysis No. 2: Shape

In this analysis, shape was used to make the initial partitions in the data. None of the shape attributes showed robust differentiation in histograms or stem-and-leaf plots so I reviewed a series of bivariate plots of the size and shape attributes. Of these, the bivariate plot of the minimum basal width/basal ear width and lateral index produced three groupings based on shape: straight-sided points, points with flaring ears, and the rest, which fall between these extremes. Figure B.6.4 shows the bivariate plot and the three groups. As discussed above, the nature of the lateral index means that the straight-sided group includes points with indices of zero or larger than an index of 30. Figure 6.8 is the taxonomic tree for this partition. Figure 6.9 shows a sample of each of the three groups. Table 6.16 is the geographical distribution of these groups for all regional configurations.

Table 6.16: Regional distribution of the Middle Paleoindian points in Analysis #2 for all regional configurations.

		Chipola	*Aucilla*	*Suwannee*	*Santa Fe*	*St. Johns*	*Hillsborough*	*Total*
Straight	*6 region*	5	6	16	10	5	7	49
	5 region	5	6		26	5	7	
	3 region	11			26		13	
Flared Ears	*6 region*	9	7	26	33	16	9	100
	5 region	9	7		59	16	9	
	3 region	16			59		25	
Straighter ear	*6 region*	23	31	55	77	22	28	236
	5 region	23	31		132	22	28	
	3 region	54			132		50	

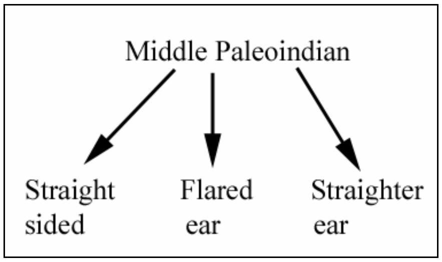

Figure 6.8: Taxonomic tree for Analysis #2 of the Middle Paleoindian points.

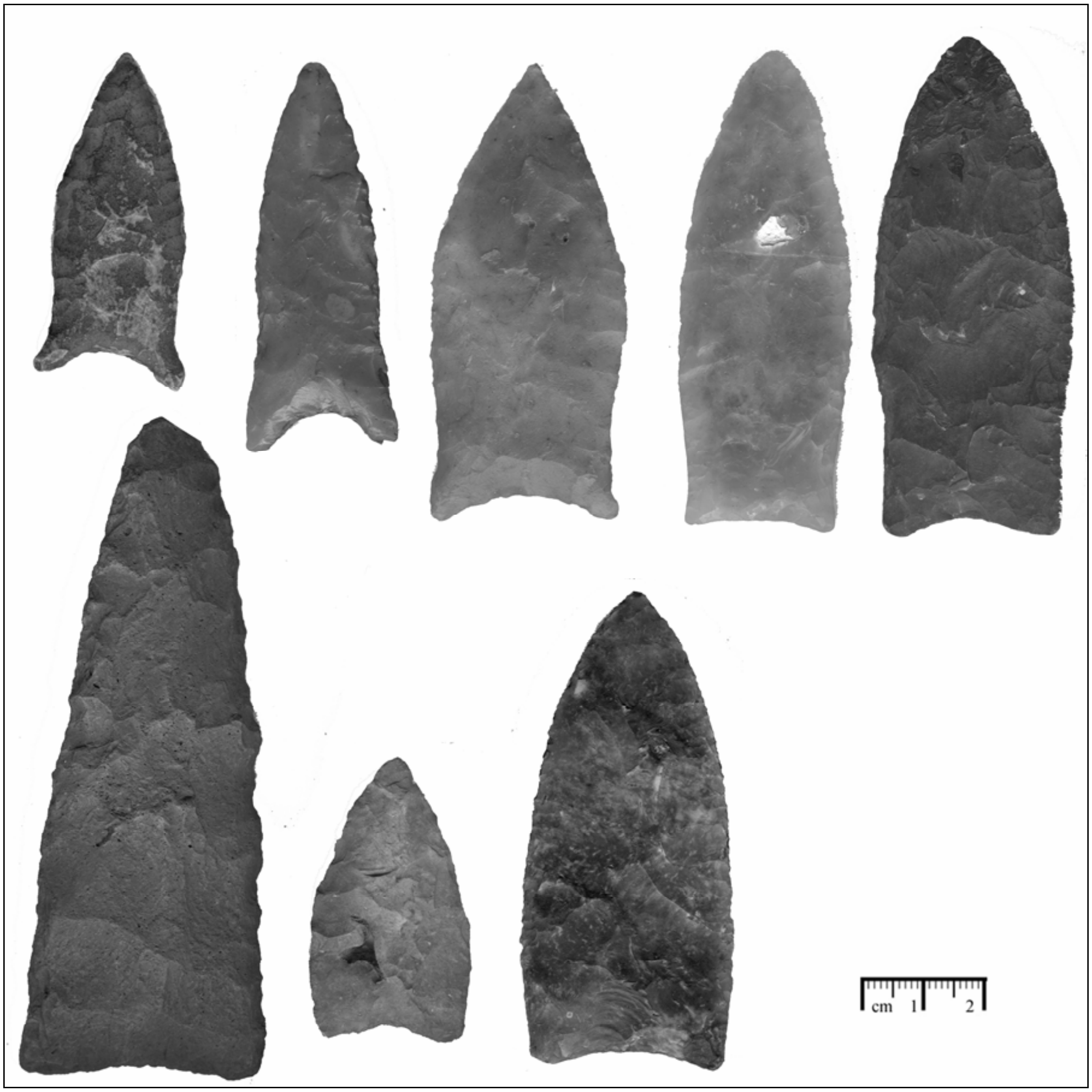

Figure 6.9: Sample of points from the three partitions in Analysis #2 of the Middle Paleoindian points. Top row: Suwannee (flared ear), Suwannee (flared ear), Suwannee (flared ear), Lake Tarpon (other), Aucilla (other). Bottom row: Chipola (straight), Suwannee (straight), Northern Withlacoochee (straight).

1. Straight-sided points. Because the sample size was so small, I did not run a PC analysis on that subset. An ANOVA was run on all attributes, but no significant regional differences were found.

2. Flared-eared points. A PC analysis was run on this sub-unit, and three PCs were saved (Table B.6.11). PC 1 is most influenced by hypotenuse and average thickness, PC 2 is most influenced by angle and minimum basal width/basal ear width, and PC 3 was most influenced by minimum basal width/basal ear width and basal concavity. In the six region configuration, the ANOVAs found 11 significant differences in minimum basal width/basal ear width, height of ear width, basal ear width, earsize, hypotenuse, minimum basal width, height of minimum basal width, PC 2, angle/basal ear width, minimum basal width.basal ear width/hypotenuse, and minimum basal width/height of minimum basal ear width, which are discussed in turn below. In the five region configuration, the ANOVAs found nine significant differences in height of ear width, basal ear width, hypotenuse, minimum basal width, height of minimum basal width, angle, angle/basal ear width, minimum basal width.basal ear width/hypotenuse, and minimum basal width/height of minimum basal ear width. In the three region configuration, the ANOVAs found 11 significant differences in height of minimum basal width, basal ear width, earsize, hypotenuse, minimum basal width, angle, angle/basal ear width, minimum basal width.basal ear width/hypotenuse, height of minimum basal ear width/basal ear width, and basal ear width/height of basal ear width. Table 6.17 summarizes the significant ANOVAs and Tukey-Kramer results from this analysis for all regional configurations. Table 6.18 lists the mean attribute values for all the significant tests. The detailed description of the results is in Tables C.6.8 – C.6.10.

Table 6.17: Summary chart of the significant ANOVA results and Tukey-Kramer tests for Analysis #2 for flared ear Middle Paleoindian points for all regional configurations. Bracketed names show how the regions were combined. Key: ear (earsize), angle (angle), hypo (hypotenuse), mbw (minimum basal width), avt (average thickness), stdt (standard thickness), hew (height of basal ear width), PC (principal component), hmbw.bew (height of minimum basal width/basal ear width), bew.bcv (basal ear width/basal concavity), hyp.mbbw (hypotenuse/minimum basal width.basal ear width), ang.bew (angle/basal ear width). The letters following the attribute were taken from the Tukey-Kramer tables. Different letters indicate significant differences. Asterisks mean the ANOVA found significant differences, but the Tukey-Kramer did not discriminate regions, and the inclusion of the attribute is based on the greatest difference in means.

Table 6.17 continued

	Chipola *[Aucilla]*	**Aucilla**	**Hillsborough** *[St. Johns]*	**St. Johns**	**Santa Fe** *[Suwannee]*	**Suwannee**
Analysis #1 **6 Regions** ***Flared Ear***	hew B bew B ear A mbw B	mbw/Bew B hmbw B PC 2 B ang.bew B mbw.hbw* A	hew A ear B PC 2 A mbw.hbw* A	mbw/Bew A hypo B hmbw A PC 2 A ang.bew A hyp.mbbw B	hew A bew A ear B hypo A mbw A hmbw B ang.bew B hyp.mbbw A	Bew A Ear B Hypo A Hmbw B ang.bew B hyp.mbbw A
Analysis #1 **5 Regions** ***Flared Ear***	hew B bew B mbw B mbbw.hyp A	hmbw B angle* A ang.bew B mbw.hbw* A	hew A angle* A mbw.hbw* A	bew B hypo B hmbw A ang.bew A mbbw.hyp A	hew A bew A hypo A mbw A hmbw B ang.bew B mbbw.hyp B	
Analysis #1 **3 Regions** ***Flared Ear***	hew B bew B ear * A mbw B hmbw B angle B mbw.hbw B hmbw.bew A bew.hew B		hypo A hmbw A angle A ang.bew A mbbw.hyp A mbw.hbw A hmbw.bew B bew.hew A		hew A bew A ear * A hypo B mbw A hmbw B angle B ang.bew B mbbw.hyp B mbw.hbw B hmbw.bew B	

Table 6.18: Summary chart of the mean attribute values of the significant ANOVA results and Tukey-Kramer tests for Analysis #2 for flared-ear subset of large Middle Paleoindian points for all regional configurations. Bracketed names show how the regions were combined. Key: Ear (earsize), Angle (angle), Hypo (hypotenuse), Mbw (minimum basal width), Avth (average thickness), Stdth (standard thickness), Hew (height of basal ear width), PC (principal component) hbw.bew (height of minimum basal width/basal ear width), bew.bcv (basal ear width/basal concavity), hyp.bew (hypotenuse/basal ear width), hyp.mbbw (hypotenuse/minimum basal width.basal ear width), hyp.hew (hypotenuse/height of basal ear width),. The mean values follow the attribute names. Asterisks mean the ANOVA found significant differences, but the Tukey-Kramer did not discriminate regions. In that case, the inclusion of the attribute is based on the greatest difference in means.

Table 6.18 continued

	Chipola *[Aucilla]*	**Aucilla**	**Hills.** *[St. Johns]*	**St. Johns**	**Santa Fe** *[Suwannee]*	**Suwannee**
Analysis #2 **6 Regions** ***Flared Ear***	hew 1.6 mm bew 24 mm ear 4 mm^2 mbw 21 mm	mbw.bew 1.2 hmbw 14 mm PC 2 -1.38 ang.bew 1.66 mbw.hbw* 1.92	hew 2.9 mm ear 11 mm^2 PC 2 1.00 mbw.hbw* 2.88	mbw.bew 1.1 hypo 16 mm hmbw 9 mm PC 2 .54 ang.bew 2.24 mbbw.hyp .07	hew 2.6 mm bew 31 mm ear 10 mm^2 hypo 19 mm mbw 27 mm hmbw 12 mm ang.bew 1.76 mbbw.hyp .06	bew 30 mm ear 8 mm^2 hypo 20 mm hmbw 13 mm ang.bew 1.78 mbbw.hyp .06
Analysis #2 **5 Regions** ***Flared Ear***	hew 1.6 mm bew 24 mm mbw 21 mm mbbw.hyp .08	hmbw 14 mm angle* 48° ang.bew 1.66 mbw.hbw* 1.92	hew 2.9 mm angle* 58° mbw.hbw* 2.88	bew 26 mm hypo 16 mm hmbw 9 mm ang.bew 2.24 mbbw.hyp .08	hew 2.6 mm bew 31 mm hypo 20 mm mbw 26 mm hmbw 12 mm ang.bew 1.77 mbbw.hyp .06	
Analysis #2 **3 Regions** ***Flared Ear***	hew 1.6 mm bew 24 mm ear * 5 mm^2 mbw 22 mm hmbw 12 mm angle 49° mbw.hbw 2.02 hbw.bew .44 bew.hew 16.02		hypo 17 mm hmbw 9 mm angle 57° ang.bew 2.13 mbbw.hyp .07 mbw.hbw 2.8 hbw.bew .33 bew.hew 12.12		hew 2.6 mm bew 31 mm ear * 9 mm^2 hypo 20 mm mbw 26 mm hmbw 12 mm angle 52° ang.bew 1.77 mbbw.hyp .06 mbw.hbw 2.37 hbw.bew .40	

3. Straighter-eared group. A PC analysis was run on this sub-unit, and three PCs were saved (Table B.6.12). PC 1 is most influenced by hypotenuse, PC 2 is most influenced by standard thickness, and PC 3 is most influenced by minimum basal width/basal ear width.

In the six region configuration, the ANOVA revealed eight significant regional differences in basal ear width, angle, minimum basal width, average thickness, standard thickness, PC 2, height of minimum basal width/basal ear width, and hypotenuse/basal ear width. In the five region configuration, the ANOVA revealed five significant regional differences in basal ear width, angle, minimum basal width, height of minimum basal width/basal ear width, and hypotenuse/basal ear width. In the three region configuration, the ANOVA revealed seven significant regional differences in angle, minimum basal width, average thickness, PC 3 height of minimum basal width/basal ear width, hypotenuse/basal ear width, and hypotenuse/height of basal ear width. Table 6.19 summarizes the significant ANOVAs and Tukey-Kramer results from this analysis for all regional configurations. Table 6.20 lists the mean attribute values for all the significant tests. The detailed description of the results is in Tables C.6.11 – C.6.13.

Table 6.19: Summary chart of the significant ANOVA results and Tukey-Kramer tests for Analysis #2 for straighter eared subset of large Middle Paleoindian points for all regional configurations. Bracketed names show how the regions were combined. Key: ear (earsize), angle (angle), hypo (hypotenuse), mbw (minimum basal width), avt (average thickness), stdt (standard thickness), hew (height of basal ear width), PC (principal component), hmbw.bew (height of minimum basal width/basal ear width), bew.bcv (basal ear width/basal concavity), hyp.mbbw (hypotenuse/minimum basal width.basal ear width), ang.bew (angle/basal ear width). The letters following the attribute were taken from the Tukey-Kramer tables. Different letters indicate significant differences. Asterisks mean the ANOVA found significant differences, but the Tukey-Kramer did not discriminate regions, and the inclusion of the attribute is based on the greatest difference in means.

Table 6.19 continued.

	Chipola *[Aucilla]*	**Aucilla**	**Hillsborough** *[St. Johns]*	**St. Johns**	**Santa Fe** *[Suwannee]*	**Suwannee**
Analysis #2 **6 Regions** ***Straighter Ear***	bew B angle B mbw B stdt A hmbw.bew A hyp.bew B	bew A mbw A avt C stdt B PC 2 B	angle A stdt A PC 2 A hmbw.bew B hyp.bew A	avth A	bew A angle A mbw A avt AB PC 2 A hmbw.bew B hyp.bew A	angle A avt BC stdt B hmbw.bew B hyp.bew A
Analysis #2 **5 Regions** ***Straighter Ear***	bew B angle B mbw B hmbw.bew A hyp.bew A	bew A mbw A	angle A hmbw.bew B hyp.bew B		bew A angle A mbw A hmbw.bew B hyp.bew B	
Analysis #2 **3 Regions** ***Straighter Ear***	angle B mbw B avth B hmbw.bew A hyp.hew B hyp.bew A		avt A PC 3* A hyp.hew A		angle A mbw A PC 3* A hmbw.bew B hyp.bew B	

Table 6.20: Summary chart of the mean attribute values for the significant ANOVA results and Tukey-Kramer tests for Analysis #2 for straighter eared Middle Paleoindian points for all regional configurations. Bracketed names show how the regions were combined. Key: ear (earsize), angle (angle), hypo (hypotenuse), mbw (minimum basal width), avt (average thickness), stdt (standard thickness), hew (height of basal ear width), PC (principal component) hmbw.bew (height of minimum basal width/basal ear width), bew.bcv (basal ear width/basal concavity), hyp.bew (hypotenuse/basal ear width), mbbw.hyp (hypotenuse/minimum basal width.basal ear width), hyp.hew (hypotenuse/height of basal ear width),. The mean values follow the attribute names. Asterisks mean the ANOVA found significant differences, but the Tukey-Kramer did not discriminate regions. In that case, the inclusion of the attribute is based on the greatest difference in means.

Table 6.20 continued.

	Chipola *[Aucilla]*	**Aucilla**	**Hillsborough** *[St. Johns]*	**St. Johns**	**Santa Fe** *[Suwannee]*	**Suwannee**
Analysis #2 **6 Regions** ***Straighter Ear***	bew 24 mm angle 50° mbw 23 mm stdt .8 mm hmbw.bew .44 hyp.bew .66	bew 28 mm mbw 27 mm avt 5.9 mm stdt .4 mm PC 2 -.58	angle 58° stdt .7 mm PC 2 .46 hmbw.bew .33 hyp.bew .6	avt 7.1 mm	bew 29 mm angle 56° mbw 28 mm avt 6.5 mm PC 2 .13 hmbw.bew .33 hyp.bew .61	angle 57° avt 6.2 mm stdt .5 mm hmbw.bew .33 hyp.bew .61
Analysis #2 **5 Regions** ***Straighter Ear***	bew 24 mm angle 50° mbw 23 mm hmbw.bew .44 hyp.bew .66	bew 28 mm mbw 27 mm	angle 58° hmbw.bew .32 hyp.bew .6		bew 30 mm angle 56° mbw 27 mm hmbw.bew .34 hyp.bew .61	
Analysis #2 **3 Regions** ***Straighter Ear***	angle 53° mbw 25 mm avt 6.1 mm hmbw.bew .4 hyp.hew 9.3 hyp.bew .65		avt 6.7 mm PC 3* .28 hyp.hew 8.05		angle 56° mbw 27 mm PC 3* -.1 hmbw.bew .34 hyp.hew .61	

C. Analysis No. 3: Size

In this analysis, size was used to make the initial partitions in the Middle Paleoindian chronological unit. The entire Middle Paleoindian unit was initially partitioned into two groups, which separated a small number of very small points. The large points were then partitioned again based on size, which produced a partition of 219 smaller and 153 larger points. Figure 6.14 is the taxonomic tree for Analysis #3. Table 6.21 shows the geographical distribution for the very narrow, and larger wider and smaller wider points for all regional configurations in this analysis.

Table 6.21: The spatial distribution of Middle Paleoindian points in Analysis #3 for all regional configurations.

		Chipola	*Aucilla*	*Suwannee*	*Santa Fe*	*St. Johns*	*Hillsborough*	*Total*
V.Narrow	*6 region*	9	0	0	1	2	1	13
Wider	*6 region*	37	44	97	121	44	45	388
	5 region	37	44		218	44	45	
	3 region	81			218		89	
Larger, Wider	*6 region*	11	21	36	51	17	17	153
	5 region	11	21		87	17	17	
	3 region	32			87		34	
Smaller, Wider	*6 region*	17	23	61	68	24	26	219
	5 region	17	23		129	24	26	
	3 region	40			129		50	

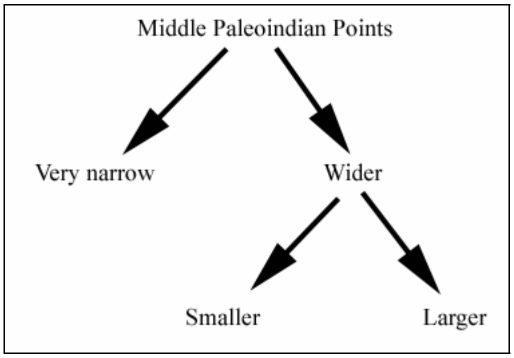

Figure 6.10: Taxonomic tree for Analysis #3 of the Middle Paleoindian points.

1. First Division. The first division in this analysis was to partition the very narrow points and wider points. The subset of very small points included points with maximum widths < 20 mm. I used maximum width because I do not believe that the dimension was affected by resharpening on any of the very narrow points.

The very narrow points are concentrated in the Chipola region, which may represent the actual distribution. However, there is a possibility that these narrow points were not produced for me by the collectors since they do not match the classic Paleoindian type, which are usually larger. The very narrow points were divided into two groups depending on whether the basal ears flared (BEW < 21mm). Table 6.22 shows the geographic distribution of the Beaver Lake and other very narrow points. The small points with flaring ears match the description of the Beaver Lake point in Bullen (1975). Figure 6.11 shows an example of straight-based and Beaver Lake points.

Table 6.22: The spatial distribution of straight-sided very small and Beaver Lake points in Analysis #3.

	Chipola	*Aucilla*	*Suwannee*	*Santa Fe*	*St. Johns*	*Hillsborough*
Straight	6	0	0	1	0	1
Beaver Lake	3	0	0	0	2	0

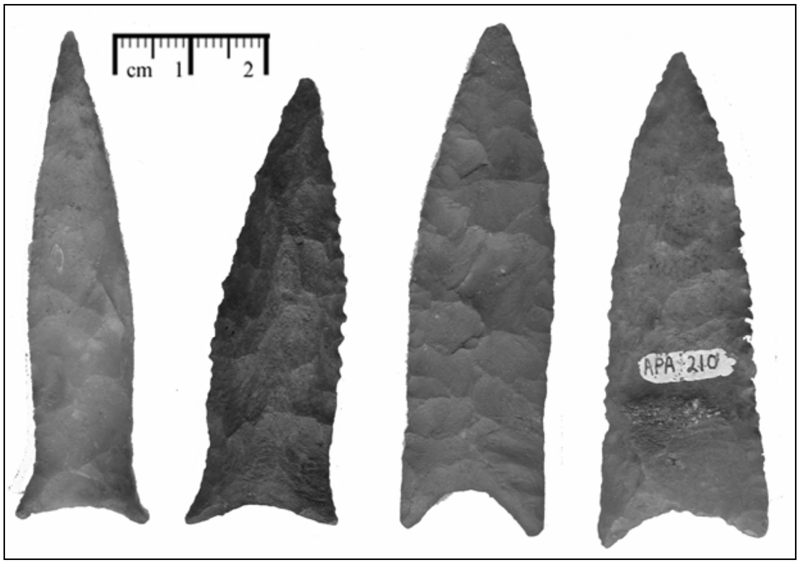

Figure 6.11: Four very narrow points partitioned in Analysis #3. From left to right: Beaver Lake (Crescent Lake), Beaver Lake (Chipola), straight sided (Chipola), straight sided (Apalachicola).

A PC analysis was done on the group of wider points, which produced three PCs (Table B.6.13). PC 1 is most influenced by hypotenuse, PC 2 is most influenced by standard thickness and angle, and PC 3 is most influenced by minimum basal width/basal ear width and basal concavity.

In the six region configuration, the ANOVA revealed four significant regional differences in angle, average thickness, PC 2, and height of minimum basal width/basal ear width. In the five region configuration, the ANOVA revealed two significant regional differences in angle and height of minimum basal width/basal ear width. In the three region configuration, the ANOVA revealed two significant regional differences in angle and height of minimum basal width/basal ear width. Table 6.23 summarizes the significant ANOVAs and Tukey-Kramer results from this analysis for all regional configurations. Table 6.24 lists the mean attribute values for all the significant tests. The detailed description of the results is in Tables C.6.14 – C.6.16.

2. Second Division – Larger Wide and Smaller Wide Points. In the next partition, I divided the wider points into those that were generally based on a bivariate plot (Figure B.6.5) of height of minimum basal width and height of basal ear width, both size

Table 6.23: Summary chart of the significant ANOVA results and Tukey-Kramer tests for Analysis #3 for entire subset of large Middle Paleoindian points for all regional configurations. Bracketed names show how the regions were combined. Key: ear (earsize), angle (angle), hypo (hypotenuse), mbw (minimum basal width), avth (average thickness), sdth (standard thickness), hew (height of basal ear width), PC (principal component), hmbw.bew (height of minimum basal width/basal ear width). The letters following the attribute were taken from the Tukey-Kramer tables. Different letters indicate significant differences. Asterisks mean the ANOVA found significant differences, but the Tukey-Kramer did not discriminate regions. In that case, the inclusion of the attribute is based on the greatest difference in means.

	Chipola *[Aucilla]*	**Aucilla**	**Hills.** *[St. Johns]*	**St. Johns**	**Santa Fe** *[Suwannee]*	**Suwannee**
Analysis #3 **6 Regions** ***All Large***	angle B PC 2 B hmbw.bew A	avt B PC 2 B	angle A PC 2 A hmbw.bew B	avt A	angle A avt A hmbw.bew B	angle A hmbw.bew B
Analysis #3 **5 Regions** ***All Large***	angle B hmbw.bew A		angle A hmbw.bew B		angle A hmbw.bew B	
Analysis #3 **3 Regions** ***All Large***	angle B hmbw.bew A		angle A hmbw.bew B		angle A hmbw.bew B	

Table 6.24: Summary chart of the means for the attributes in the significant ANOVA results and Tukey-Kramer tests for Analysis #3 for entire subset of large Middle Paleoindian points for all regional configurations. Bracketed names show how the regions were combined. Key: ear (earsize), angle (angle), hypo (hypotenuse), mbw (minimum basal width), avt (average thickness), sdt (standard thickness), hew (height of basal ear width), PC (principal component), hmbw.bew (height of minimum basal width/basal ear width). The mean values follow the attribute names. Asterisks mean the ANOVA found significant differences, but the Tukey-Kramer did not discriminate regions. In that case, the inclusion of the attribute is based on the greatest difference in means.

	Chipola *[Aucilla]*	**Aucilla**	**Hills.** *[St. Johns]*	**St. Johns**	**Santa Fe** *[Suwannee]*	**Suwannee**
Analysis #3 **6 Regions** ***All Large***	angle 50° PC 2 -.48 hmbw.bew .43	avt 6.0 mm PC 2 -.44	angle 58° PC 2 .54 hmbw.bew .32	avt 6.8 mm	angle 55° avt 6.5 mm hmbw.bew .36	angle 56° hmbw.bew .36
Analysis #3 **5 Regions** ***All Large***	angle 50° hmbw.bew .43		angle 58° hmbw.bew .32		angle 55° hmbw.bew .36	
Analysis #3 **3 Regions** ***All Large***	angle 50° hmbw.bew .43		angle 58° hmbw.bew .32		angle 55° hmbw.bew .36	

measures. A bivariate plot (Figure B.6.6) of minimum basal width and hypotenuse tracks this division of the data well, so I am comfortable that this partition captures size using several different criteria.

Large Wide Points. A PC analysis on the larger wide points produced three PCs (Table B.6.14). PC 1 is most influenced by average thickness and standard thickness, PC 2 is most influenced by angle and hypotenuse, and PC 3 is most influenced by minimum basal width/basal ear width. The basal ear width, earsize, and PC 1 attributes showed a significant difference.

In the six region configuration, the ANOVA revealed five significant regional differences in basal ear width, earsize, PC 1, average thickness, and height of minimum basal width/basal ear width. In the five region configuration, the ANOVA revealed four significant regional differences in basal ear width, angle, average thickness and height of minimum basal width/basal ear width. In the three region configuration, the ANOVA revealed two significant regional differences in basal ear width and height of minimum basal width/basal ear width. Table 6.25 summarizes the significant ANOVAs and Tukey-Kramer results from this analysis for all regional configurations. Table 6.26 lists the mean attribute values for all the significant tests. The detailed description of the results is in Tables C.6.17 – C.6.19.

Table 6.25: Summary chart of the significant ANOVA results and Tukey-Kramer tests for Analysis #3 for the wider large Middle Paleoindian points for all regional configurations. Bracketed names show how the regions were combined. Key: ear (earsize), angle (angle), hypo (hypotenuse), mbw (minimum basal width), avt (average thickness), stdt (standard thickness), hew (height of basal ear width), PC (principal component), hmbw.bew (height of minimum basal width/basal ear width), bew.bcv (basal ear width/basal concavity), hyp.mbbw (hypotenuse/minimum basal width.basal ear width), ang.bew (angle/basal ear width). The letters following the attribute were taken from the Tukey-Kramer tables. Different letters indicate significant differences. Asterisks mean the ANOVA found significant differences, but the Tukey-Kramer did not discriminate regions, and the inclusion of the attribute is based on the greatest difference in means.

	Chipola *[Aucilla]*	**Aucilla**	**Hills.** *[St. Johns]*	**St. Johns**	**Santa Fe** *[Suwannee]*	**Suwannee**
Analysis #3 **6 Regions** ***Wider***	bew B ear * A avt A hmbw.bew A	PC 1 B avt B	bew A ear * A hmbw.bew B	avt A	bew A PC 1 A avt A hmbw.bew B	avt A
Analysis #3 **5 Regions** ***Wider***	bew * A angle B avt A hmbw.bew A	avt B	bew * A angle A hmbw.bew B	avt A	avt A hmbw.bew B	
Analysis #3 **3 Regions** ***Wider***	bew B hmbw.bew* A		hmbw.bew* A		bew A	

Table 6.26: Summary chart of the means for the attributes of the significant ANOVA results and Tukey-Kramer tests for Analysis #3 for the wider large Middle Paleoindian points for all regional configurations. Bracketed names show how the regions were combined. Key: ear (earsize), angle (angle), hypo (hypotenuse), mbw (minimum basal width), avt (average thickness), stdt (standard thickness), hew (height of basal ear width), PC (principal component), hmbw.bew (height of minimum basal width/basal ear width), bew.bcv (basal ear width/basal concavity), hyp.mbbw (hypotenuse/minimum basal width.basal ear width), ang.bew (angle/basal ear width). The letters following the attribute were taken from the Tukey-Kramer tables. The mean values follow the attribute names. Asterisks mean the ANOVA found significant differences, but the Tukey-Kramer did not discriminate regions. In that case, the inclusion of the attribute is based on the greatest difference in means.

	Chipola *[Aucilla]*	**Aucilla**	**Hills.** *[St. Johns]*	**St. Johns**	**Santa Fe** *[Suwannee]*	**Suwannee**
Analysis #3 **6 Regions** ***Wider***	bew 29 mm ear * 9 mm^2 avt 7.2 mm hmbw.bew .51	PC 1 -.9 avt 6.1 mm	bew 33 mm ear * 11 mm^2 hmbw.bew .39	avt 7.2 mm	bew 34 mm PC 1 .39 avt 7.1 mm hmbw.bew .4	avt 7.0 mm
Analysis #3 **5 Regions** ***Wider***	bew * 29 mm angle 45° avt 7.2 mm hmbw.bew .51	avt 6.1 mm	bew * 33 mm angle 53° hmbw.bew .39	avt 7.2 mm	avt 7 mm hmbw.bew .41	
Analysis #3 **3 Regions** ***Wider***	bew 30 mm hmbw.bew* .46		hmbw.bew* .4		bew 33 mm	

Smaller Wide Points. The PC analysis produced three PCs (Table B.6.15). PC 1is most influenced by hypotenuse, PC 2 is most influenced by earsize and angle, and PC 3 is most influenced by standard thickness and average thickness.

In the six region configuration, the ANOVA revealed seven significant regional differences in hypotenuse, height of minimum basal width, angle, minimum basal width.basal ear width/hypotenuse, minimum basal width/height of minimum basal width, and height of minimum basal width/basal ear width. In the five region configuration, the ANOVA four revealed significant regional differences in hypotenuse, height of minimum basal width, angle, minimum basal width.basal ear width/hypotenuse. In the three region configuration, the ANOVA revealed three significant regional differences in hypotenuse, height of minimum basal width, and angle/basal ear width. Table 6.27 summarizes the significant ANOVAs and Tukey-Kramer results from this analysis for all regional configurations. Table 6.28 lists the mean attribute values for all the significant tests. The detailed description of the results is in Tables C.6.20 – C.6.22.

A. Analysis No. 4: Both

In this analysis I made the first partition based on size and the subsequent partitions based on shape. I only partitioned the data twice, because although some “types” were apparent by looking through the pictures, but when the points were visually sorted the variation seemed continuous. Figure 6.12 is the taxonomic tree.

Table 6.27: Summary chart of the significant ANOVA results and Tukey-Kramer tests for Analysis #3 for the narrower large Middle Paleoindian points for all regional configurations. Bracketed names show how the regions were combined. Key: ear (earsize), angle (angle), hypo (hypotenuse), mbw (minimum basal width), avt (average thickness), stdt (standard thickness), hew (height of basal ear width), PC (principal component), hmbw.bew (height of minimum basal width/basal ear width), bew.bcv (basal ear width/basal concavity), hyp.mbbw (hypotenuse/minimum basal width.basal ear width), ang.bew (angle/basal ear width). The letters following the attribute were taken from the Tukey-Kramer tables. Different letters indicate significant differences. Asterisks mean the ANOVA found significant differences, but the Tukey-Kramer did not discriminate regions, and the inclusion of the attribute is based on the greatest difference in means.

	Chipola *[Aucilla]*	**Aucilla**	**Hills.** *[St. Johns]*	**St. Johns**	**Santa Fe** *[Suwannee]*	**Suwannee**
Analysis #3 **6 Regions** ***Narrower***	hmbw A angle* A hbw.bew A mbw.hbw A ang.bew A	hypo A ang.bew A	hypo B hmbw B angle* A hbw.bew B mbw.hbw B ang.bew B		hypo A hmbw A ang.bew A	
Analysis #3 **5 Regions** ***Narrower***	hmbw A angle B	hypo A	hypo B hmbw B angle A		hmbw A	
Analysis #3 **3 Regions** ***Narrower***	hypo A hmbw A ang.bew A		hypo B hmbw B ang.bew B		hypo A ang.bew A	

Table 6.28: Summary chart of the means of the attributes in the significant ANOVA results and Tukey-Kramer tests for Analysis #3 for the narrower large Middle Paleoindian points for all regional configurations. Bracketed names show how the regions were combined. Key: ear (earsize), angle (angle), hypo (hypotenuse), mbw (minimum basal width), avth (average thickness), stdth (standard thickness), hew (height of basal ear width), PC (principal component), hbw.bew (height of minimum basal width/basal ear width), bew.bcv (basal ear width/basal concavity), hyp.mbbw (hypotenuse/minimum basal width.basal ear width), ang.bew (angle/basal ear width). The letters following the attribute were taken from the Tukey-Kramer tables. The mean values follow the attribute names. Asterisks mean the ANOVA found significant differences, but the Tukey-Kramer did not discriminate regions. In that case, the inclusion of the attribute is based on the greatest difference in means.

	Chipola *[Aucilla]*	**Aucilla**	**Hills.** *[St. Johns]*	**St. Johns**	**Santa Fe** *[Suwannee]*	**Suwannee**
Analysis #3 **6 Regions** ***Narrower***	hmbw 9 mm angle* 53° hmbw.bew .38 mbw.hbw 2.06 ang.bew 2.17	hypo 16 mm hyp.mbbw 15.14 ang.bew 2.17	hypo 14 mm hmbw 6.9 mm angle* 60° hmbw.bew .28 hyp.mbbw 13.53 mbw.hbw 3.76 ang.bew 2.49		hypo 16 mm hmbw 9 mm hyp.mbbw 14.94 ang.bew 2.19	
Analysis #3 **5 Regions** ***Narrower***	hmbw 9.1 mm angle 54°	hypo 16 mm	hypo 14 mm hmbw 7 mm angle 61°		hmbw 8.2 mm	
Analysis #3 **3 Regions** ***Narrower***	hypo 16 mm hmbw 8.7 mm ang.bew 2.17		hypo 15 mm hmbw 7.6 mm ang.bew 2.39		hypo 16 mm ang.bew 2.25	

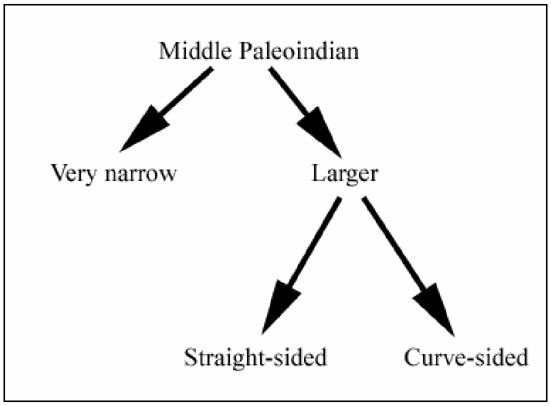

Figure 6.12: Taxonomic tree for Analysis #4 for the Middle Paleoindian

First Division – Very Narrow and Wider Points. Since the differences between large and small points were so dramatic and could arguably reflect a functional difference, I made the same division based on size used in Analysis No. 3.

Second Division – Straight-sided and Curve-sided Points. The second partition was based on the straight and curve-sided partition. Table 6.29 shows the geographic distribution of the points. The subset of the straight-sided points was too small in number to further analyze them with either a PC analysis or an ANOVA. A PC analysis was done on the subset curve-sided points, which produced three PCs (Table B.6.16). PC 1 is most influenced by hypotenuse, PC 2 is most influenced by angle and standard thickness, and PC 3 is most influenced by basal concavity and minimum basal width/basal ear width.

Table 6.29: Geographic distribution of the large, straight-sided and curve-sided Middle Paleoindian points in Analysis #4.

	Chipola	*Aucilla*	*Hillsborough*	*St. Johns*	*Santa Fe*	*Suwannee*
Straight-sided	2	4	4	3	4	14
Curve-sided	26	40	39	38	115	83

In the six region configuration, the ANOVA revealed four significant regional differences in angle, minimum basal width, basal concavity, average thickness, and PC 2. In the five region configuration, the ANOVA revealed five significant regional differences in angle, basal concavity, average thickness, height of minimum basal width/basal ear width, and basal ear width/basal concavity. In the three region configuration, the ANOVA revealed significant three regional differences in angle, PC 3, and height of minimum basal width/basal ear width. Table 6.30 summarizes the significant ANOVAs and Tukey-Kramer results from this analysis for all regional configurations. Table 6.31 lists the mean attribute values for all the significant tests. The detailed description of the results is in Tables C.6.23 – C.6.25.

Table 6.30: Summary chart of the significant ANOVA results and Tukey-Kramer tests for Analysis #4 for the Middle Paleoindian points for all regional configurations. Bracketed names show how the regions were combined. Key: ear (earsize), angle (angle), hypo (hypotenuse), mbw (minimum basal width), avt (average thickness), stdt (standard thickness), hew (height of basal ear width), PC (principal component), bcv (basal concavity), hmbw.bew (height of minimum basal width/basal ear width), bew.bcv (basal ear width/basal concavity). The mean values follow the attribute names. Asterisks mean the ANOVA found significant differences, but the Tukey-Kramer did not discriminate regions. In that case, the inclusion of the attribute is based on the greatest difference in means.

	Chipola *[Aucilla]*	**Aucilla**	**Hills.** *[St. Johns]*	**St. Johns**	**Santa Fe** *[Suwannee]*	**Suwannee**
Analysis #4 **6 Regions** ***Curve sided***	angle 51° mbw 24 mm bcv 4.1 mm PC 2 -.51	avt 5.9 mm PC 2 -.47	angle 58° bcv 3 mm PC 2 .64	avt 6.9 mm	mbw 27 m bcv 3.8 mm avt 6.6 mm	PC 2 -.9
Analysis #4 **5 Regions** ***Curve sided***	angle 51° bcv 4.1 mm avt 6.6 mm hmbw.bew .43 bew.bcv 7.34	avt 5.9 mm	angle 58° bcv 3 mm hmbw.bew .32 bew.bcv 10.63	avt 6.9 mm bew.bcv 8.27	angle 55° bcv 3.7 mm avt 6.5 mm hmbw.bew .36 bew.bcv 9.15	
Analysis #4 **3 Regions** ***Curve sided***	angle 53° PC 2 -.94 hmbw.bew .4		angle 56° PC 2 -.42 hmbw.bew .34			

Table 6.31: Summary chart of the means of the attributes of the significant ANOVA results and Tukey-Kramer tests for Analysis #4 for the Middle Paleoindian points for all regional configurations. Bracketed names show how the regions were combined. Key: ear (earsize), angle (angle), hypo (hypotenuse), mbw (minimum basal width), avt (average thickness), stdt (standard thickness), hew (height of basal ear width), PC (principal component), hmbw.bew (height of minimum basal width/basal ear width), bew.bcv (basal ear width/basal concavity), hyp.mbbw (hypotenuse/minimum basal width.basal ear width), ang.bew (angle/basal ear width). The letters following the attribute were taken from the Tukey-Kramer tables. Different letters indicate significant differences. Asterisks mean the ANOVA found significant differences, but the Tukey-Kramer did not discriminate regions, and the inclusion of the attribute is based on the greatest difference in means.

	Chipola *[Aucilla]*	**Aucilla**	**Hills.** *[St. Johns]*	**St. Johns**	**Santa Fe** *[Suwannee]*	**Suwannee**
Analysis #4 **6 Regions** ***Curve sided***	angle B mbw B bcv A PC 2 B	avt B PC 2 B	angle A bcv B PC 2 A	avt A	mbw A bcv A avt A	PC 2 B
Analysis #4 **5 Regions** ***Curve sided***	angle B bcv A avt A hbw.bew A bew.bcv A	avth B	angle A bcv B hbw.bew B bew.bcv C	avt A bew.bcv AB	angle A bcv A avt A hbw.bew B bew.bcv BC	
Analysis #4 **3 Regions** ***Curve sided***	angle B PC 2 B hbw.bew A		angle A PC 2 A hbw.bew B			

E. Summary

The analyses of the Middle Paleoindian points produced a total of 122 significant ANOVA results, and 111 regional differentiations in the Tukey-Kramer tests. Compared with the number of results in the Early Paleoindian period, it appears there was a trend toward greater regionalization through time. These results are interpreted in more detail in the next chapter.

CHAPTER 7

INTERPRETATION

In this chapter I discuss the results of the analyses in Chapter 6. My analytical method was designed to uncover regional variation in artifact form, if present, and it appears to have done that. The analyses reveal a pattern of regional variation in artifact form increasing through time and across space, which was predicted by the model. I start the discussion of the results by briefly reviewing the pertinent predictions of the models of design trajectory and social differentiation and how that variation should manifest itself. I summarize all of the significant ANOVAs in several charts and tabulate the number of differences between different regions. By looking at clusters of significant results in the Middle Paleoindian period, it appears there was consistency in artifact variation in both size and shape attributes between several regions. I then discuss three alternative hypotheses that could explain the results: statistical problems, raw material differences, and explanations that rely on analogies to biological evolution. In the discussion section, I conclude that the Early Paleoindian data indicate that the occupants of the Study Area had not yet begun to develop distinct artifact designs, although there are possible indications that the process had begun by the end of that period. In the Middle Paleoindian period, we see strong evidence to infer that social groups had established themselves and were producing regionally distinct artifacts that could be recognized by others. Based on a rough index of social differentiation, I propose that three regional centers may have been present at that time, centered in the Chipola, Hillsborough, and Santa Fe or Suwannee regions.

I. Theoretical Review

The models presented in Chapter Two make several predictions about the nature of material culture variation and how that variation will be manifested through time and across space. Initial artifact forms should show higher uniformity across a region, and the earliest form of a cultural model will show the less variation than later forms. Variation will increase through time as more people in relatively isolated areas work on the same cultural model and make idiosyncratic changes to the design. Initially, variation will be in the form of small changes to discrete aspects of the form. In the haft of a projectile point, those changes can be in the size, such as the width of the base, or the shape, such as the relationship between the width of the base and the height of the minimum basal width. Whether changes are made to the size, the shape, or both depends in part on whether a cultural rule constrains the allowable variation in that aspect of the design. These rules are unpredictable, but they should affect how variation is created across regions and within regions. Artifact designs will spread among regions through a process social learning and selection among alternative cultural models. Thus, it is likely that models will be transmitted intact between regions rather than being modified in the process of transmission. In other words, when a new point is introduced into a social group, two different designs will be made simultaneously rather than a single design that is a combination of the two forms.

The degree of interaction and the amount of cultural transmission between people is approximately inversely proportional to the distance between groups. Thus, groups that are closer will share more cultural traits in common than groups that are more distantly separated. In Paleoindian society, which we assume was organized like modern hunter-gatherers, the geographic distribution of artifact and attribute designs should positively correlate with the distribution of social groups so that groups that are closer should make artifacts that are more similar than groups that are more distantly separated.

II. Summary of the Analyses

A. Early Paleoindian

The ANOVA analyses on the Early Paleoindian points did not produce enough significant ANOVA differences to conclude that distinct social groups existed at that time. Tables 6.5, 6.9, and 6.17 show that all of the five significant ANOVAs involved point thickness (both PCs were strongly influenced by average thickness), and four of the five were in the subset of points with robust flutes. Four of the five significant results were in data partitions that exclusively included curve sided points, and the other result was in Analysis #1, which had no initial data partition. Three of the ANOVAs found significant differences between the St. Johns and Santa Fe regions. The implications of these results are discussed below.

B. Middle Paleoindian

In contrast to the early period, the Middle Paleoindian period produced 122 significant ANOVAs in a spatial pattern from which I infer that distinct social groups were present. I tabulated the significant ANOVAs for each data partition and regional configuration in Tables D.7.1 – D.7.7. Table 7.1 totals the significant differences in those tables for each regional configuration and shows that the Chipola, Hillsborough, and Santa Fe regions had the greatest number of significant differences. Looking at the six region configuration, 50 percent of the significant ANOVA results involved differences between the Chipola and Hillsborough regions, and 44 percent involved differences between the Chipola and Santa Fe regions. The next largest percentages were between the Chipola and Suwannee regions (24%), the Aucilla and Hillsborough regions (22%), the St. Johns and Aucilla regions (18%), and Santa Fe and Aucilla regions (14%). Thus, based on the total number of significant differences, it appears that there were three different territories with their foci in the Chipola, Hillsborough, Santa Fe.

The model predicts that the number of significant differences should be positively correlated with distance so that more distant regions should have a greater number of significant differences. Table 7.2 demonstrates that this prediction holds for the six region configuration. The St. Johns-Chipola relationship is the only strikingly anomalous result (Table 7.2; Figure 7.1). Figure 7.1 plots the number of significant differences against distance for all regions in the six region configuration with or without the Chipola-St. Johns pair. It shows a strong positive correlation between the number of differences and distance, which follows a classic distance decay model of interaction. The implications of this pattern are explored in more detail in the Discussion section.

Table 7.1: Summary of the ANOVA results of Analyses #1-4 for the Middle Paleoindian points. The total number of significant ANOVAs is listed in parentheses.

6 Regions (50 possible)	Chipola	Aucilla	Hillsborough	St. Johns	Santa Fe	Suwannee
Chipola	-	5	25**	0	22	12
Aucilla	5	-	11**	9	7	1
Hillsborough	25**	11**	-	1	4	5
St. Johns	0	9	1	-	5	5
Santa Fe	22	7	4	5	-	0
Suwannee	12	1	5	5	0	-

5 Regions (36 possible)	Chipola	Aucilla	Hillsborough	St. Johns	Santa Fe
Chipola	-	7*	18*	0	18
Aucilla	7*	-	5**	5	4
Hillsborough	18*	5**	-	1	3
St. Johns	0	5	1	-	5
Santa Fe	18	4	3	5	-

3 Regions (38 possible)	Chipola	Hillsborough	Santa Fe
Chipola	-	21*	18*
Hillsborough	21*	-	11**
Santa Fe	18*	11**	-

Table 7.2: The distribution of significant differences organized by the rank distance from the Chipola, Aucilla, Santa Fe, and Hillsborough regions. The number of significant differences in the six region configuration is listed below the name of the region. An asterisk indicates that one of those differences was significant in the ANOVA but was not differentiated in the Tukey-Kramer. Gray blocks indicate there are no more distant regions. [1] These regions are approximately equidistant.

	Nearest ←				**→ Furthest**
Chipola	Aucilla	Suwannee	Santa Fe	St. Johns[1]	Hillsborough[1]
	5	12	22	0	25**
Aucilla	Suwannee	Santa Fe	St. Johns[1]	Hillsborough[1]	
	1	7	9	11**	
Santa Fe	Suwannee	St. Johns	Hillsborough[1]	Aucilla[1]	Chipola
	0	4	4	7	22
Hillsborough	St. Johns	Santa Fe[1]	Suwannee[1]	Aucilla	Chipola
	1	4	5	11**	25**

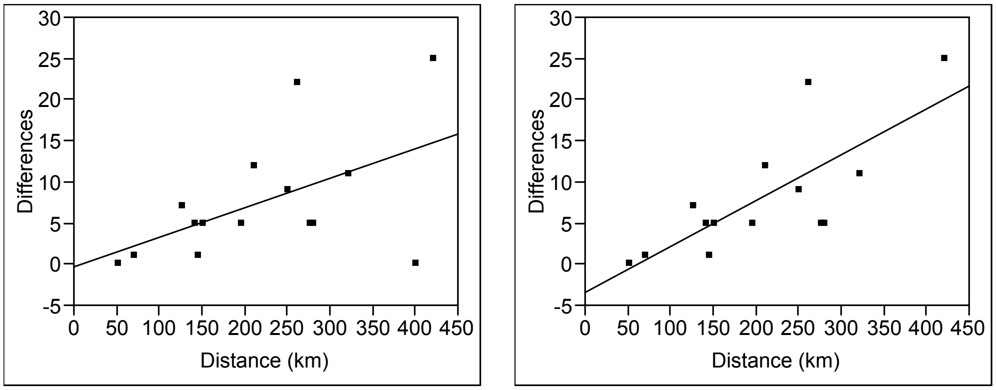

Figure 7.1: Two plots of the distance between regions against the number of differences with a regression line. The first plot includes the St. Johns-Chipola pair (at the lower right corner); the second does not.

III. Regional Comparisons

The total number of significant differences could be misleading if the ANOVAs showed no coherence with the artifact design. Thus, I looked at whether the differences make design sense, i.e., whether the ANOVAs represent a coherent set of attributes that are recognizable in the shape or size of the haft. Recognizable variation may be evident across several attributes, so I focused on 18 attribute-clusters, in which an analysis produced four or more significant ANOVAs between the same regions. These attribute-clusters, the relative differences in attribute values, and the effects of these differences are presented in Tables D.7.8 – D.7.16. Table 7.3, which totals these sets by region, shows that only the Chipola-Santa Fe and Chipola-Hillsborough combinations produced more than two attribute-clusters.

Table 7.3: The regional distribution of sets of at least four significant attributes.

	Chipola	**Aucilla**	**Hillsborough**	**St. Johns**	**Santa Fe**	**Suwannee**
Chipola	-	0	5	0	8	2
Aucilla	0	-	0	1	0	0
Hillsborough	5	0	-	0	1	0
St. Johns	0	1	0	-	1	0
Santa Fe	8	0	1	1	-	0
Suwannee	2	0	0	0	0	-

Attribute-clusters and Regional Differences

In this section, I examine the 18 attribute-clusters in more detail and review the other significant ANOVAs to look for coherent trends of differences between the regions.

Chipola – Santa Fe. This regional combination produced eight attribute-clusters, two in Analysis #1 and six in Analysis #2. Analysis #1 should be a good way to look for overall trends in variation since it had no initial partition of the data. Table D.7.17 shows consistency in the analyses in the six and three regional configurations. The Chipola points tend to be smaller, with narrower bases and waists, than the Santa Fe points. The Chipola points also tend to have longer bases as measured by the height of the minimum basal width (the distance between the base and the minimum basal width) with straighter sides and ears that are less flared.

In Analysis #2, I partitioned the points based on shape and created flared-eared and straighter-eared groups. For this analysis, I predicted that the interregional variation should manifest itself in size differences, which are borne out in the flared-ear group but not the straighter eared group. In the flared-ear group, most of the variation is in the size attributes (Table D.7.18), which confirms the interpretations from Analysis #1 and adds that the ears are smaller on Chipola points than on Santa Fe points in this subset. The shape attributes in the five and three region configurations conflict, but the ratio minimum basal width.basal ear width/hypotenuse has complex effects that may explain some of the ambiguity. In the straighter-eared group, the size difference is maintained, with an emphasis on straighter and longer bases in the Chipola group (Table D,7.19).

In sum, the Chipola points are on average smaller in the width of the waist and the base by from 4 – 7 mm, depending on the analysis. The ears are about half the size of those in the Santa Fe group. These differences are large enough to be seen. In addition, the base tends to be longer, and the ears are less flared.

<u>Chipola – Hillsborough</u>

This regional combination produced five sets of significant difference, two in Analysis #1, and one each in Analyses #2, #3, and #4. In Analysis #1 (Tables D.7.8, D.7.9), the differences are similar to those between the Chipola and Santa Fe regions, but they are less pronounced. The waist of the Chipola points is 3 mm smaller on average, but that difference is only significant in the six region configuration. The ear is also smaller. Although significant, the difference in the height of basal ear width, which is a partial linear measure of ear size, is only 0.3 mm, which is likely not noticeable. The main differences are in the shape of the base, where the Chipola points tend to have longer bases and ears that flare less than the Hillsborough points. Chipola points are also likely to be somewhat more uniform in their thickness.

The general trend in Analysis #1 is confirmed in Analysis #2 (Table D.7.12). The waist is relatively longer in relation to the width of the base. There is little significant difference in size other than the base is longer and the ears are smaller in the Chipola points. Analysis #3 reinforces finding of these differences (Table D.7.14). Analysis #4 also reveals that the large curved sided Chipola points have a relatively deeper basal concavity (Table D.7.16). The mean of the actual difference is 1.1 mm, which should have been noticeable on unhafted points.

Chipola-Suwannee

The differences between the Chipola and Suwannee points (Tables D.7.8 and D.7.13) track the differences between the Santa Fe and Chipola points, although the differences are generally not as pronounced. In addition, Analysis #2 found that the Chipola points were slightly less uniform in thickness than the Suwannee points. Whether this difference of .3 mm, which is about five percent of the mean thickness, would have been noticeable is unknown.

Aucilla-St. Johns

In Analysis #2, the flared ear partition in the six region configuration (Table D.7.10) showed that the Aucilla points had ears that flared more but also a waist that was on average 5 mm longer than the St. Johns points.

Hillsborough-Santa Fe

In Analysis #2, the flared ear partition in the three region configuration (Table D.7.12) showed that the Hillsborough points had shorter ears that were more flared and a squatter base than the Santa Fe points.

St. Johns-Santa Fe

In Analysis #2, the flared ear partition in the six region configuration (Table D.7.10), showed that the St. Johns points were significantly smaller in the ear length, basal width, and waist height than the Santa Fe points. They also had more flaring ears.

In addition to the specific differences described above, some general differences can be pulled from the significant ANOVAs, and these are summarized in Table 7.4. These general regional differences track the specific differences listed in the previous section but also include several others.

Table 7.4: List of general traits derived from all significant ANOVAs in all regional configurations.

Chipola	Size	*Greatest number of significant differences (in the six-region configuration)* Narrower waist In curved points, they have the deepest basal concavity Longest base
	Shape	Lowest angle (least flaring ears) Generally the ears do not flare, but when the ears flare, they are significantly smaller in size
Aucilla	Size	Thinnest and most uniform in thickness. Longer waist
	Shape	Longer base
Hillsborough	Size	Largest ears Wider waist Wider base Shallowest basal concavity
	Shape	Squattest base Ears more flared Highest angle
St. Johns	Size	*Least number of significant differences (in the six-region configuration)* Thickest
	Shape	
Santa Fe	Size	Larger size in general Thicker Widest waist Widest base
	Shape	Squatter base in general Largest ears Ears more flared Higher angle
Suwannee	Size	Thicker Wider waist Wider base
	Shape	Ears slightly less flared than the Santa Fe Higher angle

A description of the general differences between regions was plotted spatially (Figure 7.2) to illustrate the regional variation. Based on the six region configuration, Figure 7.3 shows the absolute differences between regions, and Figure 7.4 illustrates the relative strength of the similarities between regions.

Figure 7.2: Regional configuration with a general synopsis of the traits in the ANOVAs.

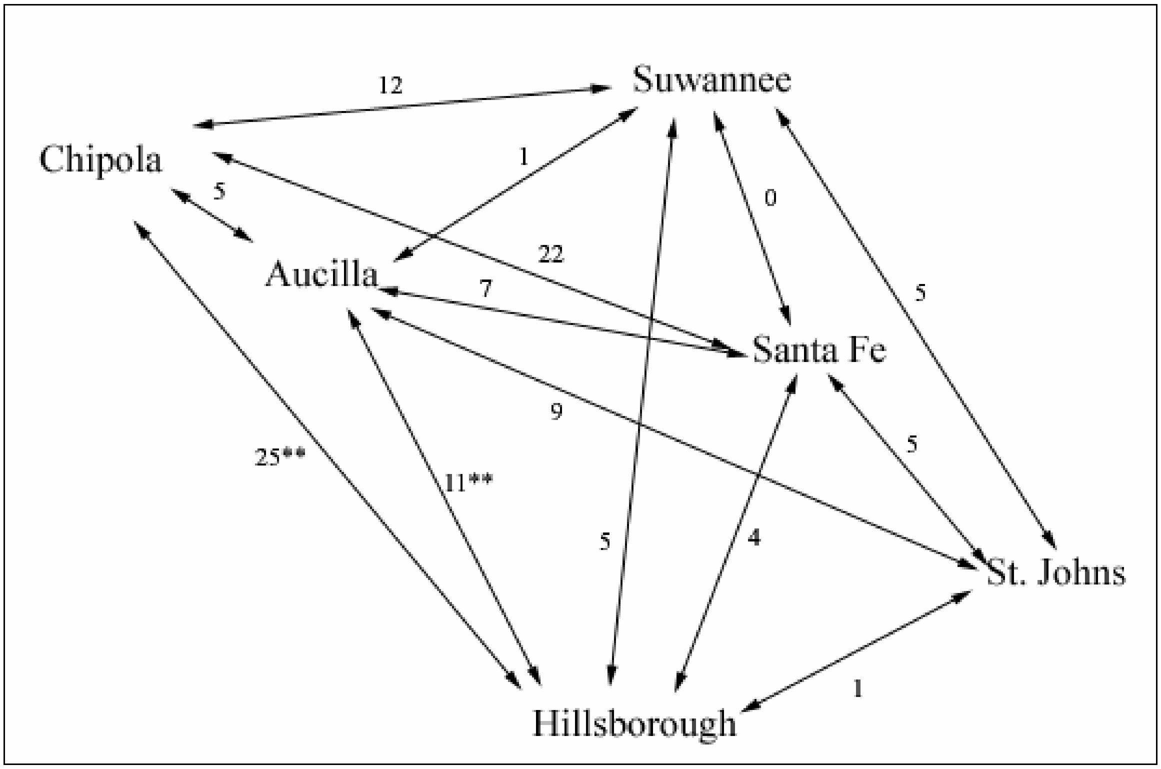

Figure 7.3: Diagram of the connections between the regions that show the number of significant ANOVA differences between the main . The anomalous St. Johns-Chipola connection, which had zero differences between them, is not shown.

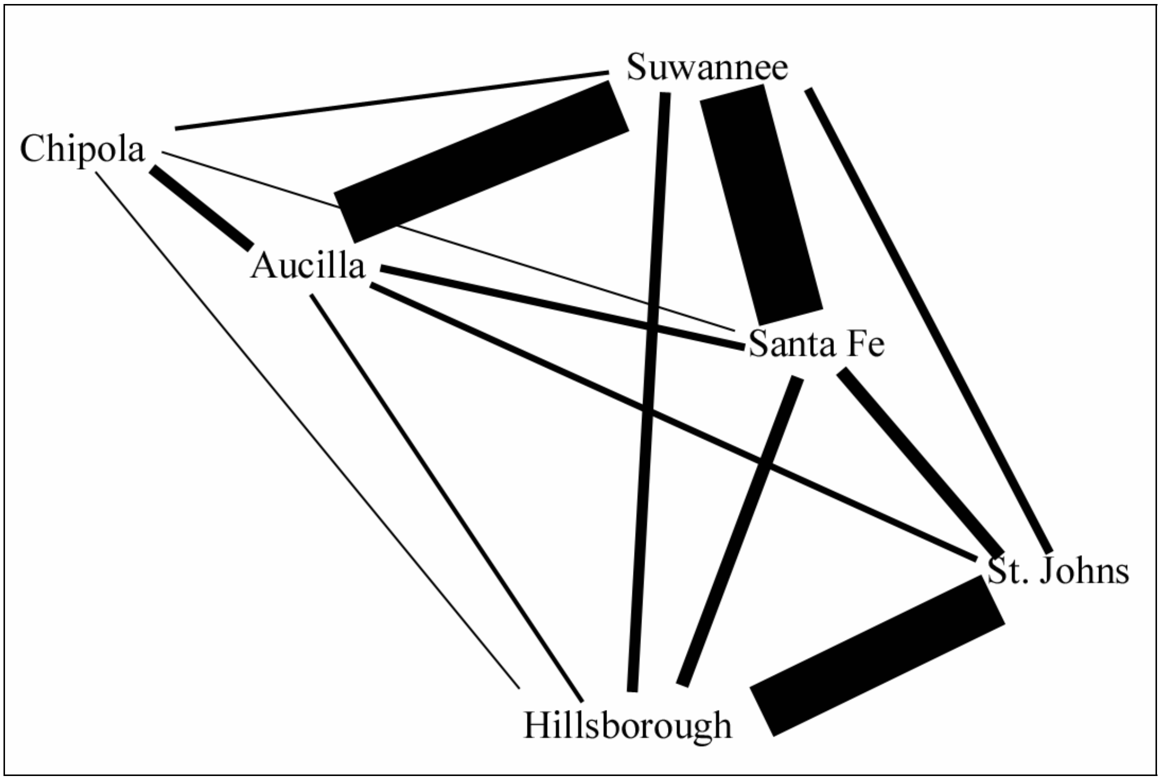

Figure 7.4: Diagram showing the relative strength of the inferred interaction between areas based on the number of significant differences between them. The thicker lines have few differences. The anomalous connection between the Chipola and St. Johns regions is not depicted but would have been the thickest because the regions had no differences between them.

IV. Alternative Hypotheses

Although the results support my hypothesis, it is possible that this pattern of regional differentiation can be explained by alternative hypotheses. Three alternative hypotheses are discussed in this section: statistical anomaly, raw material differences, and biological evolutionary analogies.

A. Statistical Anomaly

The regional configurations could be a product of the initial assignment of the points to different regions, a consequence of the statistical techniques employed, or the effect of random variations in the data.

Based on the discussions in Chapter 3, I assigned the points to six regions. However, these assignments were heuristic and in part intended to better equalize the distribution of points in the regions. The Suwannee and Santa Fe regions were in close proximity, and it was somewhat arbitrary to assign a point to the Santa Fe region that was found a few hundred meters upriver from its confluence with the Suwannee. It is not likely that the confluence formed a social or natural boundary between groups.

Because the initial regional configuration was somewhat arbitrary, I also ran all the analyses on a five region configuration, in which the Santa Fe and Suwannee regions were combined, and a three region configuration, in which the Hillsborough and St. Johns regions were combined as well as the Chipola and Aucilla regions. In some regards these reconfigurations changed the analyses, but in most regards they tended to reinforce the six-region configuration. The regional configurations made a difference in the ANOVAs, although for the most part the results in the five and three region configurations were redundant of the differences found in the six region configuration. Since the two or three region solution was apparent in the six region tests, I conclude that the initial regional configurations did not adversely influence the outcome.

Analysis of variance is the foundation of this research, and so problems with the ANOVA will affect the interpretation. Although, ANOVA can be run on small sample sizes, the robustness of the results is adversely affected. With smaller sample sizes, it is more difficult to violate either the equal variance or normal distribution conditions, so it is more likely that the conditions for running the test will be met. Thus, seemingly significant differences may be due to small sample size because not enough members of the class are present to show the range of variation. Conversely, larger sample sizes, like those created in the three region configuration, can produce significant ANOVAs based on small absolute differences in attribute size. This does not appear to have been a significant problem in this project; sometimes the absolute difference in an attribute value in the three region configuration increased and sometimes it decreased. In any event, the use of the conservative Tukey-Kramer HSD test ameliorated some of the difficulties with small sample size. In fact, in 12 instances the Tukey-Kramer test did discriminate different regions even though the ANOVA results showed a significant difference existed. Thus, it appears that the results were not simply an artifact of the regional configuration.

It is possible that the results were simply the result of random variation in the data. To investigate this possibility, I ran tests on the entire Early and Middle Paleoindian chronological units (Analysis #1) by randomly assigning the points to five "regions" and running ANOVAs on the attributes. In several regards, the random tests mimicked the results of the actual tests. In the random tests, the Early Paleoindian unit produced a single significant ANOVA, while the Middle Paleoindian unit produced five. By comparison, in the actual tests the Early Paleoindian unit also produced one significant ANOVA (in a six-region configuration), while the Middle Paleoindian unit produced eight significant ANOVAs in the five-region configuration. The Tukey-Kramer tests on the random data found consistent variation between two of the "regions."

While the random tests confirm that variation and structure exists in these data, I do not believe it affects my interpretation of the spatial distribution of that variation. My results were not randomly distributed and comported with the predictions of the hypotheses. Nevertheless, the tests show that some of the ANOVAs could be the result of random variations in the data. Thus, to minimize the effects of random variation my interpretations depend more on attribute-clusters and results that are duplicated in more than one ANOVA.

B. Raw Material Differences

The regional differences could result from differences in the raw lithic resources in each region. Lithic raw material research in Florida is hampered by the difficulty in tracing the origin of most cherts to a particular location. While most chert can be sourced to a particular limestone formation, these formations outcrop in widely spaced locations in northern Florida (Upchurch, et al. 1982). In addition, the same chert nodule can produce flakes with dramatically different knapping qualities. Finally, no system has been developed to systematically characterize the quality of chert for tool making. Nonetheless, although it would be difficult to assess this alternative hypothesis, it is possible to predict the effect of raw material resources of different quality on point manufacture.

Chert could affect both the size and the quality of the points. If the chert nodules were significantly smaller in one region (i.e., small enough to affect the ability to make a “full size” point), then we would expect the points to be smaller, at least in its total length. If the chert had poorer knapping quality, then we would expect the points to have greater inconsistency in shape and lacking in finer details, such as ear size or shape. Since the Middle Paleoindian points from the Chipola were consistently smaller, the raw chert resources in that region could have come in smaller packages. However, the Chipola points also had substantially smaller ears. Thus, although the raw chert may have come in smaller packages, it may also have been of higher quality. We might also expect that knappers could produce thinner points with greater uniformity if they were using high quality chert (assuming it was culturally appropriate to make thin points). The Aucilla region produced points that were significantly thinner and more uniform in thickness than the other regions.

In a comprehensive study of chert resources in Florida, Upchurch, et al. (1982) identified 19 “quarry clusters” that were geographically constrained and shared similar chert types. Upchurch, et al. (1982:105-107) described a Mariana cluster in which the chert had an iron-deficient chemistry, which left it lighter in color than other cherts. This comports with my observation that most of the artifacts taken from the Chipola River have a distinct orange hue. Although they (Upchurch, et al. 1982:106) describe the stone as “suitable for tool manufacture,” there is no discussion of the size of the nodules.

My sense of this issue is that differences in haft size are hard to explain by resorting to differences in the size or quality of the raw material. First, although significant between regions, the size differences between basal ear width and minimum basal width of the Chipola points is only about 5 mm. Although significant for discriminating between points, it seems unlikely to have been impacted by package size. Further, it is difficult to understand how the other smaller dimensions of ear size and height of minimum basal width could be related to package size. It seems more likely that package size would affect the total length or maximum width of a point rather than the size of the base. Second, the Chipola point hafts seem to be not only smaller but also of a different shape – longer waisted, deeper basal concavity, with ears that flare less than the points from other regions – and these shape differences likely were not compelled by a smaller package size. Third, the Early Paleoindian points from the Chipola region showed no significant differences in the size or shape of their hafts indicating that package size did not affect haft size or shape at that time. It is possible that those raw material resources were used up or lost by the time the Middle Paleoindians occupied the area, however. Thus, while it is possible that the regional differences in artifact form could be explained by regional differences in raw material resources, it seems more likely that they had no effect on the haft size or shape. Nonetheless, the hypothesis could be explored in more detail.

C. Explanations Analogous to Biological Evolutionary Processes

Finally, the variation in artifact design could have resulted from processes that are akin to those that drive biological evolution, such as environmental adaptation or genetic drift. In the adaptation analogy, we would posit that the people living in the Chipola region needed a smaller, narrower point with a longer haft and smaller ears that flared less than those used in areas to the east. If so, the Chipola people could have been closely allied with their eastern neighbors, but due to their peculiar environmental circumstances, they made different kinds of points. In this scenario, the artifact variation would be misinterpreted as deriving from different social groups rather than from different environmental conditions. This hypothesis will be supported only if conditions in the Chipola region, including the available game or fish, were sufficiently different to have spurred the perceived need to develop distinct forms, which seems unlikely.

This alternative hypothesis can never be tested since we cannot reconstruct the environment of 12,000 years ago in the Study Area in sufficient detail to parse out the crucial differences between the Chipola region and regions to the east. Further, we cannot know whether the differences in haft form were functional in the sense that they were necessary to perform a particular task. It is fair to say that environment constrains the basic form of material culture, but environment alone cannot explain the variations on the basic form. My position is that at best we can assume that any particular artifact was sufficient for its intended purpose, but we cannot assume that differences in artifact form indicate that environmental pressures stimulated someone to make a change. Although the hypothesis environmental adaptation remains a possible explanation, it seems unlikely in this case given the limited geographical extent of the Study Area, the proximity of the regions to one another, and the probability that the Santa Fe region was no more different from the Chipola region than it was from the Hillsborough region.

In the genetic drift analogy, small, isolated populations could develop different cultural behaviors or artifact designs simply because there were not enough people to maintain the entire suite of behaviors. Drift will tend to work on behaviors that are neutral in the face of selective forces, otherwise the selective forces will work to maintain a certain level of effectiveness in the behaviors and swamp the effect of drift (Henrich 2004). In addition, a scenario in which drift is at work requires that a group remain isolated and no new cultural models are introduced to replace those previously lost. Thus, the predicate conditions for drift to be effective are missing in this case. There is no evidence that the Chipola region was isolated. In fact, the opposite appears true since the Chipola region shares the same distance-decay relationship as the other regions. If the Chipola region was isolated, we would expect a dramatic break in the similarities between it and other regions. However, we see the opposite effect. In addition, while the relationship of the Chipola people with others to the north and west and up the Chattahoochee and Flint River systems is unknown, it is unlikely that they were isolated in that direction. Further, the haft of a projectile point likely is not to have been a selectively neutral trait. Rather, it is likely to have been under at least some selective pressure to maintain a functional shape. Thus, we can be fairly confident that the predicate conditions for drift were not present in the Study Area during the Paleoindian period.

V. Discussion of Results

In this section I discuss the implications of the analyses in regards to the identification of and interactions between Paleoindian social groups in the Study Area and the identification of cultural models.

A. Early Paleoindian Social Groups

When compared to the variability in the Middle Paleoindian points, the remarkable uniformity of the size and shape of the Early Paleoindian points is an indication of strong regional integration and group interaction across the Study Area during the Early Paleoindian period. These data cannot resolve whether several groups or a single group occupied the Study Area, but in comparison to the variability in the latter period, it is reasonable to infer that no significant social group differentiation was present at that time, or at least none that led to the development of different point designs.

The data may allow us to see the beginnings of regional differentiation in the Early Paleoindian period. If we assume that the straight sided fluted points likely are the earlier Clovis forms, then the curve sided fluted points may have derived from them at a later time. Although there is still uniformity in the shape of curve sided fluted points across the Study Area, three of the five significant ANOVAs indicate that the people in the Santa Fe region were making their points almost 1 mm thinner than their neighbors in the St. Johns region (Tables 6.5 and 6.17). Analysis #1 shows that this difference is a general trait for all the points with robust flutes made in these regions, and Analysis #4 indicates that it is most pronounced in the curve-sided points with robust flutes.

A one millimeter difference in thickness is probably noticeable. While this difference may be due to raw materials, there were no significant ANOVA differences in average thickness between these regions in the later Middle Paleoindian period. Whether the difference in average thickness is an anomaly is not knowable without more data. If it accurately reflects the conditions at that time, then it supports the hypothesis, which predicts that the very beginnings of regional differentiation will be evident in only one or a few attributes.

B. Middle Paleoindian Period

In contrast to the earlier period, the Middle Paleoindian period shows a robust pattern of regional differentiation that harmonizes with the model's predictions. If we use the total number of significant ANOVAs in the six region configuration as an index of social difference, then we can rank the regions accordingly (Table 7.5). While the Chipola seems to be a locus of a distinct social group, the relationships among the other regions are not as clear. By excluding the Chipola group from the calculus, we get a better picture of the relationships between the other regions. Without the Chipola, the Aucilla has a significantly greater number of differences with the other regions (Table 7.5), and it is followed in rank by the Hillsborough, St. Johns, Santa Fe, and Suwannee regions.

Table 7.5: This tabulates the total number of significant ANOVAs in the six region configuration. The second line excludes the Chipola region from the calculation.

	Chipola	**Aucilla**	**Suwannee**	**Santa Fe**	**St. Johns**	**Hillsborough**
With Chipola	64**	34**	23	37	19	46****
Without Chipola		28**	11	15	19	21**

Untangling the web of relationships beyond this level of analysis becomes complicated, but some general observations about the data may help sort it out. As discussed above, regions exhibit few differences with their immediate neighbors (Table 7.6). If we consider the Chipola, Santa Fe, and Hillsborough regions as the central loci of three social groups, then the Aucilla, Suwannee, and St. Johns regions were transitional areas. In the Chipola-Aucilla-Suwannee-Santa Fe continuum, the Aucilla and Suwannee exhibit a single difference, although the Aucilla exhibits seven differences with the Santa Fe and the Suwannee exhibits 12 differences with the Chipola. The situation is a little different for the Santa Fe-St. Johns-Hillsborough continuum. The number of differences among these regions indicates a strong affiliation between the St. Johns and Hillsborough regions and the same degree of difference between them and the Santa Fe region. However, four of the five differences between the St. Johns and Santa Fe regions consist of a single attribute-cluster (Table D.7.10), and the relationship between these regions may have been closer than is indicated by the total number of significant differences. The implications of this attribute-cluster are discussed below.

Table 7.6: The differences between a region (center column) and the two nearest and next-nearest adjacent regions in the six region configuration for all significant differences. Gray boxes mean there were no adjacent areas. Each asterisk represents a significant ANOVA result but no Tukey-Kramer differentiation. In that case, the difference is based on the largest and smallest means.

Next-nearest	*Nearest*	***Region***	*Nearest*	*Next-nearest*
St. Johns 6	Santa Fe 0	**Suwannee**	Aucilla 1	Chipola 12
Aucilla 11	Suwannee 0	**Santa Fe**	St. Johns 4	Hillsborough 3
	Hillsborough 1	**St. Johns**	Santa Fe 4	Suwannee 6
	St. Johns 1	**Hillsborough**	Suwannee/ Santa Fe 5/3	Aucilla 13***
Santa Fe 11	Suwannee 1	**Aucilla**	Chipola 5	
Suwannee 12	Aucilla 5	**Chipola**		

Another way to tackle the relationships would be to focus on the regions with the strongest affiliations, i.e., adjacent regions that share the least number of significant differences. Looking at Figure 7.3 in this light, we could establish a new three region configuration of Chipola, Suwanne-Aucilla-Santa Fe, and Hillsborough-St. Johns, in which the Suwannee is the focus of the second region rather than the Santa Fe (Figure 7.5). This new configuration also better comports with the geographic distances between regions since the Aucilla is closer to the Suwannee (70 km) than it is to the Chipola (140 km). This new three region configuration was not tested in this project.

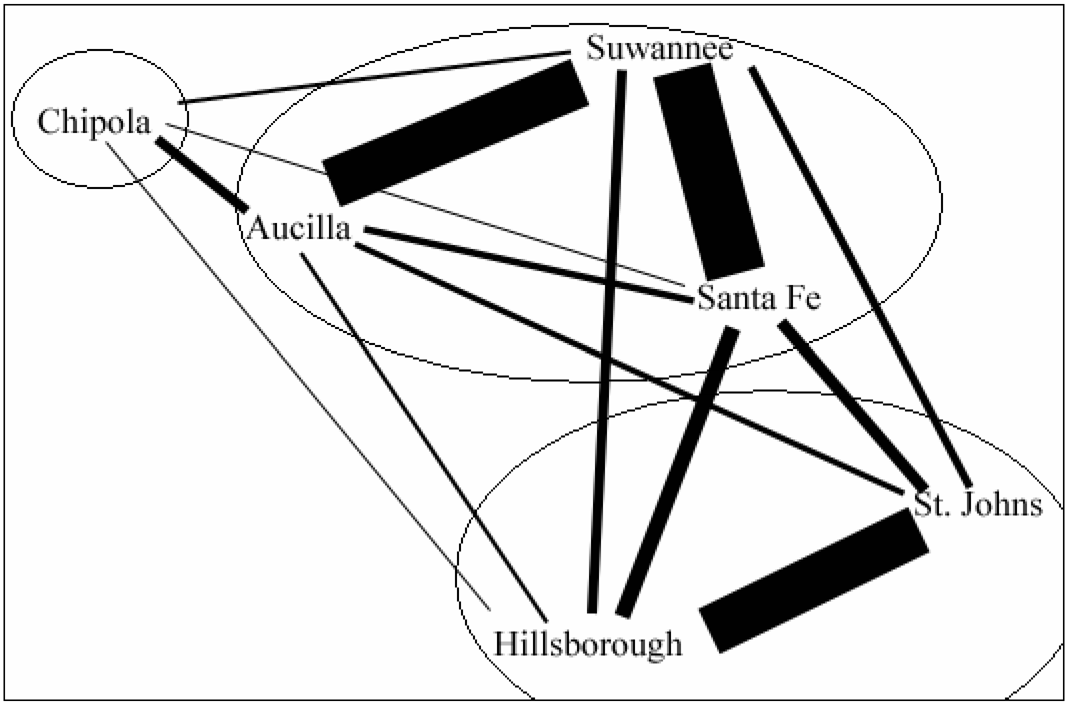

Figure 7.5: A three region reconfiguration based on the degree of similarity between regions.

The transitional areas may simply represent areas of territorial overlap between the social group core regions (Figure 7.6). Members of adjacent social groups would have made their artifacts in the transitional areas or brought them in and eventually discarded them there, which would tend to decrease the number of significant differences between the overlap area and the adjacent core regions. In other words, the statistical results do not necessarily mean that the points in the Aucilla region represent a composite form that is part-Chipola and part-Santa Fe. Rather, it could be the case that both Chipola and Santa Fe points were lost in the Aucilla region and to a certain extent in the

Suwannee region. The ANOVA test relies on mean values, which would not distinguish between these two possibilities. However, the model of cultural transmission predicts that the later scenario is likely.

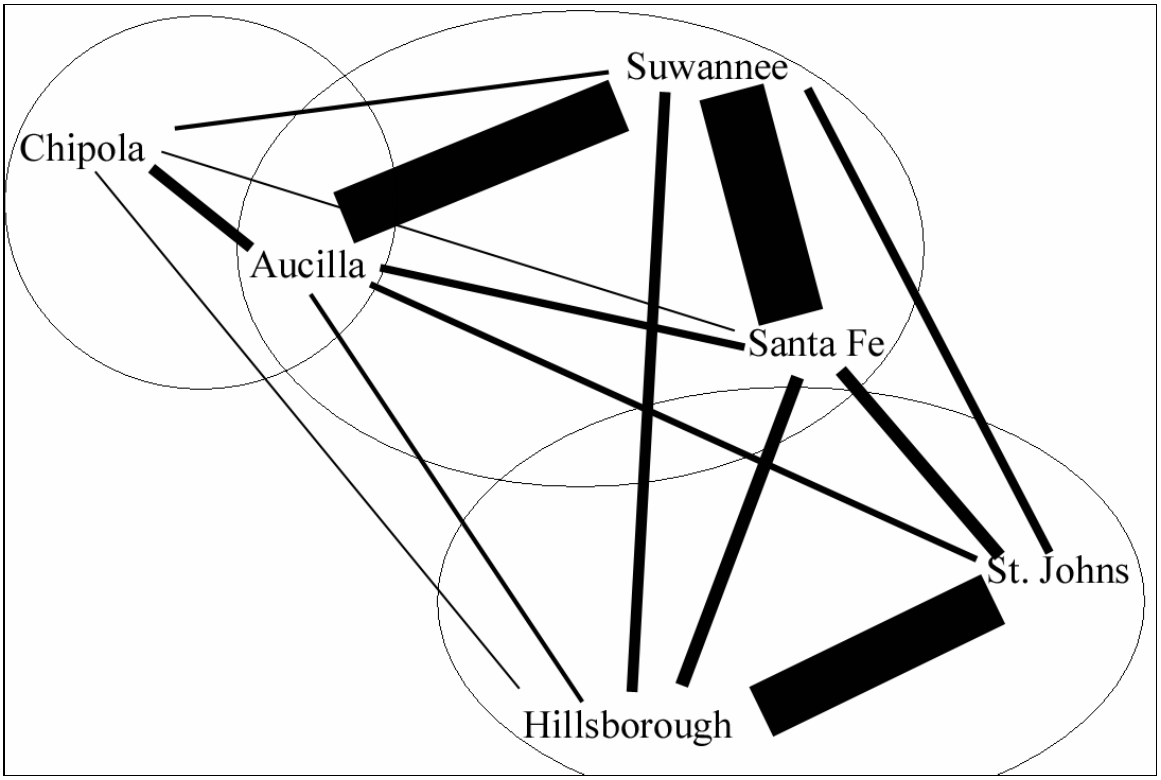

Figure 7.6: This configuration illustrates the Aucilla region as an overlap between the Suwannee-Santa Fe and Chipola regions. The stronger affiliation with the former region may be due to the fact that more Santa Fe-type points were dropped there. The overlap area between the Hillsborough-St. Johns region and the Santa Fe-Suwannee region is proposed simply because the affiliation is stronger between these areas than between the Chipola and Santa Fe-Suwannee regions. The analysis did not identify any particular region of overlap.

We can explore these alternative hypotheses by looking at the distribution of attribute values in the Aucilla region. If the distribution is unimodal, then we can infer that the points represent a composite form. If they are bimodal, then we can infer there are two forms present. By comparing the means for these variables in the Chipola and Santa Fe regions with mean for the Aucilla region, we may be able to both discern the presence of “Santa Fe” and “Chipola” points and judge the relative contribution of both to the assemblage in the Aucilla region.

Figure 7.7 presents histograms of all of the variables with significant ANOVAs between the Chipola and Santa Fe regions in Analysis #1 for the six region configuration. I chose this analysis because it maximizes the number of points per region and minimizes the effects of a small sample size on the shape of the distribution. The Aucilla region has 44 points. Figure 7.7 shows that some but not all of the variables are bimodal or multimodal. The mean values for each region are superimposed on the histograms. The results are suggestive of overlapping territories with two point designs rather than a single territory with a composite design. If the Aucilla was an overlapping area, it is clear from the relative positions of the means on the histograms that the majority of the points are "Santa Fes."

Thus, when we consider the differences, similarities, and the possibility that the intermediate regions are actually overlapping areas, the Chipola, Santa Fe, and Hillsborough regions seem to be the best solution to the regional puzzle. And the data do support the original three region configuration. The three region configuration in Table 6.5c3 supports the strong differentiation between the Chipola-Santa Fe (55% of the possible differences) and Chipola-Hillsborough (47% of the possible differences) regions found in the six region configuration, and it also exhibits fairly robust differentiation between the Hillsborough-Santa Fe regions (29% of the possible differences).

The relationship between the Chipola and St. Johns regions is not easily explained. Based on the index of social difference, the regions should share close social relations, but this violates the general distance-decay relationship we see among all the other regions (Table 7.2; Figure 7.1). Several scenarios could be developed to explain this situation including a long-distance marriage relationship, the infrequent exchange of highly influential people whom the other group members emulate, or a statistical anomaly. The question cannot be resolved without further analysis, and it remains to be explained rather than simply dismissed.

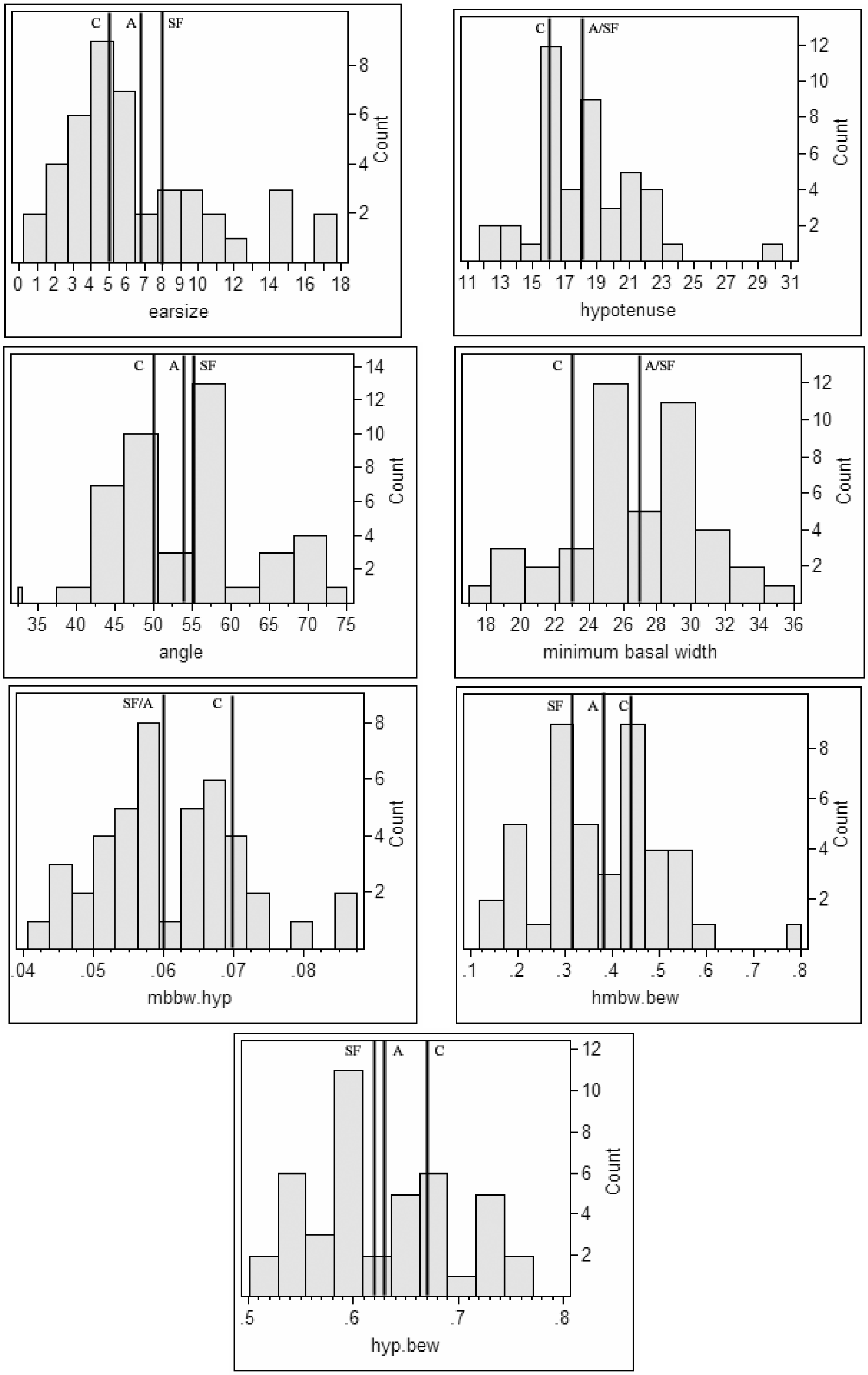

Figure 7.7: Histograms of all significant ANOVAs between the Chipola and Santa Fe regions for the six region configuration of Analysis #1 for all Middle Paleoindian points. The superimposed lines are the mean values for the attributes for the Santa Fe (SF), Aucilla (A), and Chipola regions.

Another issue that is not addressed by these data is the possibility that the foci of the social groups were on the now-submerged continental shelf and that the regions in the Study Area represent territorial hinterlands that were associated with these coastal groups. In that scenario, the regions of greatest difference in the Study Area would have been proxies for the coastal groups. Members of these groups may have traveled up river channels to their respective inland territories for specific resources. Paleochannel reconstructions on the continental shelf indicate that the rivers of the Big Bend region of the Gulf of Mexico, including the Aucilla and Apalachicola rivers, formed a single river system (Niedoroda, et al. 2004:fig. 3.4.6), which would provide a path for people on the coast to reach both the Chipola and Aucilla regions in the Study Area. The coastal Paleoindians who ventured into the interior may have been drawn to the limited sources of surface water, which would explain the density distribution of points in the Study Area.

VI. Identification of Cultural Models

Can we find the process of social differentiation described in Chapter 2 in these data? One example of the early development of design differentiation may be apparent in the Early Paleoindian data, which was described above. In that case the differentiation was apparent in a class of points. But the model of design trajectory also predicts that we could see differences in the design of a specific kind of artifact rather than a general condition of artifact design that applies to all artifacts in a class.

The single significant attribute-cluster between the St. Johns and Santa Fe regions may be one instance that involves differences in a discrete kind of artifact rather than a general condition of artifact design. This cluster comprised five significant ANOVAs in the five region configuration of the flared ear data partition in Analysis #2 (Table 7.13). Without this cluster, the St. Johns and Santa Fe regions would share a single difference. From the cluster description we can infer that for points with flared ears, the St. Johns points were generally smaller in overall haft size (shorter ear, squatter waist, and narrower base). Unfortunately, the significant shape attributes have ambiguous implications, but read together we can infer that the St. Johns points had a squatter base and ears that flared more than the Santa Fe points. Thus, this may be an instance where a particular kind of point developed along different trajectories and was used in two distinct forms in adjacent regions without a melding of the two into a single composite design.

VII. Conclusion

Based on these data, it appears that the model of social differentiation is supported. We can infer that during the Early Paleoindian period, people had not yet developed socially differentiated regions in the Study Area, although there is an indication that the process may have begun in the latter part of that period. By the Middle Paleoindian period, people in the Study Area appear to have organized themselves into social groups that developed either distinct point designs or distinct approaches to point manufacture. These social groups occupied territories with central areas that were used almost exclusively by the group and edge areas that overlapped with the territory of the neighboring group.

It appears that three main loci of differentiation are present in the Study Area that center on the Chipola, Hillsborough, and the Santa Fe regions. Of course this configuration could change if the size the Study Area was extended to the north, west, or south. The Study Area may represent a small part of a much larger network of interrelated regions, and as the number and configuration of the regions change, so will the number and nature of the significant ANOVAs. This model of organization in the Study Area may also change if we gain a better understanding of the Paleoindian occupation of the continental shelf. We may find that what appear to be three territories that are located in interior of the state may be the hinterlands of territories that are located on the shelf.

In addition to informing questions of social organization, the data may also be used to find specific instances of artifact differentiation. Arguably, the data present examples of the development of general and specific artifact design differentiation, which are predicted by the model of design trajectory.

CHAPTER 8

CONCLUSION

In this dissertation I laid out a theoretical framework and methodology for conducting an analysis of regional social organization based upon the distribution of variations in material culture. The framework is complex, but to undertake a project that relies solely on the location of isolated artifacts from uncontrolled contexts without taking care to ensure that all underlying assumptions are supported is fraught with peril. While the theory and methodology were developed for use with these particular data, they have general applicability to all kinds of human behavior. The method of using attributes of projectile points to demonstrate social group differentiation appears to work with Paleoindian points, and it should also be applicable to other artifacts in any time period.

The phenomena of consistency and variation in material culture are produced and maintained through the constant interplay of learning and production in which all people engage. These processes create the archaeological signature of geographic and temporal distribution of variation. While this statement is not groundbreaking – we all understand that in a general sense – I believe that we will begin to better understand the mechanisms for the spread of artifact designs and the patterns of variation when we look more closely at how individuals decide to do what they have always done, modify what they have always done, or adopt something new.

This research has theoretical, methodological, and application components, some of which are extensions of or new applications of existing theory and method, and some of which are new insights into the relationship of variation in material culture, typology, style, and the identification of social groups.

As to theory, I extended cultural evolutionary theory to archaeological problems of regional variation. Since variation is created by people who take intentional actions, it is appropriate to think about that variation in the context of human thought and intention. Actually understanding how people make choices, how those choices are constrained by cultural logic or habitus, and how people learn to make or do things leads to specific predictions about how variation will appear on the landscape and how it relates to the people who made it. CET predicts that people would produce a range of artifacts from a single cultural model of that artifact, and people infer a cultural model from that range of variation produced in the manufacture of those artifacts. This dynamic of making artifacts from cultural models and inferring the models from those artifacts sets up an engine that moves through time and space producing variation and consistency.

The archaeological assemblage is a subset of the range of variation initially produced by a group of people, which archaeologists try to identify from that subset. To do that, they create a typology that finds a normative form of the subset while keeping in mind the range of variation. Although the archaeologist uses more formal techniques, this is the same general process that people use to identify groups of people or ascribe people, artifacts or behaviors to a group. The sum total of the variation produced in the manufacture of artifacts (or creation of behaviors) from the repertoire of cultural models is the collective style of a group, which is simply a passive, unintentional expression of shared culture. The evaluation of collective style, whether by an archaeologist or individual, is always conducted on a subset of the cultural repertoire and is always contingent, approximate, and benefited by additional data.

The collective styles of distantly related (socially or geographically) groups can be significantly distinct so there is little difficulty in distinguishing between them. However, the collective styles of closely-related groups likely will be more subtle and may vary in a few aspects. Thus, for distinguishing between closely-related groups, it is important to understand how subtle variation can arise in material culture. For artifacts, the model of design trajectory predicts that variation can arise in small attributes in the artifact design, which is where we distinguish between closely-related groups. For example, some groups of young people wear their shirts tucked in and some wear them untucked. This small distinction in a single behavior allows us to assign an individual to one group or another, although the inclusion of more data allows us to refine our designation.

Collective style is simply an expression of a social group of people who share the same cultural models. Thus, a typology identifies that social group and nothing more. Our inferences that the social group correlates with a band, ethnic group, tribe, or clan are problematic. Regardless of the problems with those inferences, we can say certain things about the social group: it is composed of people who likely share the same language and social mores, and are in enough contact to learn from one another. We can also infer that the social closeness of groups can be measured by the degree of their differences, i.e., socially-close groups will share more similarities than socially-distant groups.

Several methodological innovations were developed in this research to deal with the nature of the data and the need to be able to find subtle distinctions. From the theory it is clear that a typology is an appropriate way to distinguish social groups, but because I wanted to test the cultural models, the statistical tests were limited to the base of the projectile point, which meant that I eliminated several traditional measures from consideration, such as maximum width and total length. We do not know whether the cultural rules that governed making Paleoindian points in the Study Area emphasized the shape or the size of the design or both. Thus, several initial data partitions were made to differentiate the points on the basis of size and shape before the analyses were run. An assessment of collective style makes a normative estimate of an artifact or behavior, and the mean is one kind of normative estimate, although the mode or median may be a more appropriate estimate of the norm. However, by using the mean of attribute values, I could use the more powerful ANOVA and Tukey-Kramer tests of significant difference, which would boost confidence in the results.

I ran the tests without knowing whether they would reveal patterns of difference. Thankfully, the results met the model predictions. First, there was little variation in the attributes of the points from the Early Paleoindian period, which could mean that a single group or several groups of closely related people entered the Study Area at that time and maintained close contact and shared models throughout the period. Alternatively, the cultural model of the Early Paleoindian point could have been introduced and spread quickly between social groups that were already in the Study Area. In either alternative, we can infer that the Early Paleoindians were in close enough contact with one another to maintain essentially a unified design in this artifact. The spatulate shaped Early Paleoindian point showed a small degree of difference in thickness between the St. Johns and Santa Fe regions, which may indicate the beginnings of subtle design differences between those regions, but the data are spare in this regard. Nevertheless, if we assume that the spatulate shaped design was developed later in that period, then the model of design trajectory predicts that we would see such subtle variation between regions.

In contrast, the Middle Paleoindian points should have shown more regional distinctions, and the results bear out this prediction. The period showed robust regional differences in artifact design, mostly in the shape of the base (squatter-wider-more flaring ears / longer-narrower-less flaring ears) but also in the size. People in the Chipola region appear to have been using a different cultural model of both size and shape of the base than people to the east. The groups to the east shared more design features in common but did appear to maintain some differences between them. Based on the relative number of differences, similarities, and artifact-clusters, it appears that the Santa Fe and Hillsborough regions were the centers of the eastern social groups. The intermediate Aucilla and Suwannee regions appear to have been loci of overlapping territories of the Chipola and Santa Fe groups.

These regional differences are not easily explained by alternative hypotheses. All of the 15 pairs of regional differences, except for the Chipola-St. Johns relationship, fit neatly into the model predictions. Thus, it appears that the statistical methods were appropriate. The differences could be due to variation in the size and quality of the raw material in the regions, but this does not seem a likely explanation for the subtle differences in size and shape of the point hafts. Finally, the design differences do not appear to have been necessitated by unique environmental conditions, although this can never be tested thoroughly.

I believe the analytical results support the theoretical predictions and that the absence of social territories in the Early Paleoindian period and the presence of territories in the Middle Paleoindian period in the Study Area probably reflect actual conditions at those times. However, whether the territories we see in the Study Area were really the inland expressions of territories centered toward the coast or in other areas outside the Study Area cannot be known without more data. With more precise chronological and location information for the data, the foci and dimensions of the territories could be better defined, but the basic arrangement of three territories in these approximate locations likely is correct.

I. Paleoindians in the Study Area

Although by no means a complete picture, this research provides some insights into life of Paleoindians in the Study Area. From the data and environmental reconstruction we can see that the limited availability of surface water probably controlled most aspects of life at that time. Most of modern Florida's lush swamps and verdant mesic habitats likely would have been drier grasslands and xeric landscapes. Although water levels fluctuated, the wettest times were relatively dry when compared to modern environments, and in the driest times, finding water may have been a challenge. People would have focused on these water sources, which were most reliable in the Chipola, Santa Fe, upper Suwannee, and parts of the St. Johns regions. The Hillsborough and Aucilla regions may have been only occupied in wetter times.

Paleoindians in the Study Area likely shared the same language, and those to the east of the Chipola region were in relatively close contact. The Chipola people may have had stronger ties to groups to the west and north up the Flint and Chatahoochee river drainages. It is possible that central territorial loci were on the Continental Shelf and that groups from that area would move up river valleys, which likely produced water in sinks or springs along their reach, to the interior. Chipola people may have occasionally ventured up the Aucilla valley, which was part of the same river system, but it appears the Aucilla region was mainly used by people from the Santa Fe and Suwannee regions. People from the Santa Fe region could have made relatively short forays into the neighboring St. Johns region, which led to the kind of contact that produced a substantial sharing of cultural models.

II. Directions for Future Study

Although it is appropriate to use a single artifact to assess collective style, the interpretation is not particularly robust for establishing firm boundaries between groups. The research would have benefited from more data, especially from areas that are sparsely represented in the distribution. I heard stories of large collections of points from the Lower Withlachoochee River and Orlando areas, but whether these were simply variations on the "fish that got away" stories is unknown. My sense is that the basic pattern of point densities would not be significantly changed by more data. If we accept Clarke's (1968) polythethic approach to group identity, which seems appropriate, a thorough regional analysis would employ the panoply of Paleoindian lithic artifacts. Unfortunately, this is well nigh impossible in Florida, because we have such a limited understanding of the Paleoindian lithic tool kit, and a limited number of specimens to test. Unlike projectile points, collectors are less likely to keep other tools or record their locations. The interpretation of the results would have benefited from including a set of Middle Paleoindian points from within the hypothetical macro-region for Suwannee and Simpson points but far from the Study Area, such as South Carolina. It would have provided a control on interpreting the degree of differences within the Study Area.

Practically, the principal components were not helpful because of the difficulty in translating the relative differences in components into meaningful differences in the size or shape of the bases. The same can be said for the ratios that were difficult to interpret. The analysis would have benefited from some nominal variables for attributes that cannot be captured in a ratio or measurement, such as the roundness of the ear.

Substantial changes seem to have taken place between the end of the Middle Paleoindian period and the Early Archaic period, and it would be interesting to see how the Middle Paleoindian territories changed in that transition, if at all, and over the rest of Florida's prehistory. Even though it lasted only a few hundred years, the Bolen period has produced more sites in Florida and many more projectile points than the entire Paleoindian period. Thus, the Bolen period provides better chronological and regional control for this kind of regional analysis than did my data. Several regions, such as the Chipola, have produced hundreds of Bolen points from a restricted stretch of the river, which presents the opportunity to examine intra-group variation in detail.

The research was hampered somewhat by limiting the analyses to attributes of the hafts. Although that was required to ensure the cultural model was being analyzed, it severely limited the dimensions along which variation could be apparent. In future projects, several different kinds artifacts with more attributes should be analyzed.

One application of the model of design trajectory could be to infer the problem that was being addressed by a change in a predicate attribute design. For example, at sometime prior to the Clovis times, we could infer that someone addressed a technical problem by grinding the edge of the haft. It is reasonable to infer that grinding was intended to keep a sharp haft from slicing through the binding material, and from that we can deduce that grinding probably arose before mastic was used on the haft. Likewise, we can use the same analysis for fluting by asking what technical problem was solved by adding a flute to the base. The key to the model of design trajectory is that each of these attributes should be looked at in isolation without assuming that their presence in the Clovis point means they were created for that particular design.

Several aspects of the theory would benefit from ethnoarchaeological research. For example, it would be helpful to examine the circumstances in which extant hunter-gatherers create design trajectories, and how the trajectories are maintained under different rules of marriage residence and the dynamics of group membership. It would also be helpful to know how substantial statistically significant attribute design differences must be before they are distinguishable. Finally, it would be interesting to see how new designs spread among local bands; are they passed during regular aggregations, do they spread through fluid membership, or is it a combination of both processes?

APPENDIX A

DATA TABLE

ID1	Image	Type	TL	MW	MWH	QMWH	BW	QBW	BEW	HEW	Earpoint	QBEW	QEAR	MinBW	HMinBW	BCV
17	AH05A	M	85.5	31.6	41.5	G	16.1	G	20.4	1.1	1.95	G	0	18.8	8.1	2.1
18	AH05B	M	113.5	38.4	53	G	24.7	G	27.4	1.7	0.79	G	0	25.2	10.6	6.7
20	AH05D	M	61.1	35.3	48.9	G	27.5	P	32.9	3.5	0.77	P	1	28.2	14.4	7.2
21	AH06A	M	74.6	32.6	40.5	G	18.9	G	24.2	3.8	0.7	G	0	23.4	8.4	2.5
22	AH06B	M	71	31.3	40.3	G	19.6	G	23	1.6	1.06	G	0	22.9	9.3	3.1
24	AH06D	M	53.2	25.3	20.4	G	24.8	G	27.4	2.4	0.54	G	0	24.8	11.4	4
41	AH11A	M	90.5	32.1	44.9	G	21.7	G	24.8	0.9	1.72	G	0	22	7	4
42	AH11B	E	101.9	29.3	53.8	G	15.6	G	21	1.4	1.93	G	0	18.9	9	3.2
43	AH11C	M	64.5	30.4	28.1	G	17.1	G	21.5	2	1.1	G	0	21.9	9.1	4.8
44	AH11D	M	71.6	31	39	G	22.5	G	24.7	1.1	1	G	0	23.4	8.4	4.5
45	AH12A	M	106.6	33.9	44.3	G	25.5	G	34	4.7	0.9	G	0	29.6	15	4.3
46	AH12B	M	102	30.7	33.1	G	28.3	G	33.2	2.5	0.98	G	0	29	12.1	2.5
47	AH12C	M	89.8	34.9	39	P	22.1	G	27.9	2.7	1.07	P	1	26.4	11.2	5.2
48	AH12D	M	83.4	29.9	36.7	G	23.7	G	27.5	1.9	1	G	0	24.7	9.5	5.7
49	AH13A	E	71.6	23.5	33.8	G	16.5	G	22.4	1.9	1.55	G	0	22.3	2	2.6
50	AH13B	M	53.1	23.7	28.1	G	18.6	P	21.4	1.7	0.82	P	1	18.2	10.4	7.6
51	AH13C	E	90.3	29.2	44.8	G	22	G	24.5	1.1	1.14	G	0	22.4	9.2	3.1
52	AH13D	M	70.8	31.9	36.1	G	25.5	G	31.8	1.5	2.1	G	0	27.3	14.5	4.8
53	AH14A	M	113.6	32.9	44.9	G	31.3	G	37.4	3.2	0.95	G	0	33.8	12.5	4.6
54	AH14B	M	50.8	33.3	31.6	P	29	G	35.6	3	1.1	G	0	33.6	13.5	4.1
56	AH14D	M	42.6	28	29	G	22.2	G	27.3	2.6	0.98	G	0	26.4	14.6	7.2
57	AH15A	M	56.3	25.6	31.1	G	14.7	G	19.4	1.9	1.24	G	0	18.5	7.7	3
25	AH07A	M	112	38.4	45.9	G	18.4	P	26.2	2.9	1.34	P	1	23.5	9.4	4.2
26	AH07B	M	113.4	30.9	26.5	G	30.4	P	33.8	4.4	0.39	P	1	32	10.1	3.2
27	AH07C	M	63.3	26.9	28.5	G	18.6	G	22.5	2	0.98	G	1	21.8	7.6	1.8
28	AH07D	M	65.1	31.6	30.2	P	19.8	P	26.1	1.6	1.97	P	1	26.7	12.7	4.5
29	AH08A	M	67.7	27.4	17.9	P	21.7	P	27.8	2.9	1.05	P	1	26	8.6	2.3
30	AH08B	M	68.1	30.2	21.4	P	24.2	P	32.7	2.4	1.77	P	2	32.3	6.1	2.5
31	AH08C	M	65.7	31	22.4	P	26.4	P	35.6	2.4	1.92	P	1	29.8	11.3	3.1
32	AH08D	M	97.8	32.5	31.5	G	27.9	G	32	2.1	0.98	G	0	30.2	5.9	4
66	AH17D	M	60.5	36.6	41	G	15.5	G	23	3	1.25	G	0	20.6	11.1	3.2
67	AH19A	M	49.2	25.1	27.5	G	21.9	G	25.5	1.7	1.06	G	0	22.6	11.9	2.9
68	AH19B	M	53.5	24.1	29.2	G	18.2	P	20.4	1.4	0.79	P	0	18.1	10.2	2.7
69	AH19D	M	43.8	29.3	20.5	G	23.1	G	26.8	1.8	1.03	G	0	25.6	8.1	2.2
70	AH20A	E	68.2	33	25.2	G	24.7	G	29.2	1.9	1.18	P	1	28.6	28.6	4.8
71	AH20B	M	83.7	32.1	35.2	G	26.2	G	30.1	2.3	0.85	G	0	25.7	12	4.4
72	AH20C	M	64	30.6	27.2	G	27.8	G	31	2	0.8	G	0	26.6	10.9	3.3
73	AH20D	M	75.2	33.9	41	G	27.5	G	35.2	2.7	1.43	G	0	31	12.6	3.9
74	AH21A	M	70.1	26.9	35.3	P	24.8	P	30.6	2.5	1.16	P	1	26	21.3	4
75	AH21B	M	108.9	51.8	77.8	P	32.6	G	40.4	3.8	1.03	G	0	39.1	14.2	8.8
76	AH21C	M	54.1	36.2	47.6	P	24.2	G	27.5	2	0.83	G	0	29.8	17	7.8
79	AH22A	M	64	37	58	P	26.6	G	31.8	1.7	1.53	G	0	25.4	17.1	6.4
80	AH22B	M	73.2	39.1	47	P	15.7	P	34.5	5	1.88	P	1	31.1	17	6
81	AH22C	M	76.2	33.2	26.8	G	29.6	G	36.7	2.5	1.42	G	0	31.2	12.1	4.3
82	AH22D	M	75.4	35.1	34.8	G	27.1	G	34.2	3.6	0.99	G	0	34.3	20.4	4.9
110	WF-3 B	M	82.9	31.2	31.8	G	26.6	G	32.6	2.6	1.15	G	0	30	8.3	2.9
111	WF-3 C	M	90.1	24.5	26.6	G	17.2	G	20.7	1.5	1.17	G	0	20.6	5.4	2.9
112	WF-3 D	M	89.6	28.7	22.3	G	23.2	P	28.3	2.9	0.88	G	1	26.9	9.7	6.6
113	WF-4 A	E	79.8	31.6	31.3	G	23.8	G	30.7	2.7	1.28	G	0	27.2	10.2	5.5
114	WF-4 B	M	65.2	30.6	21.7	P	27.6	P	31.2	2.5	0.72	P	1	30.6	12.3	4.6
115	WF-4 C	L	57.9	29.6	14	G	24.3	G	32.6	2.7	1.54	G	0	29	9.7	0.3
116	WF-4 D	L	63	27.6	17.7	G	27.2	G	33.7	3.3	0.98	G	0	28	11	3.7
33	AH09A	E	49.9	27.7	25.5	G	20.8	G	25.1	3	0.72	G	0	22	10.8	6.2
35	AH09C	M	60.7	23.1	26.1	G	16.6	P	19	4	0.3	P	1	20.8	10.5	6.7
36	AH09D	M	65	31.6	30	P	20.8	P	28.4	1.4	2.71	P	1	26	7.8	4.7
37	AH10A	M	56.5	24.2	20.8	G	21.7	G	25.4	2	0.93	G	0	23.1	9.3	3.2
38	AH10B	M	57.6	26.1	26.8	G	21.9	G	26	1	2.05	G	0	23.9	13.6	3.9
39	AH10C	M	73.5	31.4	34.6	G	21.5	G	24.9	1.2	1.42	G	0	24.2	3.8	6
40	AH10D	M	71.3	31.1	32.8	G	20.6	G	23	1	1.2	G	0	21.9	5.5	3.1
83	GM-1 A	E	64.6	29.3	27.9	G	32.1	P	26.8	2.3	-1.15	P	1	25.7	9.1	3.8
86	GM-1 D	E	59.6	23.7	30.9	G	22.9	G	24.7	1.2	0.75	G	0	20.8	9.5	2.2

87	GM-2 A	E	74.9	30.5	25.8	G	28	G	31.8	1.5	1.27	P	1	30.5	11.5	3.5
88	GM-2 B	M	61.4	31.7	32.3	G	22.6	G	28.6	2.4	1.25	G	0	25.9	7.8	6.1
89	GM-2 C	M	65.2	25.8	27.4	G	21	G	23	1.3	0.77	G	0	22.6	5.5	3.4
90	GM-2 D	M	55.5	26.2	21.2	G	21.9	G	28.2	2.9	1.09	P	0	24.8	7.3	5.2
91	GM-3 A	M	70.1	35.1	26.4	G	24.9	G	30.6	2.2	1.3	G	0	30.1	3.9	2.9
92	GM-3 B	E	73.3	30.7	34.9	G	18.2	G	22.7	1.8	1.25	G	0	19.8	5.8	2.6
93	GM-3 C	E	62.9	26.4	29.8	G	17.8	G	22.6	1.2	2	G	0	21.1	7.4	2.5
94	GM-3 D	M	61.8	30	28.5	G	22	G	28	1.3	2.31	P	1	25.6	18.2	7.3
95	GM-4 A	E	100.9	27.6	25.9	G	24.8	P	29.9	1.5	1.7	G	1	27.1	20.1	7.4
96	GM-4 B	E	51	30	39.3	G	29.1	G	33.1	3	0.67	G	0	31.1	14.2	7.9
98	GM-4 D	E	81.6	32.8	36	G	22.8	G	25.3	1.4	0.89	G	0	23.1	8.7	3.3
99	GM-5 A	E	68.2	31	30.8	G	24.1	G	26.8	1.6	0.84	G	0	25.8	10	3.7
100	GM-5 B	M	46.3	24.5	23.8	G	17.1	G	21.3	1	2.1	P	0	21.2	6.4	1.5
59	AH15C	M	78.2	32.2	36.3	G	21	G	24.4	1.9	0.89	G	0	21.8	11.1	3.3
60	AH15D	M	88.7	34	43.6	G	2.1	G	28.7	2.4	5.54	G	0	23.4	12.8	3.8
61	AH16A	M	58.6	36.8	26.5	G	11.1	P	12.8	1.4	0.61	P	1	26.3	5.1	2
62	AH16B	M	66.7	34.8	44.7	G	22.3	P	29.2	2	1.73	G	1	28.9	10.8	2.6
63	AH16C	M	49.2	35.6	30	P	30.9	G	40.5	4.1	1.17	G	0	36.3	18.3	3.8
64	AH16D	M	49.5	30.7	26.4	P	25.3	G	30.5	2.4	1.08	G	0	26.9	7.4	2.7
65	AH17C	M	50.8	36.4	49	P	19.9	G	24.7	0.9	2.67	G	0	19.6	11.8	3.3
101	GM-5 C	E	54	24.4	23.6	G	16.4	G	20.6	1.3	1.62	G	0	21.8	8.9	2.2
102	WF-1 B	M	85.7	35.2	39.1	G	20.3	G	23.5	2.5	0.64	G	0	23.5	6	5.2
103	WF-1 C	M	66.1	27.9	32.9	G	15.7	P	18.4	1.5	0.9	G	1	19.8	5.8	2.3
104	WF-1 D	M	83.2	30.1	21.7	G	26.2	G	29.6	1.9	0.89	G	0	28.8	6.2	2.5
109	WF-3 A	M	85.5	34.5	48	P	27	P	30	1.5	1	P	1	26.8	12.8	4.5
1	AH01A	M	102	36.1	51.4	P	23.4	P	28.4	0.4	6.25	P	1	27.2	9.1	3.1
2	AH01B	M	69.2	26.2	34.9	P	19.9	P	21	0.5	1.1	P	1	19.8	8.8	3.2
3	AH01C	M	66	28.7	32.5	G	22.6	G	28.8	1.4	2.21	G	0	26.7	10.6	3.7
4	AH01D	M	79.3	32.5	41	P	25	P	27	0.3	3.33	P	1	25.3	13.6	5.4
5	AH02A	E	67	27.4	37	P	20	P	27	100	0.04	P	2	23.4	10	3
6	AH02B	M	78.4	27.5	34.5	P	23.2	P	25.4	0.8	1.38	P	1	23.1	14.2	4.3
7	AH02C	M	83.7	30.7	40.8	P	19.4	P	22.8	0.6	2.83	P	1	24.2	9.9	6.8
8	AH02D	M	75.5	36.6	26.7	G	26.8	G	37.8	3.9	1.41	G	0	35.8	13	3.9
9	AH03A	M	86	28.3	47	P	18	P	29	1	5.5	P	2	25.2	12	5
10	AH03B	L	64.7	32.5	13.5	G	24.5	G	34	2.3	2.07	G	0	31.1	6.9	2.5
11	AH03C	M	75.6	29.6	18.2	G	29.1	G	32.4	2.1	0.79	G	0	29.9	7.3	4
12	AH03D	M	91	31.1	29	G	28.3	G	35.6	2.6	1.4	G	0	31.8	8.8	3.8
13	AH04A	E	47.6	20.2	24	G	19.5	G	20.9	0.8	0.87	G	0	19.2	8.4	3.3
14	AH04B	M	94.6	32.1	38.4	G	28	G	35.6	6.3	0.6	G	0	31.5	18.7	6
16	AH04D	M	52.9	34.9	28.6	G	22.9	G	28.3	2.5	1.08	G	0	26.5	7.2	2.4
117	BAR001 A	E	39	31.9	27	P	25.1	G	31.5	3.2	1	G	0	29.3	14	5.7
118	BAR001 B	M	43	25.6	21.2	P	22.2	G	27.1	2.9	0.84	P	1	25	10.2	2.4
119	BAR001 C	M	46	25.5	36	P	20.1	G	25.9	2	1.45	G	0	22.6	10.7	3.2
121	BAR002 A	M	47.6	39.5	37.8	G	31.5	G	38.7	3.2	1.13	G	0	35.3	16	4.2
122	BAR002 B	M	66.9	31.8	22.6	G	26.6	G	30.7	1	2.05	G	0	28.4	6.1	2.4
123	BAR002 C	M	33.5	29.7	19	P	27.6	P	35	3	1.23	P	1	29	12.7	6
124	BAR002 D	L	62.5	25.9	27	G	24.7	G	29.4	2.4	0.98	G	0	24.4	13.1	1
125	BAR003 A	M	29.3	34.4	24	P	30.6	G	36	2.2	1.23	G	0	34.7	10.3	4.1
127	BAR003 C	L	51.5	23.4	11.9	G	20.6	G	25.4	2.9	0.83	G	0	21.5	7.1	2.9
128	BAR003 D	M	61.5	45	47.7	P	21.6	P	29.2	2.6	1.46	P	1	33.5	17.5	5.1
130	BAR004 B	M	40.2	29.3	28.7	G	23.4	G	29.2	4	0.73	G	0	28.3	14.1	4.4
132	BAR004 D	M	39	28.1	22.2	P	19.4	P	30.4	4.1	1.34	P	0	29.1	7.2	4
133	BAR005 A	M	77.6	37.6	48.5	G	31.5	G	34.1	1.1	1.18	G	0	31.2	14.9	6.9
134	BAR005 B	M	109	34	54	P	26.4	P	30.4	2	1	P	1	25.8	15.7	7
135	BAR005 C	M	80.2	33.4	38.3	G	27.8	G	30.9	1.8	0.86	G	0	29.9	9.7	5.7
136	BAR005 D	M	86.3	32.3	47.1	G	22.1	G	28	3	0.98	G	0	26.1	8.3	6.2
137	TK001 A	M	68	27.8	33.2	G	14	P	23.3	3.4	1.37	P	1	21.3	10.2	1.4
138	TK001 B	L	34.4	22.6	11.2	G	18.8	G	25.2	2.6	1.23	G	0	20.8	7.2	2.8
140	TK001 D	E	15.9	24.7	14.5	P	21.1	P	26.4	1.8	1.47	P	1	24	8.2	4.6
141	TK002 D	M	23.2	32.3	23	P	25.2	G	31.8	2.5	1.32	G	0	26.6	7.6	3.8
142	RM001 A	M	93	40.1	43	P	25.5	P	28.7	3.2	0.5	P	1	29.2	10.9	2.1
143	RM001 B	M	49.4	26.9	17.2	G	25.9	G	29.5	1.7	1.06	G	0	27.3	8.7	3

145	RM001 D	L	50	27	12.5	G	24.6	G	28.1	3.1	0.56	P	0	26.3	7.7	2.5
146	HM001 A	E	64.9	21.5	9.3	G	20	G	22.7	2.6	0.52	G	0	19.3	15.3	4.3
147	HM001 B	M	74.1	24.9	32	G	20.6	G	23.8	1.4	1.14	G	0	22.5	8.7	3.9
148	HM001 C	E	77	32.9	41.4	G	21.6	G	25.8	1.2	1.75	G	0	24.5	5.4	4.2
149	HM001 D	E	82.3	27.2	33.5	G	17.2	G	22.1	2.3	1.07	G	0	20.3	8.9	4.1
151	HM002 B	L	43	26.8	11	P	23	P	28	2.2	1.14	P	1	24.6	8.2	1.8
152	HM002 C	M	48.6	27.3	11.7	G	24.7	G	30.1	1.9	1.42	G	0	27.7	7.4	1.9
153	HM002 D	M	54	26.5	14.3	G	19	G	25.3	1.9	1.66	G	0	23.3	10	2.7
154	HM003 B	E	102	36	49	P	22	P	22	2	0	P	2	29.9	14	5
155	ToG001 A	L	47.8	26.2	13.5	G	21.5	G	26	2.2	1.02	P	1	23	9	0.6
156	ToG001 B	M	78.2	34.1	32	G	28.7	G	33.9	2.2	1.18	G	0	31	9.3	1.9
157	ToG001 C	M	84.6	27.6	25	G	23.3	P	29.6	3	1.05	P	1	24.7	10.3	2
158	ToG001 D	M	70.8	34.9	20.7	G	27.2	G	37.9	3.6	1.49	G	0	34.3	11.1	5.2
159	ToG002 A	M	39	35.4	24	P	28.4	G	35.9	2.3	1.63	G	0	32.2	17	5.8
160	ToG002 B	M	50	31	32.5	G	29.3	G	37	3.7	1.04	G	0	29	25.4	2.2
161	ToG002 C	M	45	29	21.1	G	23.1	P	27.6	4	0.56	P	2	27.8	6.9	2.3
162	ToG002 D	M	49	31	30.7	P	24.3	P	32.6	2	2.08	P	1	29.9	13.4	4.5
163	ToG003 A	E	69.7	31.3	33.8	G	21.9	P	26.9	1.1	2.27	P	1	24.7	6.5	2.8
166	ToG003 D	M	60	34.2	21.4	G	29.7	G	39.6	4.6	1.08	G	0	35	13.5	4
167	ToG004 B	M	76	27	20	P	22	P	29	1.8	1.94	P	1	26.8	11.3	2.6
168	ToG004 C	E	48.8	24	21.3	G	21.3	G	24.8	2	0.88	G	0	22.9	11.3	4.6
169	ToG004 D	M	68.8	33.2	22	G	27.3	G	32.8	2.7	1.02	G	0	32.4	15.4	5.4
170	AA001 A	M	78.7	32.9	39.5	G	22.4	G	25.1	1.4	0.96	G	0	24.1	12.9	6.7
171	AA001 B	M	55.8	31.1	16.2	G	25.8	G	30	2.5	0.84	G	0	28.9	10.5	4.1
172	AA001 C	M	46.8	26.2	19.1	G	18.7	G	23.9	2.2	1.18	G	0	25.1	5.9	2.5
174	AA002 A	M	115	32.2	53	G	27.2	G	33.1	2.6	1.13	G	0	29.3	11.3	4.2
175	AA002 B	M	86.5	25.4	24.9	G	23	G	26.6	4	0.45	G	0	24.9	13.7	6.2
176	AA002 C	L	56	26.7	12.7	P	10	P	26	4	2	P	1	23	10	4.5
177	AA003 A	E	75	28.6	35.3	G	24	G	25.7	2.4	0.35	G	0	25.7	12.9	4.2
178	AA003 B	E	75.1	30.2	35.6	G	20.8	G	26.8	2.7	1.11	G	0	25.3	4.9	2.8
179	AA003 C	E	84.3	37	41.9	G	21.3	G	25.6	2.6	0.83	G	0	22.5	10.8	4.4
180	AA003 D	E	63.6	31.3	29.4	G	20.9	G	24.1	1.1	1.45	G	0	23.5	4.4	2.3
181	AA004 A	E	69.4	27.4	25.7	G	20.4	G	24.3	2	0.98	G	0	22.1	7.4	3.3
182	AA004 B	E	71	30.5	37.3	G	23.6	G	25.5	1.2	0.79	G	0	24.6	6.9	4.4
183	AA004 C	E	76.1	33.9	35.1	G	19.8	G	23.7	2.1	0.93	G	0	22.6	8.7	3
184	AA004 D	M	66.3	27.3	36.2	G	19	G	21.1	1.2	0.88	G	0	19.7	8.3	3.2
185	AA005 A	E	67	24.3	30.6	G	16.3	G	18.9	1.4	0.93	G	0	16.8	11.4	4.7
187	AA005 C	E	86.4	29.4	40.9	G	13.8	G	18.1	2.2	0.98	G	0	17.3	7.8	2.6
188	AA005 D	M	75.9	29	36.5	G	24.2	G	33.1	2.6	1.71	G	0	29.2	9.8	3
189	AA006 A	E	96.5	32.4	43.2	G	22.2	G	22.9	2	0.18	G	0	23.9	9.2	5.5
190	AA006 B	E	99.2	38.7	48.5	G	19.7	G	24.4	1.5	1.57	G	0	22.3	10.8	3.6
191	AA006 C	M	88.4	27.9	37.9	G	24.5	G	28.9	2	1.1	G	0	27.8	11.3	4.7
192	AA006 D	M	82	32.5	37.1	G	20.8	G	28.7	2	1.98	G	0	27.5	8.2	3.6
193	AA007 A	M	95.3	29.6	41	G	21.4	G	29.8	2.1	2	G	0	28.7	7.4	3.1
194	AA007 B	E	72	25.2	40	G	17.7	G	23.1	2.6	1.04	G	0	22	13.2	5.5
195	AA007 C	E	63.4	24.7	33	G	12.7	G	20.1	2	1.85	G	0	20.3	6.5	1.7
196	AA007 D	E	64.6	26	27.6	G	19.2	G	23	2.3	0.83	G	0	23.1	10.4	3.4
197	AA008 A	E	70.4	20.9	33.9	G	14.2	G	18.1	1	1.95	G	0	17	7	2.4
198	AA008 B	M	61.4	32.9	13.8	G	29.2	G	33.2	1.8	1.11	G	0	31.2	7.5	4.2
199	AA008 C	E	55	21.5	27.5	G	16.6	G	19.9	1.9	0.87	G	0	19.9	10.1	2.8
200	AA008 D	E	65.7	28.1	20.8	G	24	G	29.8	2.5	1.16	G	0	25.8	6.7	2.4
201	AA010 A	M	65.3	25.9	29.9	G	18.5	G	22.5	1.1	1.82	G	0	20.5	6.9	3.4
202	AA010 B	M	66.5	26.7	31.9	G	22	G	26	2.3	0.87	G	0	22.1	10.8	2.6
203	AA010 C	E	65	23.5	30.6	G	12.9	G	18.9	2.1	1.43	G	0	17.9	8.5	1.4
204	AA010 D	E	55.4	26.8	25.2	G	22	G	26.3	1.5	1.43	G	0	23.6	6.8	3.4
205	AA011 A	E	55.1	18.2	22.4	G	14.9	G	16.4	1.5	0.5	G	0	16.5	4.4	1.3
207	AA011 C	M	53.8	20.4	25.4	G	15.6	G	18.5	2	0.73	G	0	18.3	4.2	4.3
208	AA011 D	E	64.9	25.1	30.4	G	17.8	G	21.5	1.9	0.97	G	0	19.5	9.5	3.4
209	AA013 A	M	61.4	27.1	31	G	21.6	G	26.4	1.7	1.41	G	0	23.5	11.9	4.4
210	AA013 B	E	63.5	28	27.3	G	20.5	G	24.7	1.9	1.11	G	0	22.8	7.2	4.1
211	AA013 C	M	54.5	21.8	23.4	G	22.4	G	25.2	1.8	0.78	G	0	20.4	9.2	5
212	AA013 D	E	74.1	29.2	36.6	G	19.1	G	24.9	1.1	2.64	G	0	21.2	4.8	2.5

213	AA014 A	M	65.3	25.8	31.1	P	19.6	G	23.6	1.9	1.05	G	1	21	10.3	4.1
214	AA014 B	E	68.9	29.1	28.4	G	24.9	G	28.9	2.1	0.95	G	0	26.8	5.8	1.6
216	AA014 D	M	71.4	32.8	36.3	G	21.1	G	24.8	2.1	0.88	G	0	23.5	7.3	4.7
217	AA015 A	E	103.5	32.2	57.4	G	19.1	G	23.1	2.9	0.69	G	0	21.3	9.9	1.5
218	AA015 B	M	84.4	33.9	21.2	G	25.8	G	33.1	2.9	1.26	G	0	31.9	6.1	3.1
219	AA015 C	E	78	35.2	16.9	G	25.7	G	31.9	1.5	2.07	G	0	32.3	3.7	2.4
220	AA015 D	E	99.7	38.5	54.2	G	21.2	G	25.3	2.7	0.76	G	0	27.8	11.3	4.8
221	AA016 A	M	93.5	27.4	41	G	29	G	33.6	2.5	0.92	G	0	29.6	14.4	2.5
222	AA016 B	M	89.6	29.1	38.5	G	23.2	G	27.2	1.7	1.18	G	0	23.2	14	3.9
223	AA016 C	M	77.3	28.3	37.5	G	18.8	G	21.9	1.4	1.11	G	0	19.7	8.8	1.9
224	AA016 D	M	75	32.7	40.1	G	21	G	28.2	1.9	1.89	G	0	26.5	6.9	3.8
225	AA017 A	M	38	19.7	18.8	G	13.6	G	17.2	1.6	1.13	G	0	16.4	4	2.8
226	AA017 B	E	54.5	20.4	29.3	G	14.3	G	18.3	1.4	1.43	G	0	15.1	9.9	2.1
227	RN001 A	M	51.4	29.7	11.2	G	25.8	G	29.4	3.7	0.49	G	0	28.1	11.3	5.9
228	RN001 B	M	63.3	28.8	32.1	G	17.2	P	21.7	2.3	0.98	P	1	19.7	8	3.5
229	RN001 C	M	64.7	25.7	23.7	G	21.1	G	24.6	2.6	0.67	G	0	22.9	14.7	5.4
230	RN001 D	M	48.1	28.1	21.7	G	22.1	G	28.4	2.8	1.13	G	0	25.7	11.9	3.6
231	RN002 A	M	53.3	27.4	23.2	G	18.9	G	26.3	2.9	1.28	G	0	24	10.3	4.7
231	RN002 B	M	53.9	23.9	24.1	G	23.2	G	28	2.9	0.83	G	0	25.1	15.1	7.6
232	RN002 C	M	51	23.2	33.3	G	24.9	G	28	2.8	0.55	G	0	25.6	8.9	5.3
233	RN002 D	M	55.7	28	32.5	G	19.9	G	24.9	1.3	1.92	G	0	22.6	8.9	4
234	RN003 A	M	69.9	33.6	36.6	G	22.2	G	27	2.7	0.89	G	0	23.9	8.5	5.9
235	RN003 B	M	81	26.7	43	P	21.2	P	28.4	2.1	1.71	P	1	21.1	6	1.1
236	RN003 C	M	79	27.5	24.6	G	18.8	G	26.5	2.8	1.38	G	0	25.7	8	3.3
237	RN003 D	M	73.7	28.3	31.2	G	25.7	G	33.5	4	0.98	G	0	28.4	15.9	3.8
238	RN004 A	M	69.9	28	33.6	G	19.6	G	26.3	2.8	1.2	P	1	24.8	8.3	5.3
239	RN004 B	M	85.6	35.4	31	G	26.6	G	35.9	2.9	1.6	G	0	31.9	13.6	4.2
240	RN004 C	M	100	30.4	44.3	G	26.6	G	33.3	4.9	0.68	P	1	29.5	17.6	6.4
241	RN004 D	M	80.8	38.6	49	G	25.1	G	30.1	2.6	0.96	G	0	27.8	11.9	6.5
242	RN005 A	M	66.5	36	26	G	28.4	G	36.6	2.3	1.78	G	0	34.6	11.9	5
243	RN005 B	M	68.7	35.7	27.6	G	28.7	G	35.6	4	0.86	G	0	35.7	18.5	4.6
244	RN005 C	M	88	31.2	42.2	G	20.8	G	26.4	3.3	0.85	P	1	25.7	13.8	2.2
245	RN005 D	M	96.4	32.4	33.9	G	20.3	G	29.3	2.1	2.14	P	1	28.8	11.6	1.9
246	RN006 A	E	77	36	21.8	G	34.2	G	39.3	7.3	0.35	G	0	36	13.1	10.5
247	RN006 B	E	75.2	29.3	22.1	G	26.4	G	31.9	2.3	1.2	G	0	28.9	9	6.6
248	RN006 C	M	43.6	30	26.9	P	22.6	G	28.5	3.8	0.78	G	0	28.2	9	6.3
249	RN006 D	M	51.4	28.6	14.2	G	26	G	30.4	5	0.44	G	0	29.6	10	5.9
250	RN007 A	M	36.7	21.6	19.3	G	16.1	G	21.3	1.6	1.63	G	0	18.6	4.3	1.1
251	RN007 B	M	43.3	23.8	16.7	G	17.4	G	21.9	2.1	1.07	G	0	20.6	5.8	2.6
252	RN007 C	M	45.5	24.4	19.7	G	16.5	G	23	2	1.63	G	0	20.8	8	2.4
253	RN007 D	M	42.6	22.6	22.4	G	17.5	G	24.7	2.7	1.33	G	0	22	8.1	4.1
254	RN008 A	M	63.9	28.6	26.6	G	21.1	G	25.5	2.1	1.05	G	0	24.4	7.8	3.9
256	RN008 C	M	71.4	28.2	23.7	G	21.4	G	29	4.2	0.9	P	2	27.2	21.1	1.9
257	RN008 D	M	68.9	22	40.8	G	22.4	P	26.4	2.6	0.77	P	1	22.9	17.2	8.2
258	RN009 B	L	41.1	21.8	15.4	G	18.2	G	22.4	2.2	0.95	G	0	22	7.4	4.3
259	RN009 A	M	34.8	22.5	12.1	G	17.6	G	22.8	2.3	1.13	P	1	19.1	5.2	2.2
260	RN009 C	M	47	22.2	11.8	G	20.7	G	22.5	1.5	0.6	G	0	20.1	8.1	1.1
261	RN009 D	M	50.7	29.3	20.7	G	15.7	P	26.3	2.5	2.12	G	0	26.7	5.8	1.9
262	RN010 A	M	51	25.5	20.5	P	20	P	23	2.2	0.68	P	1	22.1	7.8	3.2
263	RN010 B	L	52.7	27.4	12.6	G	16.8	G	22.9	3.1	0.98	G	0	21.9	8	6
264	RN010 C	M	36.3	19.5	19.7	G	19.7	G	23	2.1	0.79	G	0	20.5	5.7	3.3
265	RN010 D	M	55	27.4	26.5	P	21.3	P	29.9	4	1.08	P	1	27.2	14.2	6.5
266	RN011 A	M	48.7	19	18.8	G	13.8	G	20.8	5.2	0.67	P	1	17.4	9.9	3.5
267	RN011 B	M	46.5	15.2	26.8	G	15.1	G	18	3.2	0.45	P	1	16.5	7.3	2.7
268	RN011 C	M	54.2	24.3	23.9	G	11.9	G	25.1	4.4	1.5	G	0	24.6	11.2	2.1
269	RN011 D	M	57.6	22.9	20.2	G	19.4	G	25.7	2.1	1.5	P	0	23.7	9.4	5.6
270	RN012 A	M	65	39	38.2	P	26.9	G	36.9	3.6	1.39	G	0	30.1	17.2	4.8
271	RN012 B	M	43.6	18.1	23.4	G	18.2	P	25.1	2.7	1.28	P	1	23.3	6.4	3.8
272	RN012 C	M	15	27.6	13.5	P	19.5	G	24.2	2.1	1.12	G	0	23.1	6.3	3.1
273	RN012 D	E	23.4	26.7	21.7	P	18.8	G	25.1	2.2	1.43	G	0	24.8	6	3.2
274	RN013 A	M	85	35.2	42.9	P	23.7	P	29.3	2	1.4	P	0	25.8	13	9.5
275	RN013 B	M	88.7	28.4	26.3	G	19.2	P	24.4	1.2	2.17	P	1	24	5.2	0.8

276	RN013 C	M	86.3	33.5	27.5	G	25.7	G	35.2	3.9	1.22	G	0	32.4	14	3.6
277	RN013 D	M	82.9	27	34.4	G	16	G	21.6	1.7	1.65	G	0	21.5	8.2	4
278	RN014 A	M	56	37	25.3	G	23.8	G	33.3	2.7	1.76	G	0	28.9	10.9	2.7
279	RN014 B	E	74.7	27.5	24.6	G	24.2	G	30.6	2.1	1.52	P	1	25.3	7	1.7
280	RN014 C	M	52	26.3	19.7	G	21.8	G	26	1.3	1.62	G	0	25.3	5.8	2
281	RN014 D	E	56.7	28.4	16.7	G	19.9	G	24.3	2.3	0.96	G	0	23.5	7.3	2.2
282	RN015 A	M	50.5	20.5	11.6	G	19.3	G	22.3	1.2	1.25	G	0	18.6	6.3	4.7
283	RN015 B	E	44.3	20.6	14.3	G	20.7	G	23.9	2.2	0.73	G	0	21.9	9.7	7
284	RN015 C	M	64.8	14.8	25.8	G	14.6	G	17.6	0.7	2.14	G	0	13	6.5	2
285	RN015 D	E	62	23.8	30.3	G	15.6	G	20.1	1.5	1.5	G	0	17.1	7.9	3.1
286	RN016 A	M	78.3	27.5	34.3	G	17.1	G	23.3	3.4	0.91	G	0	21	7.4	3.4
287	RN016 B	M	45.7	26.9	12.6	G	22.5	G	25.7	3.8	0.42	G	0	27.4	9.3	4.3
288	RN016 C	M	51	32	25.1	G	16.7	G	22.5	0.6	4.83	G	0	22.3	7.7	2.7
289	RN016 D	M	54.1	15.2	9.7	G	14.7	G	17.1	1.3	0.92	P	1	14.4	7.6	2.7
290	RN017 A	M	85.4	34.4	35.2	P	29.4	P	35.6	2.8	1.11	P	1	16.6	12.4	5.1
291	RN017 C	M	45.5	32.8	17.3	P	21.3	G	28	1.4	2.39	G	0	26.2	10.2	3.4
292	RN017 D	M	48.7	17.8	24.8	P	14.4	G	22.5	4.6	0.88	G	0	18.8	10	3.6
293	DM001A	M	57.6	34.4	23.6	P	31.1	G	37.7	3.3	1	G	0	34.1	15.1	4.3
294	DM001B	M	35.5	31.6	25	P	28.5	G	38.5	5.5	0.91	P	1	32.1	11.1	5.6
295	DM001C	M	61.2	26.5	25.7	P	20.4	P	24.4	1.7	1.18	P	1	22.9	8.3	3.8
296	DM001D	M	65.1	36.3	41	G	26.5	G	32.9	3.2	1	G	0	32.1	11.4	7.2
297	DM002A	M	41.7	34.1	38.5	P	25.7	G	35.6	3.3	1.5	G	0	28.9	20	7
298	DM002B	M	42.2	32.2	28.1	P	28.8	G	36.8	3.4	1.18	G	0	32.3	12.7	12.7
299	DM002C	M	61	31.5	31.5	P	25	P	32.7	4.7	0.82	P	1	30.1	10	5.2
300	DM002D	E	34.5	20	15.3	G	11.2	G	17	2.2	1.32	G	0	16	6.9	1.1
301	DM003A	M	43.8	33.6	29	G	28.4	G	36.8	3.7	1.14	G	0	31.8	15.5	4.7
302	DM003B	E	47	30.9	24.7	G	21.4	G	25.2	2.1	0.9	G	0	25.5	4.3	3.4
303	DM003C	M	69	35.3	31.6	G	25.7	G	33.4	3.2	1.2	G	0	31.8	8.7	3.7
304	DM003D	M	39	37.4	32	P	30.9	G	36.6	3.9	0.73	G	0	34.4	12	5.4
305	DM004A	M	72.3	39.7	39.3	G	28.3	G	42	3.7	1.85	G	0	37	13.2	4.4
306	DM004B	M	42	39	28.5	P	28.3	G	35.4	3.3	1.08	G	0	34.3	17.1	3.9
307	DM004C	M	38	24.5	14.6	G	18.5	G	23.8	1.9	1.39	P	1	23	4.6	2.2
308	DM005A	M	55.4	25.4	30.9	G	19.9	G	25.4	1.7	1.62	G	0	20.7	8.7	2.5
309	DM005B	M	75.8	30.5	32.3	G	22.9	G	29.2	2.7	1.17	G	0	26.7	8	5.1
310	DM005C	M	85	32.2	41.2	G	20.1	G	27.4	1.5	2.43	G	0	26	13	2.9
311	DM005D	M	70.7	26.3	28.2	G	17.9	P	23.8	1.8	1.64	P	1	22.9	8.7	2.6
312	DM006A	E	56.6	20.5	22.4	G	15.6	G	19	2.9	0.59	G	0	18.7	5	1.9
313	DM006B	M	57.9	26.9	32.3	G	22.4	G	25.7	1.6	1.03	G	0	22.6	11.1	3.2
314	DM006C	E	61	26.1	27.8	G	15.7	G	23.3	2.3	1.65	G	0	22.2	9.6	1.8
315	DM006D	M	87.7	36.3	33.5	G	27.5	G	34.4	2.5	1.38	G	0	31.6	6.9	4.7
316	DM007A	M	79.3	27.6	33.1	G	16.1	G	22.1	2.5	1.2	G	0	20.8	12.6	4.2
317	DM007B	M	111.8	25.9	60.3	G	19.7	G	31.8	5.2	1.16	G	0	28.1	18	3.2
318	DM007C	M	116.7	37.9	54.5	G	26.1	G	33.4	2.7	1.35	G	0	31	12.2	6.8
319	DM007D	M	99.3	33.9	45.7	G	26.3	G	34.4	4.7	0.86	G	0	31.3	12.4	8.6
320	DM008A	M	65.5	35.5	32	G	16.9	G	23.6	2.6	1.29	G	0	24	10.1	2.1
321	DM008B	E	31.5	15.2	14.4	G	10	G	14.1	1.8	1.14	G	0	13.7	5.6	1.6
322	RK001A	E	42.8	32.7	35.7	P	17.3	P	26	2.2	1.98	P	1	24.6	7.5	1.6
323	RK001B	M	44	28.5	32	P	20.6	P	27.2	3	1.1	P	1	25.5	15.5	4
324	RK001C	M	44	33.1	36.4	G	27.5	G	33.7	2.3	1.35	G	0	33	12.3	2.7
325	RK001D	M	53	32.4	28.9	P	28.3	G	37	3.4	1.28	G	0	31.5	17.5	2.9
326	RK002A	M	50	30.9	23	G	29.1	G	33.3	3.4	0.62	G	0	29.8	14	1.9
327	RK002B	M	80.9	28.9	39.5	P	15	P	23.6	2.8	1.54	P	2	22.9	9.2	4.3
328	RK002C	M	35	29.6	28	P	23.9	G	31.3	2.8	1.32	G	0	28.3	15.8	4.3
329	RK002D	M	43.2	31.6	15.2	P	23	G	30.3	4.8	0.76	P	1	30.7	5.6	3.4
330	RK003A	M	74.8	30.4	27.2	G	22	G	29.5	3.1	1.21	P	0	27	6.6	2
331	RK003C	E	79	30.8	35.3	P	21.5	G	28.8	3	1.22	P	1	26.6	10.8	4.6
332	RK003C	M	68.2	28.5	18	G	18.1	G	28.5	2.6	2	P	1	24	6.9	0.9
333	RK003D	M	66	31.8	28	G	21.5	G	28.5	2.6	1.35	G	0	26.6	9.7	3.1
334	RK004A	M	52	23.5	20.5	G	18.3	G	24.1	2.5	1.16	G	0	23.6	5.5	1.2
335	RK004B	M	59	17	16.1	G	12.4	G	15.7	1.3	1.27	P	1	14.6	3.7	2.1
336	RK004C	M	60.7	29.5	26.3	G	24.3	G	31.6	2.6	1.4	G	0	27.6	14	3.7
337	RK004D	E	60	25.7	32	G	15.7	P	21.4	4.3	0.66	P	1	21.3	12.1	5

338	RK005A	M	73	33.4	26	P	22.7	G	30.5	4.1	0.95	G	0	30.6	13	4.9
339	RK005B	M	19.3	31.5	26.1	P	19.1	P	26.6	2.1	1.79	P	1	25.6	7.8	1.6
340	RK005C	M	55.8	34.5	33.3	G	30.3	G	37.5	3.8	0.95	G	0	33.6	16	4.9
341	RK005D	M	42	24.9	15.6	G	23.6	G	29.1	1.7	1.62	G	0	27.5	7.5	3.1
342	RK006A	E	65.6	31.3	30	G	18.2	G	23.1	2.7	0.91	G	0	22.9	18.8	3.8
343	RK006B	E	29	22.3	20	P	19.5	G	23.6	1.3	1.58	G	0	19.7	8.8	3.3
344	BB001A	M	45	34.6	43.8	P	29.5	G	38.4	3.5	1.27	G	0	35.3	9.4	3
345	BB001B	M	50	33	44	P	24.4	G	33.4	2.3	1.96	P	1	30.8	23.8	6
346	BB001C	M	51	41.3	48	P	31.3	G	40.8	5.9	0.81	G	0	37.9	21.1	4.8
347	BB001D	M	43	34.3	34.5	P	25.1	G	30.7	1.8	1.56	G	0	29.9	9.6	2.5
348	BB002A	M	53	32.6	48	P	21.3	G	29.8	5.4	0.79	G	0	27	14.6	2.3
350	BB002C	M	54	34	39.6	P	27.4	G	36	4.8	0.9	P	1	33.2	18.7	5.7
351	BB002D	M	59	42.1	31.8	G	23.2	G	32.1	3.2	1.39	G	0	32.7	13.2	4
352	BB003A	M	36.5	33	28.7	P	24.4	G	30.9	1.9	1.71	G	0	28.9	9.4	2.9
353	BB003B	M	39	34.4	28.2	P	21.4	P	31.4	2.1	2.38	G	0	28.4	9.8	5.9
354	BB003C	M	49	36.2	28.6	G	19.5	G	26.5	2.5	1.4	G	0	23	6.5	2.3
356	BB004A	E	20	24	17	P	19.1	G	27.6	2.5	1.7	G	0	26.8	11	2.5
357	BB004B	E	42	21.5	21.6	P	15.7	G	20.1	1.8	1.22	G	0	21	3.8	4.8
360	BB005B	M	58	32	45.4	G	25.6	G	34.7	4	1.14	G	0	31.6	21.6	3.5
361	CC01A	E	58.5	24.4	30.5	G	18.1	G	21.3	1.6	1	G	0	20	8.6	3.1
362	CC01B	M	58.4	30	17.3	G	23.9	G	32.6	2.5	1.74	G	0	30.2	12.4	6.2
363	CC01C	M	85.8	36.6	44.3	P	26.6	P	34.4	3	1.3	P	1	31.2	13.9	8
364	CC01D	E	68.9	29.4	32.4	G	21.5	G	25.7	2	1.05	G	0	25.7	6.3	3.6
365	CC02A	M	82.4	33.5	29.9	G	21.8	G	29.5	2.5	1.54	G	0	29.2	13.2	2.9
366	CC02B	E	66.4	27.4	31.8	G	20.9	G	25	1	2.05	G	0	24.8	7.8	2.6
367	CC02C	M	101.9	31.3	29.9	G	25	G	32	2.1	1.67	G	0	30.1	9.9	4.1
368	CC02D	M	88.8	33	25.6	G	26.7	G	36.8	2.9	1.74	P	1	33.6	19.9	3.6
369	CC03A	M	117.1	35.5	48.6	G	20.3	G	25.1	2.5	0.96	P	1	25.5	10.2	5.9
370	CC03B	E	86.5	35.9	40.3	P	20.2	P	30.3	2	2.53	P	1	31.4	11.3	1.9
371	CC04A	M	82.6	32.5	35.8	G	31.1	P	35.9	3.1	0.77	P	1	36.3	13.1	6.9
372	CC04B	M	73.7	24.7	30.5	G	27	G	32.7	1.5	1.9	G	0	25.8	13.9	4.3
373	CC04C	M	62.1	31.3	25.7	G	22.2	G	31.1	3.4	1.31	G	0	31.1	9.8	7.1
374	CC04D	M	35	30.8	21.7	P	18.8	P	25.8	3.2	1.09	P	2	23.7	11	3.3
375	CC05A	M	71.1	33.3	30.7	G	22.7	G	29.8	3.8	0.93	G	0	29.7	15	7
376	CC05C	M	71	29.3	35	P	21.5	G	26.8	2.5	1.06	G	0	24.4	8.2	4.1
377	CC05D	M	97.7	34.3	37.8	G	25.7	G	33.4	3	1.28	G	0	29.2	16.2	5.5
378	CC06A	M	65.5	24.9	16.8	G	22.3	G	26	1.2	1.54	G	0	25.3	10.8	3.5
379	CC06B	M	72.1	28.3	17.8	G	22.8	G	27.2	2.2	1	G	0	26.6	5.7	2.4
380	CC06C	E	45.2	22.2	13.5	G	19.2	P	24	1.4	1.71	G	0	22.6	9.3	3
381	CC06D	M	55.2	28.1	15	G	19.3	G	25.7	2.9	1.1	G	0	25.7	5.2	2.7
386	CC08A	M	64.2	26.5	23.7	G	23.1	G	28.8	1.1	2.59	G	0	24.5	8.5	2.4
387	CC08B	M	55.3	29.2	15.2	G	25.7	G	31.2	1.8	1.53	G	0	29.2	5	3
388	CC08C	E	53	22.6	19.2	G	21.1	G	24.6	1.5	1.17	G	0	22.8	9.9	5.7
382	CC07A	E	57	24.8	22.6	G	18.1	P	23.3	2.9	0.9	P	1	21.9	8.6	2.9
383	CC07B	E	119.4	39.1	52.4	G	22.9	G	26.9	1.5	1.33	G	0	26.5	10.1	4.6
384	CC07C	M	99.2	33.5	44.3	G	24.3	G	30.3	1.8	1.67	G	0	24.8	10.2	3.9
389	CC09A	M	105.3	39	47.3	P	26.4	F	34	2.7	1.41	P	2	28.8	38.7	7.2
390	CC09B	M	115.4	37.3	41.7	G	25.4	G	31	2.2	1.27	G	0	28.4	13.4	3.5
391	TG01A	M	96.9	34.6	43	G	29.3	G	35.3	3.5	0.86	G	0	33.4	13	4.6
392	TG01B	M	95.9	35.5	41.3	G	28.7	G	35.9	3.7	0.97	G	0	33.9	17.1	5.7
393	TG01C	M	98.1	31.5	40.5	G	23	G	35	2.5	2.4	G	0	30	12.4	3.4
394	TG01D	M	87.8	34.2	41.3	G	23.8	G	28.2	3.7	0.59	G	0	28.3	11	5.8
395	TG02A	M	88	34.1	33.4	G	29	G	34	3.2	0.78	G	0	30.9	16.1	2.7
396	TG02B	M	84	29	21.8	G	21	G	28.8	2.7	1.44	G	0	26.1	6.8	2.1
397	TG02C	M	72.3	29.3	35.9	G	20.9	G	22.6	1	0.85	G	0	22.6	7.4	3.2
398	TG02D	M	75.6	30.6	36.3	G	20.3	G	23.3	1.2	1.25	P	0	23.3	9.6	4.6
399	TG03A	E	77.3	35	36.1	G	18.4	G	24.2	1.9	1.53	G	0	23	7.4	4.6
400	TG03B	E	76.7	32.5	36.9	G	19	G	24.4	1	2.7	G	0	22.2	8.7	5.9
401	TG03C	M	76.8	28.6	34	G	18	G	22.7	1.2	1.96	G	0	20.9	10.7	3.2
402	TG03D	M	84.6	32.4	33.9	G	20.8	G	26	1.6	1.63	G	0	25	9.2	3.2
403	TG04A	M	73.7	28.3	38.4	G	19.8	G	23.2	1.2	1.42	G	0	21.7	7.8	4.3
404	TG04B	M	73.9	28.6	35.1	G	17.9	G	22	0.8	2.56	G	0	19.1	11.9	5.2

406	TG04D	E	77.8	23.9	34.9	G	17.1	G	21.8	1.5	1.57	G	0	26	12	2.4
407	TG05A	E	92	34.5	21.1	G	25.9	G	34.2	4.8	0.86	G	0	33.7	10	5.4
408	TG05B	M	103.9	36	51.9	G	20.7	G	24.9	2.4	0.88	G	0	24.1	7.4	3
409	TG05C	M	103.7	35.1	49.4	P	18.5	P	23.5	1.2	2.08	P	0	21.8	7.6	1.7
410	TG05D	M	106.3	29.1	48	P	18	P	25.6	3	1.27	P	1	24.1	9.5	2.9
411	TG06A	M	104.4	28.1	52.5	G	23.4	G	28.1	4.2	0.56	G	0	25.9	13.3	5.8
413	TG06C	E	57.5	24.5	23.4	G	16.1	G	18.7	1.7	0.76	G	0	18.1	5.6	2.3
414	TG06D	E	64.3	27.1	25.5	G	19.1	G	24.1	4.5	0.56	G	0	24.5	11.5	6.7
415	TG07A	M	51.9	22.7	22.2	G	12.8	G	17.4	1.1	2.09	G	0	16.7	6.5	2.1
416	TG07B	E	53.4	27.4	23.6	G	14.8	G	19.9	2	1.28	G	0	19.9	9.7	1.4
417	TG07C	E	71.3	26.6	28.1	P	21.2	P	23.6	1.1	1.09	P	1	22.7	8.7	3.2
418	TG07D	E	42.7	22.7	15.9	G	16.6	G	20	1.6	1.06	G	0	21	8.3	5.3
419	TG08A	E	50.6	20.9	19.2	G	16.2	G	19.4	2.3	0.7	G	0	18.1	10.9	5.4
420	TG08B	M	68.6	28.3	25	P	21.2	P	26.3	3.4	0.75	P	1	26.1	14.8	6.3
421	TG08C	M	70.6	23.7	24.7	G	18.2	G	21.8	1.6	1.13	G	0	21.8	6.6	4.9
422	TG08D	M	52.8	26.7	23.6	G	13.6	G	20.3	1.8	1.86	G	0	20.8	5.4	1.6
423	TG09A	E	56.7	23	26	G	14.7	G	20.3	2.9	0.97	G	0	20.1	4.6	2
424	TG09B	M	80	32.1	39.6	G	22.4	G	28	2.2	1.27	G	0	27.3	9.5	4.9
425	TG09C	M	57.5	29.9	30	G	23	G	28.1	2.2	1.16	G	0	25.1	8.5	4.6
426	TG09D	M	93	42	47.6	G	19.9	G	24.3	1.7	1.29	G	0	23	5.4	6.2
427	TG10A	M	109.5	36.9	41.9	G	24.1	G	29.9	3.1	0.94	P	1	27.8	10.3	5
428	TG10B	M	117.6	42.6	50.5	G	26.8	G	32.8	3.5	0.86	G	0	32.1	10.5	5.4
429	TG10C	E	71.6	35.5	33.1	G	21.7	G	28.3	2.7	1.22	G	0	26.4	11.8	2
430	TG10D	M	98.8	40.6	42.3	G	21.3	G	29.9	2.8	1.54	G	0	28.8	9.2	2.7
431	TG11A	E	85.5	35.6	40.2	G	23.2	G	29.6	2.5	1.28	G	0	27.1	10.6	3.2
432	TG11B	M	87.5	36.3	40.3	G	25.4	G	30.4	3.1	0.81	G	0	26.7	13.8	6.9
433	TG11C	E	88.8	38.9	39.8	G	21.1	P	28.1	2.2	1.59	P	1	25.5	10.3	2.3
434	TG11D	E	82.7	27.1	41.4	G	19.6	G	25.8	1.8	1.72	G	0	21.9	22.4	2.2
435	TG12A	M	81.7	25.9	37.9	G	23.6	G	28.3	1.9	1.24	G	0	25.3	15.5	5.8
436	TG12B	M	84.6	34.1	43.2	G	20.4	G	27.3	3.3	1.05	G	0	25.8	10	3.9
437	TG12C	E	96.4	31.1	41.2	G	18.7	G	25.9	3.7	0.97	G	0	26.1	8.5	1.8
438	TG12D	E	107.2	32	43.3	G	22.4	G	27.2	2.3	1.04	G	0	27.7	6.7	5.5
439	TG13A	E	98.5	26.2	51.6	P	13.9	P	22.7	2.2	2	G	0	22.7	6.6	4.1
440	TG13B	E	97.4	25.4	28.8	G	19.2	G	24.2	1.9	1.32	G	0	24.8	11.7	1.9
441	TG13C	E	85.7	29.9	39.8	G	20.4	G	24.2	1.4	1.36	G	0	23.7	5.1	2.4
442	TG14A	M	92.9	36	44.5	G	26.6	G	30.6	1.6	1.25	G	0	26.8	16.6	5.7
443	TG14B	M	95.5	42.4	47.4	G	27.3	G	33.9	2.8	1.18	G	0	31.7	11.3	6.2
444	TG14C	M	109.5	37.8	49	G	24.4	G	31.1	2.7	1.24	G	0	30.2	10.4	5.8
445	TG14D	M	119.4	38.2	53	P	19.8	P	25.2	2.9	0.93	P	0	24	10.1	7.4
446	TG15A	M	126.9	32.1	63.1	G	24.8	G	32.8	3.5	1.14	G	0	26	25.3	7.5
447	TG15C	M	129	34.6	53.5	G	23.9	G	31.6	2.9	1.33	G	0	29.6	15.9	5.3
448	TG15D	M	111.4	40.1	54.7	G	18.2	G	25	2.7	1.26	G	0	23.7	9.7	2.5
449	TG16A	M	92.8	32.8	39.7	G	28.3	G	36.3	3.1	1.29	G	0	36.6	20.3	4.3
450	TG16B	E	77.9	31.2	34	G	28.3	G	35.3	2.4	1.46	G	0	31.2	10.3	2
451	TG16C	M	97.2	31.3	42.7	G	23	G	28.6	2.2	1.27	G	0	26.1	8.9	4.3
452	TG16D	M	109.4	34.4	33	G	24.9	G	31.9	2.5	1.4	G	0	30.6	10	2.9
453	TG17A	M	106.8	38.1	36.4	G	30.2	G	36.4	3.2	0.97	G	0	35.6	11.9	5.8
454	TG17B	M	76.1	36.1	32.8	G	26.7	G	36.5	2.8	1.75	G	0	32.3	12.6	4
456	TG20A	M	55.4	23.6	28.1	G	16.9	G	21	1.2	1.71	G	0	19.7	8.8	3.8
457	TG20B	M	70.6	27	37.2	G	14.3	G	18.5	1.8	1.17	G	0	17.4	9.5	2.1
458	TG20C	E	59	23.6	27.5	G	17.2	G	20.3	1.6	0.97	G	0	18.4	9.4	2.9
459	TG20D	M	70.7	25.2	32.6	G	15.8	G	19.7	2.2	0.89	G	0	18.4	8.3	3.4
460	TG21A	M	64	32.4	30.9	G	22.9	G	26.4	1.9	0.92	G	0	26	9.7	2.7
461	TG21B	M	63.3	31.2	30.1	G	23.4	G	28	2.2	1.05	G	0	26.4	9.9	4.1
462	TG21C	M	75.4	36	35.6	G	24.3	G	29.3	2.5	1	P	1	27.9	12.4	3.9
463	TG21D	M	68.8	26.2	28.8	G	15.9	P	22.8	1.8	1.92	P	1	21.2	7.9	1.9
464	TG22A	M	78.1	28.3	35.2	P	21.2	P	23	1.6	0.56	P	1	21.7	10.2	5.1
465	TG22B	E	71	33.5	32.2	G	17.6	P	25.8	1.8	2.28	G	0	24.2	8	4.1
466	TG22C	M	72	29.1	31.5	P	28	P	34	3	1	P	1	29.2	12.8	3
467	TG22D	M	68.5	31.4	32.7	G	26.1	G	30.4	3.8	0.57	P	0	28.4	11.4	6.7
468	TG23A	E	46	24.6	20.7	P	22.2	P	25.8	1.3	1.38	P	1	22.2	8.8	2.9
469	TG23B	M	54	27.5	20.1	G	20.7	G	25.1	2.6	0.85	G	0	25.2	8.7	4

470	TG23C	M	76.3	30.1	32.9	G	20.2	G	30.5	2.5	2.06	G	0	29.6	15.2	2
471	TG23D	M	100	37	46.9	G	26.1	G	33.9	2.5	1.56	G	0	30.4	10.1	4.3
472	TG24A	M	89.2	39.7	39.4	G	28.7	G	35.9	3.5	1.03	G	0	33.5	15.6	5.3
473	TG24B	M	83	33	26.9	G	29.8	G	35	3	0.87	G	0	32	12.8	1.4
474	TG24C	M	71.5	31.3	18.1	G	28.9	P	33	2.3	0.89	P	1	31.1	10.3	3.7
475	TG24D	M	44.8	31.5	16	G	27.3	G	32.7	2.2	1.23	G	0	30.4	8.5	3.8
476	TG25B	M	63.4	29.4	16.6	G	19.4	G	28.1	2.7	1.61	G	0	27.3	7.8	1.2
477	TG25A	M	69	27.4	19.4	G	18.9	G	28.5	3.2	1.5	G	0	24.5	8.3	1.6
478	TG25C	E	59.3	31.2	13	G	26.1	G	30.1	2	1	G	0	28.2	7	2.8
479	TG25D	M	82	27.8	18.6	G	20.6	G	25.1	2.1	1.07	G	0	24	7.6	3.6
480	TG27A	M	51.1	27.5	17.4	G	20	G	25.9	1.8	1.64	G	0	23.9	6	1.8
481	TG27B	M	45.6	25.8	13	G	19.4	G	25.7	3	1.05	G	0	23.1	7	3.2
482	TG27C	M	64.6	28.2	16.9	G	20.9	G	27.6	3.1	1.08	G	0	25.2	8.5	2.3
483	TG27D	M	66.4	28	14.4	G	20	G	27.5	2.4	1.56	G	0	26.4	7.5	0.9
484	TG26A	M	60.8	30.2	14.4	G	22.8	G	28	1.1	2.36	G	0	26	3.8	3.2
485	TG26B	M	40.8	24.8	14.7	G	21	G	25.9	2.2	1.11	G	0	23.9	9.5	2.5
486	TG26C	M	76.3	30.2	18.1	G	28.2	G	32.6	2.3	0.96	G	0	28.3	8.3	2.3
487	TG26D	M	73.6	31.9	28.5	G	19.1	G	30.7	2.9	2	G	0	27.3	7.2	2.5
488	TG28A	M	59.1	35.5	32	G	28.2	G	32.2	1.6	1.25	G	0	30.4	8.1	3.6
489	TG28B	M	53.1	23.9	16.9	G	24.3	G	29.6	2.5	1.06	G	0	28.1	8.6	2.7
490	TG28C	M	74.7	32.2	31.4	G	28	G	33.8	2.9	1	G	0	30.9	13.9	5
492	TG29A	M	40.2	30.7	21.6	G	27.1	G	35.7	4.5	0.96	G	0	34	13.7	5.2
493	TG29C	M	70.5	35.8	31.8	G	25.7	G	32.4	2.7	1.24	P	0	31.4	9.3	5.7
494	TG29D	M	38.8	23.2	17.3	P	17.7	P	23.2	1.6	1.72	P	1	21.9	4.7	1.7
495	TG30A	M	105.1	33.7	25.9	G	27	G	35.6	3.3	1.3	G	0	32	10.5	4.8
496	TG30B	M	106.3	37.4	52.7	G	27	G	33.1	3.7	0.82	G	0	31.2	8.7	4.6
497	TG30C	M	112.5	34.9	50.6	G	30.4	G	35.2	2.6	0.92	G	0	32.3	16.1	3.7
498	TG30D	M	116.1	35.2	39.5	G	22.2	G	30.7	2.2	1.93	G	0	29.6	7.5	4.5
499	TG31A	M	101.4	34.1	27.7	G	30.8	G	37.7	4.1	0.84	G	0	32.1	9	3.7
500	TG31B	M	119.6	34.7	49.1	G	28.4	G	34.1	2.7	1.06	G	0	30.7	10.4	2
501	TG31C	M	97	35.7	47	G	24.3	G	30.8	2.7	1.2	G	0	27.4	11	2.8
502	TG31D	M	83	35	34.5	P	24	G	30.8	3.7	0.92	P	2	29.8	7	3
503	TG32A	M	109.1	36.4	46.9	G	27.2	G	35.5	2.9	1.43	G	0	33.9	7.4	3.1
504	TG32C	M	112.7	32.8	17.3	G	29.3	G	38.2	4.6	0.97	G	0	32.1	11.4	3.2
505	TG32D	M	121.7	33.1	44.6	G	23.8	G	33.7	3.6	1.38	G	0	29.5	10.9	1.6
506	TG33A	M	129.6	40.7	50	G	32.7	G	39.6	3.9	0.88	G	0	38.1	22.9	6.5
507	TG33B	M	116.5	31.8	38.6	G	21.5	G	31.3	2.6	1.88	G	1	29.7	10.1	3.9
508	TG35A	M	51	31.3	18.6	P	34.6	G	40.6	3.6	0.83	G	0	37.8	11	2.5
509	TG35B	M	75	36	53.6	G	25.9	G	33.4	5.2	0.72	G	0	24.1	21	4.6
510	TG35C	M	83	34.1	38.8	G	25.5	G	35.4	3.3	1.5	G	0	31.3	12.7	3.6
511	TG35D	M	57	33.8	44.4	P	29.1	G	35.2	3	1.02	G	0	32.6	14.1	2.8
512	TG36A	M	58	33.5	33.8	P	28.1	G	38.3	5.1	1	P	1	34.6	15	4
513	TG36B	M	82.1	32.1	38.4	G	26.1	G	35.4	3.7	1.26	G	0	31.4	13.8	3.6
514	TG36C	M	92.8	32.1	29	P	24.8	P	35.1	2.2	2.34	P	1	30.2	16.1	3.8
515	TG37A	E	60	28.7	23.6	G	19.7	G	26.2	1.3	2.5	G	0	26.7	4.1	1.8
516	TG37C	M	81.7	29.5	41.1	P	17.8	P	21.9	1.7	1.21	P	1	20.6	11.7	5.5
517	TG37D	M	72.3	23.8	36.1	G	17.5	P	20	2.1	0.6	P	1	17.5	10.3	3.9
518	TG38A	M	65.2	27.9	29.4	G	23.1	G	27	2.2	0.89	G	0	24.3	11.6	3.5
519	TG38B	M	66	23.8	27.1	P	23	G	27	2.3	0.87	G	0	24.3	6.1	3.4
520	TG38C	E	51.8	23.2	21.7	G	19.8	G	24.4	2.2	1.05	G	0	21.2	12.8	1.7
521	TG38D	M	63.7	28.6	16.4	G	23.3	G	28.2	1.9	1.29	G	0	26.2	8.7	2.4
522	TG39A	M	50.4	24.5	21	G	20	G	23	1.5	1	G	0	21.2	6.1	2.1
523	TG39B	E	57.6	25.9	20.7	G	20.7	G	24	1.3	1.27	G	0	23.1	5.3	2.7
524	TG39C	M	41.9	21.7	15.7	G	16.8	G	21	1.8	1.17	G	0	20.6	5.5	2.6
525	TG39D	M	67.8	29.1	21.1	G	24.5	G	29.6	1.6	1.59	G	0	27.3	5.3	1.8
526	TG40A	M	82	29.2	34.3	G	20.9	G	24.4	0.9	1.94	G	0	22.1	11.5	2.9
527	TG40B	M	90	27.3	37.2	G	16.7	G	22.2	2.5	1.1	G	0	19.5	8.1	2.3
528	TG40C	M	91.9	36.9	24.3	G	31.7	G	38.8	4.3	0.83	G	0	36.4	11.9	5.4
529	TG40D	M	87	33.7	41.1	G	28.4	G	33.8	4.9	0.55	G	0	31.7	10	3.3
530	TG41A	M	37.5	22.8	10.5	G	18.8	G	23.7	2.3	1.07	G	0	22.8	5.1	1.9
531	TG41B	M	68.6	28.5	32.7	G	16.2	G	20.9	2.2	1.07	G	0	19.5	8.1	3.9
532	TG41C	E	67	35	18.7	G	25.7	G	32.9	4.1	0.88	G	0	29.2	10	3.2

533	TG41D	M	57.4	24.5	24.6	G	17.5	P	20.8	1.7	0.97	P	0	20.5	8.4	1.8
534	TG42A	M	52	25.2	15.1	G	18	G	22.7	1.7	1.38	G	0	21.9	5.8	1.6
535	TG42B	M	65.6	23	17.9	G	22.4	G	28	2.4	1.17	G	0	21.9	10.3	3.8
536	TG42C	M	65.6	25.2	21.9	G	26.9	G	31.3	2.2	1	G	0	25.2	12.6	4.3
537	TG42D	M	86.5	23.2	24.2	G	23.2	G	29.3	2.1	1.45	G	0	24.3	9.7	5.3
538	TG43A	E	74.6	27.8	21	G	23	G	33.4	2.1	2.48	G	0	27.2	11.6	4.3
539	TG43B	M	74.6	26.6	20.8	G	24.5	G	30	2.7	1.02	G	0	25.2	8.4	2.1
540	TG43C	M	152.6	32.2	61.7	G	33.1	G	38.1	3.1	0.81	G	0	30.8	34.6	5.3
541	TG44A	M	81.6	29	20.2	P	24.3	G	28.8	1.4	1.61	G	0	26.7	6.3	2
542	TG44C	M	69.2	34.4	22.7	G	25.3	P	33.6	2.2	1.89	P	1	32.7	6.9	4.1
543	TG44D	M	59.4	27	14	G	21.1	P	27.3	3	1.03	P	1	26	6.3	2.3
544	TG45A	M	107.5	37.2	29.6	G	32.6	G	38.6	2.3	1.3	G	0	35.7	11	4.7
545	TG45B	M	78.9	28.4	31.5	G	21.1	G	24.7	1.5	1.2	G	0	23.5	8.3	1.4
546	TG45C	M	62.3	21.4	24.6	G	25.6	G	29.6	1.3	1.54	G	0	21.1	18.7	5.3
547	TG45D	M	63.9	30.8	22.3	P	21.4	G	25.4	1.7	1.18	G	0	24.6	5.6	1.9
548	TG46A	M	54.3	24.4	29.8	G	24.4	G	28.9	2	1.13	G	0	19.5	14	2.5
549	TG46B	M	50.5	25	20	G	10.8	G	21.8	2	2.75	G	0	21.2	7.5	1.3
550	TG46C	E	29.9	14	8.3	G	15.9	G	18.3	0.8	1.5	G	0	15.4	4.4	2.1
551	TG46D	M	63	30.4	20.2	G	21.5	G	31.1	3	1.6	G	0	29.3	9.2	4.5
552	TG47A	M	75.4	32	30.7	G	26.2	G	31	2.8	0.86	G	0	28.4	9.1	3.9
553	TG47B	M	64	26.9	28	G	23.2	P	27.3	1.7	1.21	P	1	24.7	8.1	4.3
554	TG47C	M	70	25.8	19.3	G	20.3	G	25.1	1.4	1.71	G	0	24.2	9.1	2.1
555	TG47D	M	55.2	20.8	20.7	G	14.4	G	16.8	1.4	0.86	G	0	17.5	6.8	4.7
556	TG48A	M	77.5	29	25.8	G	21.2	G	24.7	2	0.88	G	0	22.2	10.7	5.1
557	DM09A	M	45	43.1	41	P	21.6	G	28.9	2.6	1.4	G	0	26	12.6	4.1
558	RA01A	M	38.2	30.2	21	P	25.8	G	32.8	3.2	1.09	G	0	30.1	13.8	2.7
559	RA01B	M	60	28.2	16.7	P	24.2	G	32.1	1.8	2.19	G	0	28.7	8.7	2.9
572	RA04C	E	70	29.5	31.9	G	22.4	G	26.4	2.3	0.87	G	0	25.4	9.3	4.1
583	RAaA	M	44	36.1	43	P	28.4	G	35.6	3.9	0.92	G	0	33.2	21.3	7.1
584	RAaB	M	42	38.8	41	P	31.3	G	40.3	4.5	1	P	1	35	19	4.2
585	RAaC	M	48	47.4	42.5	P	36.8	G	45.9	4.5	1.01	G	0	39.7	15.3	3.1
586	RAaD	M	31	30.8	31	P	26.8	G	27.7	2.5	0.18	G	0	26.9	9.9	7.7
587	RAbA	M	25	26.5	24	P	20.1	G	24.5	1.9	1.16	G	0	21.5	8.9	2
588	RAbB	M	85.6	35.2	21.1	G	27.6	G	36.6	3.6	1.25	G	0	33	8.4	3.2
589	RAbC	M	53	36.7	48.7	G	30.2	G	37.3	2.7	1.31	G	0	30.6	11.3	2.9
590	RAbD	M	69	32.2	41	G	17.5	G	21.8	2	1.08	G	0	20.1	7	3.1
591	RAcA	M	29	30	29	P	23.3	G	28.8	1.5	1.83	G	0	27.5	8.1	3.4
592	RAcB	M	25	28.3	22.1	P	18	G	23.3	2.8	0.95	P	1	23.9	7.5	5
593	RAcC	E	39	18.7	23.1	G	17.3	G	27	1.8	2.69	P	1	17.6	10	2.1
595	RAdA	M	112.4	35.2	46.2	G	25.8	G	34.9	2.5	1.82	G	0	31.8	15.1	6.1
596	RAdB	L	59.4	29.6	14.1	G	26.2	G	30.8	2.9	0.79	G	0	25	9	2.5
597	RAdC	M	71.4	31.9	33	G	22.6	G	26.6	1.8	1.11	G	0	26.3	3.6	1.3
598	WG01A	E	49.9	25.2	25.9	G	19.6	G	24.5	1.4	1.75	G	0	22.3	7	2.2
599	WG01B	M	78	21	33	P	15.8	P	18.2	2.1	0.57	P	1	15.1	9.3	3.4
600	WG01C	L	63.2	19.8	9.9	G	18.7	G	22.3	3.7	0.49	G	0	19.9	8	5.6
601	WG01D	M	68	22.2	25.5	P	17.7	G	23.9	2.3	1.35	G	0	20.3	10	3.6
602	WG02A	L	37	25.8	13	G	18.5	P	25.2	3	1.12	P	1	22.2	7.3	1.5
603	WG02B	L	39.8	23.9	12.1	G	19.8	G	24.6	2.8	0.86	G	0	21.9	7.7	3.6
604	WG02C	L	49.1	29.8	11	G	21.5	G	26.7	2.7	0.96	G	0	23.7	7.5	3.1
606	MS01B	M	54.3	30.5	25.1	G	22.5	G	26	1.2	1.46	G	0	25.1	9.6	2.9
607	MS01C	M	78.9	31.1	38.6	G	20	G	25.7	3.3	0.86	G	0	24.7	9	4.6
608	JW01A	E	43.6	19.2	19.3	G	15.3	G	19.5	1.5	1.4	G	0	17.7	12.4	1.3
609	JW01D	M	58.3	18.4	21.2	P	13	P	19	2.5	1.2	P	1	17.2	7	3.7
610	JW02A	M	56.4	24.4	17.4	G	21.3	G	25.2	4.1	0.48	G	0	24.1	13.1	6.7
611	JW02C	L	49	26.6	15.7	G	20.3	G	26.3	2.5	1.2	G	0	20	9.5	5.1
623	GG01A	M	63.5	21.2	28.2	G	15.2	G	18.6	2.3	0.74	G	0	17.7	4.8	2.4
613	GG01B	E	65.9	21.9	23.1	P	18.8	P	21.7	2.9	0.5	P	1	20.3	10.5	4.1
612	GG01C	M	80.4	33.6	41.8	G	19.3	G	22.3	1.1	1.36	G	0	21.2	8.5	3.6
615	JS01A	M	108.3	46.3	54.5	G	18.8	G	21.8	1.5	1	G	0	19.4	11.4	4.3
616	JS01B	M	104.9	38	45.1	G	18.5	G	26.5	4.3	0.93	G	0	25	8.3	4.1
617	JS01C	E	31	37	28	P	22.9	P	33.9	2.9	1.9	P	1	33.3	14	4.2
624	JS01D	M	37	24.6	22	P	24.3	G	28.3	2.2	0.91	G	0	25.6	8.4	3

621	USF02A	M	37	18.6	15.9	G	22	G	26.3	1.9	1.13	G	0	23.8	6.3	3.9
625	BB07A	E	85.2	27.2	25.6	P	20.3	P	25.7	3.6	0.75	P	2	25.8	8	3.7
626	BB07B	E	59.7	28.1	19.4	G	19	P	25.3	3.1	1.02	P	1	24.7	6.9	2.1
627	BB07C	E	66	25.7	30.4	G	19.7	G	22.8	2	0.78	G	0	21.9	7.6	2.7
629	BB08A	M	68.3	29.6	21.6	G	28.6	G	32	1	1.7	G	0	28.9	9.5	2
631	BB08C	E	105.6	36.4	45	G	22.5	G	36.1	1.4	4.86	G	0	27.1	9.7	4
632	BB09A	M	95.2	31.7	24	G	28.7	G	35.8	3.5	1.01	G	0	32.5	11.4	3.3
633	BB09B	M	53.4	37.8	15.3	P	26.3	P	38.5	6.9	0.88	P	2	37.6	11.3	4.1
636	BB10B	M	69	28.7	32.2	P	22	P	26	1.2	1.67	P	1	23.3	10.5	5.6
637	BB10C	M	69.5	32.8	37.9	G	22.2	G	26.5	1.6	1.34	G	0	25.7	8.6	3.5
638	BB11A	M	58	25.9	27.6	P	22.5	P	26	2.5	0.7	P	1	23.4	12.7	5.5
639	BB11B	E	80.3	28	32.1	G	22.3	P	25.4	2.1	0.74	P	1	23	9.3	4.5
640	BB11C	M	108.2	38	44.7	G	34	G	40.6	4.4	0.75	G	0	36.5	17.5	4
641	BB12A	M	62.7	24.2	22	G	20.1	G	24.8	3	0.78	G	0	23	9	2.3
642	BB12B	E	75.4	27	19	G	18.4	P	28	2.9	1.66	P	1	25	8.8	2.4
643	BB12C	M	48	34.5	34.9	P	26.6	G	31	2.1	1.05	G	0	30	14	5.5
644	BB12D	M	42	21.3	18	P	18	P	20	1.1	0.91	P	1	19	7.5	3.5
645	BB13A	M	55	22.8	27.3	P	16.6	P	20.8	1.1	1.91	P	1	19.8	5.9	1.3
646	BB13B	M	93.5	35.6	42.5	G	29.7	P	39.7	3.8	1.32	P	1	32.8	14.6	4.5
647	BB13C	M	89	33.6	48	P	14.9	P	22.9	3.8	1.05	P	2	21.1	8.8	3.9
648	BB13D	M	62	32.9	34	P	17.1	P	24.5	2.3	1.61	P	2	23.9	9.4	2
649	BB14A	M	59.5	28.2	25.8	G	18.5	G	21.2	0.8	1.69	G	0	21.3	2.4	4.1
651	BB14C	M	56.6	29.7	21.6	P	20	P	26	2.3	1.3	P	1	21.1	6.9	1.3
652	RK10A	M	86.5	32.9	37.9	G	21.4	G	25.4	1	2	G	0	23.1	10.5	3.7
654	RK10C	M	37	26	32	P	13	P	37	2	6	P	1	16	8	3
655	RN40A	M	50	38.2	44.2	P	28.1	G	37.5	3.6	1.31	G	0	32.9	15	6
656	RN40B	M	25	38	24	P	33	G	43.2	4	1.28	G	0	37.3	17.3	3.2
657	RN40C	M	37	35.3	36	P	29.4	G	34	3.2	0.72	G	0	32.4	7.9	3.8
659	RN41A	M	79	34.3	44	P	22.4	G	32	2.9	1.66	G	0	30.1	8.9	4.5
660	RN41B	M	41	39.5	25.4	P	33	G	41.9	3.7	1.2	G	0	39	11.7	3.4
661	RN41C	M	58	38	53	G	25.8	G	33.7	4.7	0.84	G	0	30.5	17.3	3.7
662	RN41D	M	41	35.6	30	P	31.7	G	39	3.3	1.11	G	0	32.4	12.1	2.5
663	RN42A	M	27	32	26	P	27.7	G	36.1	3.8	1.11	G	0	32.7	13	4.6
664	RN42B	M	26	35.2	25	P	33.4	G	39.2	3.1	0.94	G	0	36.1	12.3	5.5
665	RN42C	M	28	29	17	P	30.1	G	36.8	2.9	1.16	G	0	30.8	11.1	3.7
666	RN42D	M	34	30.7	29	P	21	P	28	1.9	1.84	P	1	24.9	9	4
667	RN43A	M	31	33.6	30	P	33.3	G	39.1	3.4	0.85	G	0	33	16.1	3.3
668	RN43B	M	52	29	32	P	20	P	27.2	2.1	1.71	P	1	25.4	11.1	7
669	RN43C	M	42	22.5	29	P	18	P	26	3	1.33	P	1	23	14.6	5.1
670	RN44A	M	44	28.4	21.1	G	26.2	G	33.1	2.3	1.5	G	0	29.2	7.5	4.5
671	RN44B	M	44	26.2	24.7	G	26.4	G	28.7	2.5	0.46	G	0	25.5	13.9	8.3
672	RN45A	M	35	36	31	P	30	G	35	2.6	0.96	G	0	31.9	10	4.3
673	RN45B	M	49	36	25	P	27	P	37	3	1.67	P	1	34.8	14	5.6
674	RN45C	E	32.6	31	27	P	32	P	35.8	2.6	0.73	P	1	30.2	17	6.8
675	RN46A	M	40	31.6	35.5	P	23.6	G	30.6	2.6	1.35	G	0	26	11.2	3.1
676	RN46B	M	23	31	21	P	27.9	G	34.8	2.2	1.57	G	0	30.8	10.9	3.1
677	RN46C	M	23	27	20	P	18.9	G	24.3	2.1	1.29	G	0	24.3	9.3	2.2
678	RN46D	M	26	16.3	20.7	P	13.4	G	17.1	1.7	1.09	G	0	13.9	7.2	2.2
679	RN47A	M	50	35.6	26.7	G	27.4	P	34.9	3.7	1.01	P	1	33.4	12.5	4.4
680	RN47B	M	21	30.4	20	P	25.5	G	32.3	2.3	1.48	G	0	25.6	7.2	4.2
681	JT01A	M	31.4	29.3	14.6	G	24.2	G	31.7	2.6	1.44	G	0	29.1	9	3.4
682	JT01B	M	37	33.8	36	P	27.4	G	31.4	2.2	0.91	G	0	28.3	15.2	2.2
683	JT01C	M	27	27.7	25	P	20.9	G	25.9	1.6	1.56	G	0	24.3	7	2.3
684	JT01D	M	55	33.5	19	P	27.3	P	33.3	3.4	0.88	P	1	31.6	8.2	2.6
685	JT02A	M	47	29	19	P	21	G	30	3.6	1.25	G	0	27.9	6.9	3.1
686	JT02B	M	43	46.6	37	P	27.5	G	37.5	3.9	1.28	G	0	36.1	29.1	1.7
687	JT02C	M	43	39	34	P	27	G	34.6	4.5	0.84	G	0	36.2	13.5	4
688	JT02D	M	48	35	27	P	25	G	32.2	3	1.2	G	0	31.3	13.6	2
689	JT03A	M	35	29.5	28	P	20	P	32	2	3	P	1	29	15	3.8
690	JT03B	M	33	30	31	P	18	P	27	2	2.25	P	2	27	10	4
691	JT03C	M	34	36	23	P	23.2	P	33.3	2.6	1.94	P	1	30.2	13.8	4
692	JT03D	M	26	27	14.5	G	23.2	P	28	2	1.2	P	1	25.7	7.2	2.7

693	JT04A	M	63	37.8	3.7	P	23.9	G	29.2	1.5	1.77	G	0	29.7	7.2	5.4
694	JT04B	M	57	33.2	47	P	26.5	P	32.2	2.8	1.02	P	1	27.9	14.8	4.5
695	JT04C	E	53	38	49.3	P	24.9	G	30.9	2.9	1.03	G	0	30	7.6	5.8
697	JT05A	E	65	37	25.3	P	30.2	P	35.8	2.8	1	P	1	34.5	11.3	4.7
698	JT05B	E	63	36.8	36	P	22	P	32	3	1.67	P	1	31.5	11	5
699	JT05C	M	63	38.2	30	P	27.3	G	36.5	4.2	1.1	G	0	35.2	13.6	5.1
700	JT05D	M	57	29.3	17.3	G	24.4	G	29	2.1	1.1	G	0	29.1	8.9	2.9
701	JT06A	M	45	37.3	37.4	P	33	G	41.4	3.3	1.27	G	0	36.5	16.1	5.2
702	JT06B	M	39	32.2	21.5	P	29.9	G	39.9	4.7	1.06	G	0	33.7	13.2	4.3
703	JT06C	M	42	31.7	23	P	21	P	30	1.9	2.37	P	1	29.2	7.8	3.5
704	JT06D	M	51	28.5	37	P	21.4	P	27.2	2.6	1.12	P	1	26.3	6.3	6.3
705	JT07A	M	79	38.2	43.8	P	26	P	31	2.9	0.86	P	1	30	9	3
706	JT07B	M	54	24.5	22	P	16	P	21	2	1.25	P	1	21.8	8	2.5
707	JT07C	M	43	36	37	P	25	P	35	2	2.5	P	2	34.3	15	4
708	JT07D	M	81	41	68	P	29	G	36	2.5	1.4	G	0	33.4	14.2	5
709	JT08A	M	64	34.4	22	G	30.7	G	40.3	2.7	1.78	G	0	35.2	11.7	3
710	JT09A	M	57.1	28.2	22	G	23.8	G	30.5	2.5	1.34	G	0	26.6	8.8	2
711	JT09B	M	67.9	28.7	18.6	G	25.3	G	28.5	1.8	0.89	G	0	26.9	8	2.3
712	JT09C	M	68.6	35.8	30.2	G	26.5	G	35.1	3.7	1.16	G	0	33.9	10.2	2.7
713	JT09D	M	63.7	31.9	41	G	30.7	G	42	4	1.41	G	0	33.3	19.4	2.9
714	JT10A	E	59.5	31.3	18.6	G	23.9	G	29.6	2.5	1.14	G	0	27.9	7.8	1.5
715	JT10B	M	70.6	33.8	17.5	G	26.4	P	34.4	4.4	0.91	P	1	33.7	10.2	1.7
716	JT10C	M	56.1	28.8	14.3	G	23.7	G	30.5	2.4	1.42	G	0	29	9.1	3.4
717	JT10D	M	69.5	25.3	21.2	G	29.9	G	35.2	2	1.33	G	0	26.1	13.5	3.1
718	JT11A	M	73.2	33.8	24.5	G	21.6	G	28.5	2.4	1.44	P	1	28.4	5.7	1.1
720	JT11B	E	99.3	30.8	24.9	P	24.4	G	33.3	3	1.48	G	0	29.4	13.7	2.9
721	JT11C	M	76.4	24.5	29.9	G	16.2	G	20.3	1.8	1.14	P	1	18.2	10.7	1.7
724	JT12B	M	75.6	32.9	26.8	G	31.8	P	36.6	2.2	1.09	P	1	35	9.9	1.8
727	JT13A	E	56.3	25.9	25.9	G	18.3	G	18.3	2.3	0	G	0	22.6	11.7	5.2
729	JT13C	M	73.5	28.3	39.1	G	20.7	G	24.5	2.5	0.76	G	0	23.7	10	2.9
730	JT13D	M	79.3	28.9	19.8	G	27.3	P	34.4	3.1	1.15	P	1	30.9	7.8	2.2
731	JT14A	M	64.3	24.6	17	G	20.1	G	24.3	2.3	0.91	G	0	23.3	10.2	2.9
732	JT14B	M	80.7	35.3	35.5	G	30.4	G	37.3	3.3	1.05	G	0	33.5	14.3	5.1
733	JT14C	M	85.8	26.9	34.6	G	21.1	G	27.8	2.4	1.4	P	1	25.4	14.3	2.7
734	JT14D	M	45	26.9	12.3	G	23.2	G	25.8	1.4	0.93	G	0	26.7	8.6	1.6
735	JT15A	M	76.6	35.5	36.7	G	22.5	G	27	2.2	1.02	G	0	24.5	9.6	3.4
736	JT15B	M	64.6	34.3	22.4	G	20.7	P	25.2	4.1	0.55	P	1	24.6	9	3.3
737	JT15C	M	71.6	24.9	19	G	21.9	G	27.1	2.5	1.04	G	0	24.3	10.5	2.2
739	JT16A	M	87	34.7	49	P	20	P	30	4	1.25	P	2	28	16	5
740	JT16B	M	56.3	28.7	24.4	P	21.4	P	21.7	2	0.08	P	1	25.4	8.8	3.7
741	JT16C	M	46	29.7	33.8	G	19.4	P	22.3	1	1.45	P	1	21.3	6.8	2.6
742	JT16D	M	27	31.4	26	P	25.6	G	35.1	1.4	3.39	G	0	28.2	14.6	5
744	JF01A	E	81.9	27	42.6	G	16.4	G	20.7	1.9	1.13	G	0	20.3	6.3	1.4
745	JF01B	E	71.3	25	26.8	G	16.2	G	23.6	3.7	1	G	0	22.7	11.4	2.7
746	JF01C	E	66.4	24	30.5	G	16.9	G	20.9	1.9	1.05	G	0	19.5	7.3	2.9
747	JF01D	M	51	26.1	23	P	19	P	21	2.7	0.37	P	1	18.7	12	4.1
748	JF02A	M	113.1	31	39.8	G	25.1	G	29.5	2.1	1.05	G	0	27.6	13.1	4.7
749	JF02B	M	49	28.1	19.7	G	22.3	G	27.1	1.7	1.41	G	0	26.2	8.6	2.5
750	JF02C	M	62.6	28.9	21.7	G	23.4	G	28.4	3	0.83	G	0	26.6	6.7	5.3
751	JF02D	M	60.5	28	23.3	G	21.6	G	27.1	1.7	1.62	G	0	25.6	7.1	6.9
752	JF03A	M	51.4	24.9	19.4	G	20.3	G	24.5	2.5	0.84	G	0	23.3	6.4	5.7
753	JF03B	M	113.1	40.4	54.2	G	19.6	G	26	2	1.6	G	0	24.8	13.4	5.1
754	JF03C	M	71	24.3	38.5	P	12.6	P	18.6	1.8	1.67	P	1	17.7	19	2
755	JF03D	M	44.5	35.6	22.3	P	22.7	P	33.7	3.8	1.45	P	2	34	12.5	5.8
756	JF04A	M	55.4	25.4	14.7	G	23.9	G	25.9	3.7	0.27	G	0	23.8	11	7.4
757	JF04B	M	69.3	29.3	17.1	P	20.7	P	27.2	2.9	1.12	P	2	25.3	11.9	4.9
758	JF04C	L	65.4	24	9.7	G	20.5	G	23	2.5	0.5	G	0	21.8	6.7	4.3
759	JF04D	L	69.3	27.3	9.8	G	25.9	G	28.7	2.6	0.54	G	0	27.8	6.7	5.9
760	JF05A	M	55.1	17.2	16.2	G	17.5	P	15.2	2.3	-0.5	P	1	16.8	11.8	3.7
761	JF05B	M	36.5	13.5	11.7	P	14.4	P	17.6	1.2	1.33	P	1	15.8	16.9	2.5
762	JF05C	M	46.2	22.7	12.3	G	20.8	G	25.8	0.8	3.13	G	0	22.7	7.2	2
763	JF05D	M	35.4	25.4	10.9	G	19.5	G	22	3	0.42	G	0	21.8	5.3	5.4

764	JF06A	M	67.4	19.2	29.9	G	15.9	G	19.2	1.4	1.18	G	0	17.9	14.3	5.6
765	JF06B	M	70.6	17.9	22.5	G	15.2	G	17.4	2.6	0.42	G	0	17.2	5.1	4.4
766	JF06C	M	59.5	17.7	21.8	G	18.2	G	20.4	0.8	1.38	G	0	15.9	9.6	2.7
767	JF07A	M	46.5	17.5	18.7	G	14.7	G	18.2	0.7	2.5	G	0	16.7	6.6	2.9
768	JF07B	M	48.9	13.4	13.2	G	15.1	G	17.1	1.3	0.77	G	0	14.1	6.1	0.9
769	JF07C	M	60.7	15.3	25.8	G	16	G	19	1.1	1.36	G	0	14.9	11	0.5
770	JF07D	L	43.4	18.9	15.3	G	16	G	20	2.3	0.87	G	0	17.4	7.3	1.1
771	JF08A	L	57.6	22.8	15.8	G	18.5	P	23.2	2.8	0.84	P	1	18	7.9	3.1
772	JF08B	L	52.9	22	14.2	G	16.2	G	21.1	1.8	1.36	G	0	17.4	7.8	4.9
773	JF08C	M	32.8	18.2	10	G	18.2	G	21	1.1	1.27	G	0	18.5	6.2	2.7
774	JF08D	M	42.1	16.1	14.3	G	12.3	G	16.3	1.4	1.43	G	0	15.3	8.4	1.7
775	JF09A	M	47	29.3	45	P	24	P	30	4	0.75	P	1	27.9	25	6.7
776	HC01A	E	79.3	37.3	39.1	G	22.6	G	27.7	2.4	1.06	G	0	26.3	10.6	3
777	HC01B	E	75.8	27.9	37.9	G	19.4	G	23.5	2	1.03	G	0	23	11.1	3.5
778	HC01C	E	53.5	23.5	29.3	G	19.6	G	24.5	1.6	1.53	G	0	22.7	7.9	3.4
779	HC01D	E	63.3	24.1	29.2	G	17.5	G	21.5	1.6	1.25	G	0	19.7	11.9	3.4
780	HC02A	M	54.1	23	24.3	G	22.1	G	25.2	2.2	0.7	G	0	21.8	10.8	2.5
781	HC02B	E	55.3	24	11.5	G	19.3	G	24.1	2.4	1	G	0	22.4	12.4	5.1
782	HC02C	M	71.3	21.6	29	G	17.2	G	20.8	2.2	0.82	G	0	19.9	13.7	3.4
783	HC02D	E	59.9	27.9	28.6	G	17.3	G	23.9	2.8	1.18	G	0	24.2	13.9	2.8
784	HC03A	M	132.9	41.9	47.4	G	22.7	G	26.3	1.5	1.2	G	0	25.5	8	6.6
785	HC03B	E	81.2	29.2	35.8	G	20	G	24.2	1.9	1.11	G	0	23.4	8.5	4.3
786	HC03C	M	96.2	31.2	32.9	G	25.5	G	30.3	2	1.2	G	0	26.8	7.8	5.6
787	HC03D	M	119.1	37.8	56.3	G	20.9	G	25.5	2.1	1.1	G	0	23.4	16.3	5.8
788	HC04A	M	46.8	20.8	13.1	G	17.6	G	21.5	2.2	0.89	G	0	20.1	7.4	4.4
789	HC04B	M	107.1	32.2	45.6	G	23.6	G	27.5	1.3	1.5	G	0	26.4	12.3	3.2
790	HC04C	E	97	33.1	31.2	G	21.9	G	28.6	5	0.67	G	0	29.6	12.7	5.5
791	HC05A	E	61.1	56.3	56	P	28.6	G	32	2.1	0.81	G	0	30.1	16.4	4.3
792	HC05B	M	150.8	66	75.1	G	29.7	G	32.2	1.9	0.66	G	0	30.5	14.9	5
793	HC05C	M	158.7	74.5	70.9	G	28.3	G	35.8	2	1.88	G	0	32.2	13.3	7.5
794	HC06A	M	69.1	22.5	30.6	G	22	G	24.6	1	1.3	G	0	21.5	10.5	3.7
795	HC06B	L	52.4	23.4	12.8	G	20.6	G	23.2	1.7	0.76	G	0	22.2	6.4	4.3
796	HC06C	L	48.9	25.4	15	G	20.9	G	24.2	1.3	1.27	G	0	22.5	5.1	4.8
797	HC06D	M	70.5	23.6	35.3	G	18.5	G	21.9	1.7	1	G	0	19	11.6	4.3
798	HC07A	M	67.2	16.2	15.1	G	12.6	G	15.1	1.1	1.14	G	0	14.9	7.1	1.1
799	HC07B	M	77.1	25.7	28	G	24.4	G	26.6	2.4	0.46	G	0	24.3	16	5.3
800	HC07C	M	46.3	24.5	18.2	G	18.9	G	23.3	2.4	0.92	G	0	21.8	7.8	4.1
801	HC07D	L	64	27.3	20.8	G	17.2	G	22.6	2.1	1.29	G	0	18	9.7	6
802	HC08A	L	63	25.3	19.8	G	26.6	G	30.1	4.1	0.43	G	0	27.6	12.6	7.2
803	HC08B	L	41.6	23.5	11.7	G	22.4	G	24.8	2.3	0.52	G	0	24	7.3	5.5
804	HC08C	L	50.8	28.5	11.5	G	24.4	G	30.8	3.2	1	G	0	27.7	9.3	7.1
805	HC08D	M	55.6	18.1	14.7	G	15	G	18.2	1	1.6	G	0	17.2	6.2	3.4
806	HC09A	M	53.5	30	18.6	G	30.6	G	35.9	2.9	0.91	G	0	32.3	8.4	5.3
807	HC09B	M	57.2	31.2	17.2	G	22.8	G	32	3.6	1.28	G	1	30.6	13.2	8.1
808	HC09C	L	63.8	21.2	11	G	18	P	23	2.3	1.09	P	1	22.5	6	3.5
809	BS01A	M	90.4	34.2	43.6	G	19.2	G	26.3	1.5	2.37	G	0	25	8.3	2.5
810	BS01B	M	47.1	25	9.5	G	22.3	G	26.1	1.8	1.06	G	0	25	8.9	4.7
811	BS01C	M	33	33.3	32	P	21.6	G	31	4.5	1.04	G	0	33.1	11.9	3.5
812	BS01D	M	108.7	36.6	36.1	G	27.2	G	40.2	4.5	1.44	G	0	38	10.8	1.8
814	BS02D	M	46.5	25.4	15.7	P	23	P	28	2.7	0.93	P	1	27	11	6
815	BS03A	M	59	24.2	27	P	17	P	24	3	1.17	P	1	20.7	16.5	4
816	BS03B	M	43.5	24.6	9.7	G	17.7	P	24.6	1.9	1.82	P	1	24	7.6	3.3
817	BS03C	M	31.9	30	16.8	P	23.7	G	29.7	2.2	1.36	G	0	30	8.5	4.6
818	BS03D	L	29.7	18.9	13.8	G	12.2	G	16.3	2.2	0.93	G	0	14.7	8.1	3.5
819	BS04A	M	56.4	26.2	26.9	G	18.3	G	23.8	2	1.38	G	0	21.3	7.2	3.2
820	BS04C	M	51.1	24.9	24.6	G	15.8	P	20.5	2.1	1.12	P	1	20.2	7.8	1.7
821	BS04D	L	35	19.3	11.5	G	16.7	G	21	1.9	1.13	G	0	18.3	8	6.9
822	WB01A	M	44.8	25.7	22	G	22.3	G	25.7	1.7	1	G	0	24.7	6	1.4
823	WB01B	M	53.6	25.8	23.9	G	24.2	G	28	2.8	0.68	G	0	26.7	13	9.3
824	WB01C	M	65.2	25.1	18.8	G	27.6	G	30.1	1.7	0.74	G	0	28.5	8.3	6
825	WB01D	M	49.7	30.4	13.1	G	21	G	31.5	1.6	3.28	G	0	30.2	8.7	4.4
826	WB02A	M	21	29.2	18.1	P	25	G	31.2	4.3	0.72	G	0	29.8	10	6.6

827	WB02B	M	24	27.8	15	P	21.8	G	28.1	2.4	1.31	G	0	27.4	9.5	7
828	WB02C	M	17	24	15	P	22.7	G	26.2	2.2	0.8	G	0	24.1	10.5	7.8
829	DB01A	M	58.1	22.9	22.6	G	16.4	G	22.1	1.9	1.5	G	0	19.3	10.2	4.4
830	DB01B	M	84.7	30.1	27.1	G	25.9	G	30	2.4	0.85	G	0	29.2	11.8	8.4
831	DB01C	M	62	28.6	27.5	P	18	P	22.2	1.8	1.17	P	1	21.7	6.8	2.5
832	DB01D	M	38.9	25.3	20.2	G	20.6	G	25.8	2.4	1.08	G	0	23.6	10	3
833	DB02A	M	33.5	23.1	9.7	P	19.7	P	22.1	2.4	0.5	P	1	22.4	6	3
834	DB02B	L	56.5	26.9	15.5	G	23.3	G	31.1	2.7	1.44	G	0	23.8	9.5	7.2
835	DB02C	L	49.4	20	10.2	G	17.9	G	22.1	1.3	1.62	G	0	18.7	7.5	4.9
836	DB02D	M	68.5	24.6	16.6	G	21.6	G	26	2.3	0.96	G	0	24.1	8.2	7.3
838	UF01B	M	72.8	31	37.5	G	26	G	30	2.8	0.71	G	0	26.3	13.1	7.2
839	UF01C	M	88.2	32.1	31.4	P	22	P	32	3.1	1.61	P	1	31.4	14.7	3.6
840	UF01D	M	114	32.9	47	P	17	P	30	4	1.63	P	2	29.2	16	8.5
841	UF02A	M	81	31	35.8	G	26.8	P	35	4	1.03	G	0	32.3	14.8	2.2
845	UF03A	M	81.5	35	32.5	P	21	P	29	3.7	1.08	P	2	24.9	12.5	5.5
849	UF04A	M	70	30.2	34.7	P	15	P	22	2	1.75	P	1	20.9	7.1	3.2
851	UF04C	E	39.3	19.7	18.3	G	12.5	G	17.2	1.3	1.81	G	0	18.4	4.6	1.2
852	UF04D	E	98.7	29	39.8	G	20.5	G	25.6	1.7	1.5	G	0	25.9	8.9	4.8
854	UF05B	E	60.5	22.2	28.1	P	16.5	P	20	1.5	1.17	P	1	20.9	8.3	3
856	UF05D	E	60.9	29.8	26.9	G	21.8	G	29.5	2.3	1.67	G	0	28	8.3	3.1
857	UF06A	L	26.8	24.5	12.4	G	16.6	G	25.6	2.9	1.55	G	0	20.1	7.3	2
858	UF06B	L	31.8	21.5	11.5	P	13.6	P	27.6	2.2	3.18	P	1	21.1	7.6	1.8
859	UF06C	L	36	26.1	13.9	G	20.2	G	24.9	2.2	1.07	P	1	20.6	9.5	3.2
860	UF06D	L	39.8	39.5	12.4	G	23.5	G	30	2.8	1.16	G	0	27.7	7.6	2
861	UF07A	L	58.9	31.1	13.5	G	25.5	G	32.2	3.7	0.91	G	0	28.8	8.3	1.3
862	UF07B	L	54	31.6	16.9	G	5.7	G	31.6	3	4.32	G	0	25.9	8.5	0.1
863	UF07C	L	46.7	26.4	13.4	G	24	G	31.2	2.4	1.5	G	0	27.5	6	1.1
864	UF07D	L	40.5	23.5	12.8	G	19	G	25.2	2.4	1.29	G	0	21	7.2	0.8
865	UF08A	L	41	25.2	13.8	G	24.5	G	27.6	1.5	1.03	G	0	22.9	9	1
866	UF08B	L	50.2	25.2	14.6	G	0	G	28.6	3.2	4.47	G	0	22	9	0
867	UF08C	L	42	30.7	13.7	G	42.6	G	32.5	4.3	-1.17	G	0	27.2	8.8	2.2
868	UF08D	L	37.5	20	11.7	G	16.3	G	21.9	2.7	1.04	G	0	16.8	6.9	1
870	UF09B	L	54.5	17.7	27.7	G	16.9	G	21.1	1.2	1.75	G	0	16.2	8.6	0.9
872	UF09D	L	41	16.4	13.2	G	15.9	G	18.5	0.8	1.63	G	0	16.9	5.4	1.9
873	UF10A	L	41.4	23.9	18	G	18.2	G	22	2.7	0.7	G	0	22.9	9	0.6
874	UF10B	L	39.2	22.9	15.2	G	19.1	G	23.5	1.2	1.83	G	0	21.7	7	0.8
875	UF10C	M	50.7	26.7	18.6	P	16	P	24	3	1.33	P	1	25	9	3.5
876	UF10D	L	40.5	20.1	16.6	G	16.3	G	21.3	1.8	1.39	G	0	20.9	7.9	1.4
877	UF11A	M	33	27.5	21.3	P	18.9	P	24.9	2.7	1.11	P	1	24.3	10.4	3.1
878	UF11B	M	72.9	26.1	15.9	G	24.8	G	27.2	2.2	0.55	G	0	25.6	9.7	3
879	UF12A	M	80.6	33.4	27.2	G	21.4	G	30.4	2.9	1.55	G	0	29.4	13.9	1.7
880	UF12B	M	47	37	23.5	G	27	G	34.4	2.1	1.76	G	0	32.7	9	2.6
881	UF12C	M	57	39	45.7	P	25.4	G	35.6	3.4	1.5	G	0	33.7	9.8	4.9
882	UF14A	E	94	37	37.6	G	20.9	P	20.2	2.4	-0.15	P	1	28.4	7.6	3.4
883	UF14B	M	52	41.6	42.5	P	32.8	G	42.5	4.2	1.15	G	0	40.1	19.5	4.8
884	UF14D	M	68	36.8	32.2	P	26.7	P	37	3.4	1.51	P	1	35.1	12	4.5
885	UF15A	M	76.2	32.8	27.1	G	20.3	P	30.9	2.9	1.83	P	1	31.6	10.6	0.9
886	UF15B	M	58	29.6	45	P	21.9	P	28	2.4	1.27	P	1	27	8.6	3.2
887	UF15C	M	32	26.8	26.5	P	24.8	P	30.1	3.3	0.8	P	1	25.6	12.2	4.5
888	UF16B	M	47	34.6	29.5	P	21	P	26.3	1.9	1.39	P	1	23.5	9.2	2.4
890	UF16D	M	54	26	13.8	G	21.5	P	27.8	2.7	1.17	P	1	25.1	8.6	3.1
891	UF17A	M	45	30.5	28.9	G	26	G	33.5	3	1.25	G	0	29.2	9.5	3.8
892	UF17B	M	37	26.2	34	P	17.6	P	23.6	2.8	1.07	P	1	21.5	12.6	2.6
893	UF17C	M	36.8	26.2	21.2	G	21.9	G	27.2	1.5	1.77	P	1	24.9	5.1	1.5
895	UF19A	M	49	23.9	26.5	P	16.9	P	23	1.2	2.54	P	1	28.1	1.6	3.6
899	UF21A	M	44	32.9	18.5	G	30.4	G	33.5	1.4	1.11	G	0	31.3	6.9	2.1
900	UF21B	M	77	26.4	31.2	G	19.7	P	24.3	1.9	1.21	P	1	22.8	10.8	3.7
901	UF21C	M	91	33.5	38.9	G	28.5	P	34	5	0.55	P	1	31.5	17.5	4.4
902	UF21D	M	69	25.7	22.1	P	23	P	27.5	2.7	0.83	P	1	26.4	8.1	4.3
903	UF22A	M	40	28.1	31.1	P	26.3	G	32.1	2.1	1.38	G	0	27.7	14.5	7.5
904	UF22B	M	37	32.3	25.4	P	24.6	G	34.2	2.8	1.71	P	1	32.2	13.6	4
905	UF23A	E	54	30	32.2	P	17.8	G	21.8	2.2	0.91	G	0	22.1	13	3

906	UF23B	M	56	24.2	26.1	P	14.5	P	20.4	2.3	1.28	P	1	20.3	8.4	3.1
907	UF23C	E	84.9	29.1	20.9	G	24.9	G	28.2	2.2	0.75	G	0	28.2	5.9	3.8
908	UF24A	E	62.7	23.5	29.7	G	19	G	23.9	1.2	2.04	G	0	21.5	10.5	3.1
909	UF24B	E	64	26.3	31.4	G	18.7	G	21.4	2.3	0.59	P	1	18.5	7.7	1.8
910	UF24C	M	91.4	32.8	47.8	G	13.2	G	23.3	2.5	2.02	G	0	17.7	12	4.7
911	UF25A	M	80.4	30.9	36.7	G	27.4	G	32.4	1.8	1.39	G	0	29.7	17.1	4.7
912	UF25B	M	93.2	34.2	43.1	G	25.4	G	31.3	3.8	0.78	G	0	29.4	16.1	3.3
913	UF25C	M	69.8	27.4	20.9	G	25.9	G	30.5	1.9	1.21	G	0	28.1	10.4	3.7
914	UF25D	M	60	25	29.1	G	27.4	G	31.8	2.7	0.81	G	0	25.5	14	2.9
915	UF26A	E	60.8	29.6	27.3	P	22.6	P	26.5	1.7	1.15	P	1	24.8	12.9	4.1
916	UF26B	E	64	26.7	28.2	G	19.4	P	21.8	1	1.2	P	1	19.3	13.3	2.6
917	BE01A	M	51.5	24.2	20.3	G	18	G	24	2.2	1.36	G	0	21.7	6.6	1.5
918	BE01B	M	68.2	30.9	33.2	G	17.2	G	22.1	1.9	1.29	G	0	22.8	8.6	5
919	BE01C	M	65.7	30.4	32.7	G	18.2	G	22.8	1.7	1.35	G	0	22	10.2	4.7
920	BE01D	M	65.3	31.3	36.4	G	18.8	G	23.1	2.2	0.98	P	1	23.3	9.4	5.5
921	BE02C	M	73.6	32.1	29.5	G	24.3	G	28.1	1.7	1.12	G	0	27.1	8.1	3.7
922	BE02D	M	76.4	32.8	22.3	G	24.8	G	31.9	3	1.18	G	0	30.6	6.2	1.6
923	BE03A	M	95.8	37.4	41.3	G	29.8	G	36.1	4.6	0.68	G	0	35.2	12.5	8.1
924	BE03B	M	107.6	36	27.8	G	32	P	39	4.3	0.81	G	1	35.9	14.3	4.8
925	BE03C	M	68.8	25	23.4	G	16.6	G	24.3	3.6	1.07	G	0	23.5	9.1	1.9
926	BE03D	M	51.8	22.8	21.3	G	17.2	P	23.1	2.8	1.05	P	1	20.4	11.4	4.3
927	BE04A	M	49.3	20.7	19.7	G	16.5	G	20.1	1.6	1.13	G	0	18.9	3.8	1.6
928	BE04B	M	47.2	23.2	19.5	G	16.9	G	20.6	1.3	1.42	G	0	20.6	2.4	1.8
929	BE04C	M	56.6	26.6	28.8	G	22.8	G	25.7	1.7	0.85	G	0	23.2	7.3	3.8
930	BE04D	M	83.4	28	35	G	27.3	G	31	2.1	0.88	G	0	28	14.8	2.9
931	BE05A	M	71.5	24.5	26.4	G	21.9	P	25.9	3.3	0.61	P	1	23.8	12.3	2.5
932	BE05B	M	66.9	25.5	21	G	22.3	G	26	1.6	1.16	G	0	24	7.6	2.8
933	BE05C	M	48	24.3	24.2	G	19.3	G	21.3	1	1	G	0	20.1	11.6	4.2
934	BE05D	M	54.3	30	25.1	G	19.9	P	27.6	1.9	2.03	P	1	25.9	9.2	0.5
935	BE06A	M	78.3	29.4	28.8	G	22.8	G	27	1.7	1.24	G	0	27.3	13.6	2.9
936	BE06B	M	77.8	35.1	35.9	G	24.5	G	29.6	2.4	1.06	G	0	28.5	10.3	8.2
937	BE06C	M	69.8	28.4	25	G	18.8	G	23.9	2.4	1.06	G	0	22	7.7	1.6
938	BE06D	M	71.7	24.9	26.9	G	19	G	26.6	3.1	1.23	G	0	22.1	8.5	2.5
939	BE07A	M	65.8	27.8	28	G	16	G	21.7	2.3	1.24	G	0	20.1	10.5	1.5
940	BE07B	M	65.3	28.8	27.2	G	17.9	G	22.7	1.6	1.5	G	0	22	7.3	2.8
941	BE07C	M	65.8	23.2	38.1	G	16.8	G	21.8	1.9	1.32	G	0	17.1	14	3.4
942	BE07D	M	85.1	26.8	40.2	G	12.6	G	17	1.1	2	G	0	14.3	7.9	1.5
943	BE08A	M	109.9	39.4	53.8	G	31.2	G	37.8	2.7	1.22	G	0	32.9	20.7	5.1
944	BE08B	M	126.6	35.5	67.9	G	25.3	G	29.6	3.6	0.6	G	0	29.4	17.2	3.2
945	BE08C	M	113	28.3	45.7	G	17	G	21.9	2.3	1.07	G	0	21.1	13.3	3.1
946	BE08D	M	42.5	30.6	12.3	G	26.3	G	29.5	1.7	0.94	G	0	29.3	5.6	3
947	BE09A	M	50	24.4	35.8	G	17.8	G	27	1.8	2.56	G	0	22.5	13.8	4.9
948	BE09B	M	64	35.9	44.7	G	28.7	G	38.1	4.1	1.15	G	0	33.2	21	4
949	BE10A	M	104.2	30.4	27.5	G	27.3	G	34.5	4.5	0.8	G	0	31.3	14.1	3.8
950	BE10B	M	97.9	33.6	33.6	G	31.2	G	38.9	4.5	0.86	G	0	33.8	17.4	1.5
951	BE10C	M	68.2	24.6	23.3	G	24	G	27.1	1.4	1.11	G	0	22.4	9.1	4.8
952	BE10D	M	66.3	29.2	27.6	G	23	G	26.1	2.3	0.67	G	0	25.8	12.4	5.7
953	BE11A	M	78.9	31.8	29.4	G	20.9	G	29	3.6	1.13	G	0	28.9	11.5	1.4
954	BE11B	M	71.4	31.4	33.9	G	22.9	G	30.4	4.6	0.82	G	0	29.5	12.8	3.4
955	BE11C	M	77.6	28.5	26.4	G	25	P	27	2.4	0.42	P	1	26.7	8	3.1
956	BE11D	M	65.1	34.5	25.1	G	23.7	G	33	3.1	1.5	G	0	32.4	9.7	3.5
957	BE12A	M	112.5	35.6	31.3	G	32.6	G	38	2.8	0.96	G	0	34.2	10.9	3.1
958	BE12B	M	95.9	36.5	43.5	G	25.5	P	31.4	2.7	1.09	P	1	31.8	11.5	4.7
959	BE12C	M	95.1	35.7	42.2	G	23.4	G	29.1	2.8	1.02	G	0	29	12.5	2.9
960	BE12D	M	122.7	34.9	66.3	G	29	G	34	2.1	1.19	G	0	29.7	17.4	5.7
961	BE13A	M	56.4	22.9	21.5	G	19.1	G	25.4	1.9	1.66	G	0	22.6	10	4.1
962	BE13B	M	67.5	24.2	29.4	G	25.9	G	30.4	3.3	0.68	G	0	25	14.8	9
963	BE13C	M	70.5	27.5	34.2	G	21.6	G	24.4	1.9	0.74	G	0	22.8	10	5.5
965	BE14A	M	60.4	29.9	23.9	G	30.6	G	36	3.6	0.75	G	0	30.9	11.5	5.9
966	BE14B	M	74.5	34.2	35.9	G	28.4	G	32.1	2.3	0.8	G	0	31.3	10.3	8.1
967	BE14C	M	80.5	35	40	G	24.4	G	30.8	2.1	1.52	G	0	28.2	11.7	3.9
968	BE14D	M	76	33.2	35	G	30.3	G	34.4	1.7	1.21	G	0	30	17	6.2

969	BE15A	M	95	33.3	44.1	G	26.7	G	32.8	3	1.02	G	0	30.5	16.5	3.4
970	BE15B	M	76.7	30.3	20.4	G	23.4	G	28.5	2.4	1.06	G	0	27.9	10.7	2.7
971	BE15C	M	74.7	34	37	P	20	P	24	2.5	0.8	P	1	23.4	10	5.6
972	BE15D	M	75.8	28.6	31.4	G	20.4	G	25.8	2.5	1.08	G	0	24.2	7.7	4.1
973	BE16A	M	96.6	27.9	34.5	G	20	S	22.6	1.3	1	G	0	17.8	14.6	3.5
974	BE16B	E	92.5	34	28	G	27.8	G	34	2.4	1.29	G	0	32.8	13.4	8.1
975	BE16C	M	87.6	35.6	22.4	G	27.8	G	36.3	4	1.06	G	0	34.5	12.5	3.1
976	BE16D	E	57.4	24.9	24	P	18	P	22.8	3.5	0.69	P	2	23.7	10.5	5.4
977	BE17A	E	52.4	25.1	23.1	G	16.8	P	20.5	1.6	1.16	P	1	20.2	8.3	2
978	BE17B	E	100.7	30.9	40.2	G	23.3	G	28.7	5.1	0.53	G	0	29.9	13.4	5.3
979	BE17C	E	63	24.3	32.3	G	16.6	G	19	0.8	1.5	G	0	18.3	7.2	5.7
980	BE17D	M	66.5	33.7	28.5	G	30.4	G	36	2.7	1.04	G	0	32.2	16.2	5
981	BE18A	M	35	30	35	P	26	P	37	4.5	1.22	P	1	34.2	10.5	4.3
982	BE18B	M	38	28	38	P	29.2	P	34	4	0.6	P	1	30.3	16.5	6.2
983	BE18C	M	62	37.5	36.9	G	23.8	G	27.8	2.2	0.91	G	0	28.8	12	6.3
984	BE18D	M	37.2	31.9	33.4	G	25.3	G	29.6	3.2	0.67	G	0	28	10.4	4.6
985	BE19A	M	40.8	30.8	37.5	G	19.7	G	24.7	1.2	2.08	G	0	23.7	8.9	5
986	BE19B	M	26.5	34.2	26	P	26.5	P	36	2.7	1.76	P	1	31	13	6
987	BE19C	M	45.3	21.9	13.5	G	15.6	G	25.1	3.6	1.32	G	0	22.3	10.7	4.7
988	BE19D	M	61.8	22.4	21.5	G	18	P	22.7	1.4	1.68	P	1	22.2	6.8	3
989	BE20A	M	34	29.5	30	P	28.7	G	33.5	1.5	1.6	G	0	30.2	8.7	3.7
990	BE20B	M	37	30.9	36	P	21.8	G	27.7	2.7	1.09	G	0	26.1	6.5	2.9
991	BE20C	M	26	29.9	23	P	21.3	G	26.3	1.9	1.32	G	0	26	9.7	5.3
992	BE20D	M	37	30.7	16	P	26.2	G	31.5	1.6	1.66	G	0	29.7	6.3	3.5
993	BE21A	M	51	29.7	15	P	28.4	G	32.7	1.9	1.13	G	0	28.8	7.9	2.5
994	BE21B	M	33.5	28.4	31	P	28.7	P	34.6	2.3	1.28	P	1	29.8	14.2	5.3
995	BE21C	M	65.4	30.7	43.5	G	31.8	G	35.8	1.9	1.05	G	0	32.8	12.4	3.8
996	BE21D	M	31	30.7	24.7	P	29.7	G	33.8	1.7	1.21	G	0	29.6	9.3	7.7
997	BE22A	M	43.5	37.6	29.2	P	29.7	G	36.3	4.7	0.7	G	0	34.6	12.9	5.9
998	BE22B	M	28	28.1	28	P	19	P	25	3	1	P	1	24.9	11	5.1
999	BE22C	M	36	30.6	30	P	21	P	30	2	2.25	P	1	25.7	10.3	7.1
1000	BE22D	M	48.5	34.7	25.5	P	28.8	G	33.5	2.8	0.84	G	0	31	17	4.8
1001	BE23A	M	40	37	30	P	27.6	G	32.8	1.8	1.44	G	0	31.7	16.1	5.9
1002	BE23B	M	57	42.7	38.4	G	16.7	G	22.6	1.8	1.64	G	0	21.8	3.9	4.9
1003	BE24A	M	31.5	31.2	14.2	P	25.9	G	32.8	2.5	1.38	G	0	29.8	7.6	3.4
1004	BE24B	M	22	27	21	P	22.4	G	29	3	1.1	G	0	24	9	1.5
1005	BE25A	M	40	33.4	23.6	P	26.3	G	33.9	3.5	1.09	G	0	33.3	7.8	1.5
1006	BE25B	M	37	34	22	P	24	P	36	6	1	P	1	34.4	13	5
1007	BE25C	M	32	32	27.6	P	25	P	31.6	3.8	0.87	P	1	31.8	11.6	3.3
1008	BE25D	M	65	33	24.2	P	32.2	P	38.4	4.3	0.72	P	1	33.5	21.1	4.9
1014	BE27B	M	69	31	49.2	P	25	G	30.3	3	0.88	G	0	28	19.9	3.8
1020	BE28D	M	57.1	38	36.7	G	20	G	26.3	1.9	1.66	G	0	27.4	9.5	4.1
1021	BE29A	M	66	40.9	51.1	P	32.8	G	40.2	2.7	1.37	G	0	36.6	14.1	2.6
1024	BE29D	M	70	39.1	56	P	28.5	G	37	4	1.06	G	0	33.2	16.9	3.2
1026	BE30C	M	43	30.4	16.9	G	28.1	G	31.7	1.7	1.06	G	0	29.2	10.2	3.9
1027	FF01A	L	53	31.8	16.3	G	21.2	G	29.6	6	0.7	G	0	24.8	11	1.6
1028	FF01B	L	60.4	35.3	17.7	G	26.4	G	34.7	4.6	0.9	G	0	25.3	10.5	2.3
1029	FF01C	L	44.2	24.8	12.7	G	19.2	G	25.8	3.7	0.89	G	0	20.5	8.9	0.5
1030	FF01D	L	39.7	25.5	11.1	G	18.4	G	28.5	3.5	1.44	G	0	22.5	8	1
1031	FF02A	L	47.2	26.1	14	G	17.1	G	26.1	5.1	0.88	G	0	19.7	9.7	3
1032	FF02B	L	50	26.9	15.1	G	19.5	G	28.1	5.4	0.8	G	0	21.9	10.3	1.9
1033	FF02C	L	67.1	32.1	28.5	G	14	G	23	3.2	1.41	G	0	18.1	9.1	0.3
1034	FF02D	L	57	27.3	16.4	G	19.6	G	26.3	3.6	0.93	G	0	21.8	9.2	0
1035	FF03A	M	63.5	20	28.5	G	18.9	G	25.1	1.7	1.82	G	0	20	18	5.6
1036	FF03B	M	56.8	26.3	11.3	G	19.9	G	26.7	4.2	0.81	G	0	25.5	7.6	4.4
1037	FF03C	M	51	25.1	13.3	G	25	G	27.4	1.7	0.71	G	0	25.7	5.1	2.9
1038	FF03D	M	55.2	27.8	13.6	G	23.5	G	27.8	1.3	1.65	G	0	27.2	4.1	0.9
1039	FF04A	M	40	43.6	25.2	P	28.8	G	36.2	3	1.23	G	0	33	15.8	3.6
1040	FF04B	M	44	38.4	42.4	P	31.6	G	38.3	3.6	0.93	G	0	34.9	20.3	7.4
1041	FF04C	M	30	34.6	18.2	P	28.9	G	34.9	2	1.5	G	0	33.8	8.3	7.5
1042	FF04D	M	49.3	29.1	23.5	P	21.1	G	31.2	2.5	2.02	G	0	27.6	12.8	5.5
1043	FF05A	M	115.3	29.7	35	G	29.6	G	30.7	1.3	0.42	G	0	29.5	16.9	3.8

1044	FF05B	M	59.5	32.6	18	G	28.6	G	34.2	2.3	1.22	G	0	31.8	11.9	5.9
1045	FF05C	M	74.6	26.5	28	G	18.5	G	25.6	2.3	1.54	G	0	23.9	12	2
1046	FF05D	M	76.8	26.6	14.2	G	21.8	G	25.7	1.5	1.3	G	0	25.7	4.9	4
1047	FF06A	M	80.7	26.8	17.3	G	21.9	G	27.5	2.2	1.27	G	0	25.2	9.2	2.6
1048	FF06B	M	50.3	28.7	12.5	G	23.7	G	28.8	1.7	1.5	G	0	27	6.8	2.8
1049	FF06C	M	54.6	28.1	17.1	G	22	G	25.2	1.5	1.07	G	0	25.9	3.7	2.3
1050	FF06D	M	55.2	25.2	15.5	G	23.7	G	27.4	1.3	1.42	G	0	24.4	10.4	2
1051	FF07A	M	57.9	27.4	11.6	G	25.1	G	30.2	2	1.28	G	0	28.4	6.4	3.1
1052	FF07B	M	63.8	29.7	34.2	G	19.5	G	23.6	1.7	1.21	G	0	24.5	10.1	4.1
1053	FF07C	M	41.6	29.2	13.2	P	26.2	G	30.3	2.2	0.93	P	1	28.6	7.9	3.4
1054	FF07D	M	36.2	24.1	11.1	G	21.6	G	25.3	1.4	1.32	G	0	23.5	6.1	2.1
1055	FF08A	M	76.2	28.4	25.2	G	23.3	G	27.3	2	1	G	0	26.1	15.2	4.8
1056	FF08B	M	67.4	29.4	33.4	G	14.2	G	16.2	1.2	0.83	P	1	15.8	7.5	4.1
1057	FF08C	M	90.5	35	28.9	G	31.2	G	37.1	2.2	1.34	G	0	34.4	11.1	2.7
1058	FF08D	M	91.4	32.5	43.6	G	21.8	G	28.4	1.7	1.94	P	1	24.6	10.5	3.3
1059	FF09A	M	105.8	38.8	48.5	G	27.2	P	37	4.1	1.2	P	1	34.3	20	6.4
1060	FF09B	M	103.8	36.8	39.6	G	30.4	G	36.4	2.9	1.03	G	0	34.6	11.1	4.2
1061	FF09C	M	99.5	33.2	34.3	G	22.9	G	27.9	1.8	1.39	G	0	27.3	4.7	3.5
1062	FF09D	L	76.2	28.4	14.4	G	22.1	G	29.9	2	1.95	G	0	25.7	8.3	8.2
1063	FF10A	M	76.4	34.2	25	G	31.3	G	36.4	1.9	1.34	G	0	34	12.5	3.7
1064	FF10B	M	51.3	21.6	24	G	18.7	G	21.2	0.9	1.39	G	0	19.4	12.3	2
1065	FF10C	M	65.5	31.1	20.4	G	25.6	G	32.3	3.4	0.99	G	0	33	14.8	9.4
1066	FF10D	M	76	29.7	35.2	G	15.9	P	22.4	2.2	1.48	P	1	23.3	11.3	3.3
1067	FF11A	E	69	34	36.5	G	23	G	28.8	2.6	1.12	G	0	28.1	11.4	3.6
1068	FF11B	E	103.3	37.9	45.3	G	25.9	G	28.9	3.1	0.48	P	1	29.5	11.2	3.5
1069	FF11C	E	55.4	28.1	27.5	G	20.7	G	25.1	1.7	1.29	G	0	24.6	9.7	5.3
1070	FF11D	M	56	23.5	24.6	G	17.3	G	20.7	1.7	1	G	0	21.1	7.1	1.5
1071	FF12A	M	66.4	30.1	30	G	17.6	G	24.6	2.5	1.4	G	0	23.4	9.3	1.4
1072	FF12B	M	71	25	23.4	G	22.2	G	27.9	2.1	1.36	G	0	25	10	3.6
1073	FF12C	M	57.7	30.3	28.4	G	14.4	G	21	2.1	1.57	G	0	19.9	5	0.8
1074	FF12D	E	78.6	34.1	31.1	G	23.4	G	30.9	3.1	1.21	G	0	30.8	8.7	3.1
1075	FF13A	M	58.8	25.7	27.6	G	14.2	G	20.1	2.6	1.13	G	0	20.4	4.4	2.2
1076	FF13B	M	62.5	29.5	29.6	G	18.1	G	22.4	2.5	0.86	G	0	19.1	10.3	3.8
1077	FF13C	M	75.1	33.1	39.3	G	21.5	G	28.4	1.8	1.92	G	0	26.3	11.9	3.7
1078	FF13D	M	66.7	27.5	16.6	G	24.5	G	27.9	5.3	0.32	G	0	27.1	8.9	4.8
1079	FF14A	L	55.2	26.6	14.8	G	22.4	G	29.4	4	0.88	G	0	23.1	10.5	2
1080	FF14B	L	61	25.8	13.4	G	21.3	G	26.8	3	0.92	G	0	21.9	8.5	1.5
1081	FF14C	L	65.9	30.9	16.5	G	22.8	G	29.6	3.4	1	G	0	26.1	10	0
1082	FF14D	L	59.8	30.6	15.7	G	23.6	G	33.2	4	1.2	G	0	26.7	11.8	2
1083	FF15A	L	52.7	28	11.4	G	21.7	G	28.4	2.8	1.2	G	0	24.3	7.6	2.6
1084	FF15B	L	61	29.9	16.3	G	23	G	33.4	4.2	1.24	G	0	24.8	9.7	3.5
1085	FF15C	L	59.1	29.1	14	G	24.7	G	31.6	3.3	1.05	G	0	27.5	8.4	1.1
1086	FF15D	L	45.3	27.1	14.3	G	22.8	G	28.6	3	0.97	G	0	24.6	8.5	0.5
1087	JW03A	M	28	23	12.5	P	20.9	P	24.3	1.5	1.13	P	1	22	8.9	3.6
1088	TG36D	M	64.4	28.3	17.2	G	22.7	G	28.6	2.8	1.05	G	0	25.6	8.6	3.8

LA	LI	QLA	RA	RI	QRA	GL	GR	REWORK	Tip	FLen1	FLen2	T10	T20	T30	T40	T50	T60	T70
28.7	2.3	G	30.6	2	G	21	30	N	R	0	0	5.6	6.8	7.3	6.1	5.3	4.8	5.2
28.2	2.8	G	24.7	2.3	G	26	28	Y	P	0	0	4.9	7	7.2	7	5.5	4.7	5.6
45	2.9	G	46.4	2.5	G	48	37	U	B	0	0	8.1	9	9.3	7.9	6.4	0	0
24.3	1.4	G	21.7	1.9	G	31	19	U	P	0	0	5.4	7.6	6.4	6.7	5.7	6.5	0
21.5	0.9	G	24.5	1.5	G	36	22	U	P	0	0	6.1	6.6	7	6.3	6.4	5.8	0
11.1	0.7	G	17.4	1	G	0	22	Y	P	0	0	5.7	5.2	4.4	3.6	0	0	0
36.2	2	G	34	2	G	28	32	N	P	0	0	6	5	3.9	5.5	5.2	3.2	3.2
46.2	2.3	G	30.9	1.6	G	25	27	U	P	12.9	0	5.2	6.9	6.8	6.7	6.8	7.1	7.1
26.1	1.9	G	21.6	2.1	G	18	22	Y	P	0	0	5.9	6.3	6.3	5.6	3.9	0	0
26	1.1	G	18.1	1.7	G	27	0	Y	P	0	0	4.9	6	5.6	5.6	4.9	3.8	0
24.1	2.1	G	27.4	1.5	G	31	32	N	P	0	0	6.1	7.8	8.3	7.8	7.3	6.6	7.1
29.5	1.5	G	27.2	2.2	G	31	30	N	P	0	0	6.3	7.4	7.6	8	8.6	7.7	6.1
29.2	1.9	G	33.9	1.7	G	33	31	N	P	0	0	7.4	7.3	7.6	7.3	6.7	6.1	5.8
29	1.4	G	28.3	1.9	G	25	27	N	P	0	0	5.2	5.8	7.1	8	7.6	7	4.2
24.1	1.5	G	23.8	1.4	G	27	28	N	P	23.5	0	5.2	6.3	7.8	6.3	6.1	4.3	0
19.3	1.6	G	18.5	1.8	P	22	24	N	R	0	0	3.8	5.2	6	5.4	1.3	0	0
31.3	1.5	G	28.1	1.3	G	26	27	N	P	26.1	0	4	6.2	7.3	7.6	8.1	6.7	5.4
33.4	2.2	G	28.4	2.3	G	25	28	U	P	0	0	6.4	6.3	6.2	5.2	3.3	0	0
42.1	1	G	29.8	1.2	G	36	33	Y	P	0	0	7.3	7.9	8.2	8.3	8.4	8.5	8.2
27.1	1.1	P	23.1	0.6	P	27	25	Y	B	0	0	5.3	6.9	7.7	6.5	0	0	0
22.4	0.9	G	25.7	0.3	P	23	26	Y	B	0	0	5.8	8.3	6.5	0	0	0	0
17.2	1.5	G	18.7	1.5	G	23	22	U	R	0	0	3.4	4	4.4	4.9	2.8	0	0
34	3	G	34.7	2.8	G	24	28	Y	P	0	0	5	6.8	7.4	7.5	8.9	6.6	6.4
21.1	1.2	G	16.7	1	G	22	30	Y	P	0	0	5.6	7.5	7.5	8.3	8.2	8.6	7.7
26.3	1	G	24	1.4	P	22	26	U	P	0	0	5.9	7.4	7.5	6.8	6.3	0	0
22.6	1	G	26.5	1.1	P	27	28	Y	P	0	0	5.3	6.1	5.7	5.8	4.6	0	0
14.7	1.2	G	16.3	1	P	15	15	Y	P	0	0	6	6	6	6.3	5.4	3.3	0
18.4	1	G	11.8	1	P	26	23	Y	P	0	0	6.8	6.5	6.2	6.7	5.6	2.8	0
19.2	0.6	P	20.9	2	G	29	32	U	R	0	0	5.6	7.7	7.6	7.1	7.1	3.1	0
25.2	1.3	G	19.1	1.8	G	19	17	U	R	0	0	6.2	6.3	6	6.8	6.6	6	5.8
26	3.6	G	25.5	3	G	25	26	U	B	0	0	3.6	5.9	5.5	6.3	5.3	0	0
18.7	1.1	G	25.9	1.5	G	20	21	Y	P	0	0	4.7	5.4	4.7	3.7	0	0	0
21.3	1.6	G	18.3	1.8	P	21	23	U	R	0	0	3.8	5.5	6.2	5.3	2.5	0	0
17.8	1.3	G	15.4	1.1	G	19	20	Y	R	0	0	5	6.1	5	2	0	0	0
22.4	1.3	G	20	1.2	G	25	25	Y	R	13.6	0	4.5	5	5.6	7.1	5.8	2.9	0
28.4	2.5	G	24.8	2.3	G	29	28	N	P	0	0	6.1	6.5	6.3	5.9	6.8	6.1	4.5
29.1	2.1	G	24.6	2.5	G	29	32	Y	P	0	0	4.9	6	6.8	5.6	4	0	0
28.5	2.1	G	30.7	2	G	32	26	Y	B	0	0	5.7	6.8	6.8	8.4	8.2	8.5	8.9
24.5	0.1	P	31.7	1.3	G	20	30	U	R	0	0	5.8	5.3	5.4	5	4.9	4	0
43.2	2.5	G	28.1	1.2	G	20	32	Y	B	0	0	5.9	6.2	8.4	10	11	11	10
0	1	G	0	1	G	37	36	U	B	0	0	6.7	7.1	7.9	7.9	0	0	0
54.9	4.6	G	36.8	3.1	P	40	30	U	B	0	0	6	6.9	6.9	7.1	0	0	0
35.6	2.5	G	40.5	2.8	P	20	17	U	B	0	0	4.9	7.8	7.8	9.3	10.1	10	0
24	2.1	G	20.5	2.1	G	26	23	U	B	0	0	6.9	8.4	8.6	9.3	8.3	7.1	0
0	1	G	0	1	G	37	40	U	B	0	0	6.2	7.2	7.2	7.2	7.3	7.2	0
34.4	1.9	G	14.9	1.6	G	0	17	U	P	0	0	5.5	7.4	6.1	3.6	4.1	4.1	3.8
22	0.8	G	25.2	0.7	P	27	28	Y	P	0	0	7.3	7.3	6.9	6.2	6.8	7	6.8
9.7	0.6	G	15.5	0.9	P	27	22	U	P	0	0	5.8	6.7	7.1	6.6	6.2	5.7	5.3
28.3	2.2	G	27.3	1.7	G	20	20	Y	R	15.2	0	8.5	8.8	8	8.4	8.5	7	5.3
0	1	P	0	1	G	21	24	Y	B	0	0	6.5	6.4	7.7	6.1	5.6	3.5	0
12.7	0.3	G	9.2	1.3	G	9	11	Y	P	0	0	5.7	6.6	8.9	7.3	3.7	0	0
14.6	0.5	G	0	1	P	0	9	Y	P	0	0	5.6	8.3	7.5	6.4	4	0	0
22.8	1.1	G	19.9	1.2	G	25	25	Y	B	12	0	4.7	5.4	4.9	4	0	0	0
0	1	P	0	1	G	27	25	U	P	0	0	5.8	4.7	4.3	3.5	3.5	0	0
20.9	1	G	27.8	0.8	P	28	26	Y	P	0	0	6.5	6.4	6	5.7	5.1	2.5	0
18.4	0.8	G	18.4	1.1	P	24	21	Y	P	0	0	4.4	4.7	5.2	5.5	2.1	0	0
23.8	1.2	G	14.9	1	G	24	22	Y	P	0	0	6.7	7.2	6.9	7.5	3.5	0	0
22.5	1	G	18.7	0.9	G	27	30	Y	P	0	0	6	5.6	5.6	5.3	5.2	3.6	0
31.8	1.6	G	31.8	1.8	G	32	31	Y	P	0	0	5	5.3	5.5	5.4	5	4.1	0
25	1.2	G	18.7	1.1	G	20	30	U	P	16	0	7.5	6.5	5.6	5.8	5.9	0	0
29.9	1.8	G	23.3	1.7	G	27	21	U	R	27	0	6	6.7	7.2	5.6	5.9	3.8	0

18.4	0.5	P	18.4	0.4	G	30.5	20	U	P	16.4	0	6.1	6.1	6.4	6.2	4.9	4.7	2.7
32.3	1.8	G	28.1	1.9	G	35	30	Y	P	0	0	6.4	7.1	8.3	7	4	0	0
25.3	1	G	22.7	1.1	G	33	38	U	P	0	0	3.5	4.4	4.3	4	4.2	2.5	0
18.6	0.9	G	17.9	0.6	P	21	20	Y	P	0	0	6.1	6.7	6.5	4.9	0	0	0
17.7	0.6	G	16.4	0.6	G	29	34	U	P	0	0	6.1	7.3	6.8	7.2	6.1	3.7	0
24.1	2.4	G	21.9	2.7	G	25	34	N	P	21.2	0	6	6.3	7	6.7	6	5.3	0
21.1	1.4	G	19.6	1.3	G	24	24	U	P	21.3	0	4.7	6	6.5	6	4	2.3	0
27.3	1.6	G	25.2	1.3	P	23	28	Y	P	0	0	4.7	6.3	5.9	4.9	3.3	0	0
0	1	G	0	1	G	0	81	Y	P	0	0	5.4	6	8.5	8.8	8.8	7.6	6.9
36.2	1	G	0	1	G	0	48	U	B	27.6	19.7	5.7	6.8	6.8	7	0	0	0
35.3	2.2	G	28.4	2.4	G	40	29	U	R	12.3	11.8	3.7	5.9	6.4	6.5	6.5	6.5	4.6
24.9	1.1	G	26.6	1.6	G	28	25	N	R	23.4	17.8	5.3	8	9	8.6	7.5	4.3	0
22.4	0.8	G	15	0.6	P	22	22	U	R	0	0	4.6	5.5	5.9	4.4	0	0	0
27.8	2.7	G	24.9	2.5	G	28	27	Y	P	0	0	4.7	5.5	5.6	5.3	5.6	5.9	3.1
30.5	3.4	G	27.6	3.2	G	29	28	N	P	0	0	6.2	6.9	6.9	7.2	8.9	7.1	5.2
16.9	0.8	G	19	0.6	P	26	20	U	P	0	0	5.4	4.8	6.4	6.5	4.2	0	0
20.3	1.3	P	26.3	1	P	26	22	Y	B	0	0	6	7	7.4	7.2	6.7	0	0
24.9	1.9	P	22.8	0.8	P	27	32	Y	B	0	0	7.2	8.8	8.3	5.4	0	0	0
16.5	1.3	G	13.2	1.6	G	17	16	Y	B	0	0	5.6	5.6	5.8	6	0	0	0
42.3	3.6	G	24.7	1.9	P	30	28	U	B	0	0	11.6	10	7.9	7.9	6.5	4.5	2.6
0	1	G	0	1	G	21	20	U	R	15.4	0	4.9	5.9	5.5	4.7	1.6	0	0
34.8	1	G	25	1.1	P	36	35	U	P	0	0	4.9	5.1	6.3	6	5.9	5.1	4.4
0	1	G	0	1	P	14	10	U	P	0	0	5.4	5.3	5.3	4.8	4.8	3	0
18.2	0.9	G	17.4	0.8	G	23	22	Y	P	0	0	6.4	7	7.3	7	6.9	6.7	5.2
33	2	P	30.2	2	G	21	30	Y	P	0	0	6.9	6.9	7.4	6.6	6.7	5.6	4.8
51.1	1.1	G	36.1	1.9	P	32	39	N	P	0	0	6	7	7	6	6	6	6
28.5	1.8	G	25	2	P	18	29	U	R	0	0	4.3	4.7	5	4.8	3.8	2.9	0
18.1	1.3	G	18.4	1	G	19	20	U	B	0	0	5.1	6.1	6	5.9	4.6	3.4	0
40.3	1.8	G	38	2	P	25	34	Y	P	0	0	5.1	6.5	6.8	7.1	7.5	5.2	0
30	1	P	34	1	P	25	27	N	R	21	0	4.2	6.3	7.6	8.3	7.6	5.6	3.2
35	1.5	P	32.7	1.9	G	28	24	N	P	0	0	5.6	6.2	5.1	5.4	3.8	4.2	4.9
30	1	P	24	1	P	26	30	N	P	0	0	3.8	6.3	6.4	5.6	5	4.3	3.2
25.8	1	G	21.8	1.1	G	34	22	Y	B	0	0	5.7	8	8.6	8.6	6.8	6.1	0
45	2	P	40	2	P	30	36	U	P	0	0	7.5	8.7	7.5	8.9	8.7	8.3	5.9
10.5	1.3	G	11.3	1.3	G	0	13	Y	R	0	0	5.4	5.6	5.5	5.1	5.7	3	0
15.4	0.8	G	15.3	0.9	G	15	14	Y	P	0	0	5.3	7.6	5.5	5.6	5.6	4.4	0
15.6	1.4	G	23.6	1.8	G	23	29	U	P	0	0	5.5	6.8	5.9	7.3	7	4.7	4.5
19.3	0.6	G	23.4	0.7	G	27	18	U	R	11.8	0	6	7.3	6	4	0	0	0
29.6	2.1	G	26.3	1.3	G	21	30	N	P	0	0	9.4	9.3	9.8	9.1	8.4	8.1	7.6
17.6	1.7	G	26.6	1.7	G	26	17	N	B	0	0	5.5	5.2	5.3	6.3	0	0	0
31	0.8	P	23.2	1.8	G	28	37	Y	B	14.4	0	4.5	4.5	4.5	0	0	0	0
18.3	0.8	P	13.9	0.6	P	26	31	Y	B	0	0	5.5	5.5	6	0	0	0	0
34	1.5	P	36.9	1.3	P	44	24	Y	B	0	0	6.4	8.7	8.3	8.5	0	0	0
30.4	1.9	G	34	1.9	G	36	41	U	B	0	0	7.3	9.2	8.6	9	0	0	0
25.8	1	G	15.9	1.6	G	28	24	Y	P	0	0	4	6.2	5.9	6.9	6.8	5	0
16.9	1.9	P	11.6	1.2	P	22	0	U	B	0	0	5.8	7.6	0	0	0	0	0
25	1.4	G	24.4	2	G	33	27	Y	P	0	0	5.2	6.4	7.8	8.9	7.8	4.9	0
21	0.8	P	24	0.8	P	29	27	U	B	0	0	6.6	6.3	0	0	0	0	0
9.7	1.5	G	8.6	1.1	P	12	14	Y	P	0	0	4.7	6.3	6.4	5.7	0	0	0
0	1	G	0	1	G	52	50	U	B	0	0	5.5	5.9	6.9	6.5	8.2	0	0
21.8	0.9	P	0	1	P	28	27	U	B	0	0	6.4	8.3	7.7	0	0	0	0
17.9	4.1	P	13.1	0.5	P	23	24	U	B	0	0	7.6	8.7	7.9	0	0	0	0
39	1	P	37.8	2.8	G	48	51	Y	B	0	0	5.8	6.9	6.9	7.6	7.4	7.6	0
44	2.5	P	37.9	2.8	G	37	25	N	P	0	0	7	7.6	7.9	7.6	7.7	7.1	5.7
33.5	1	G	29.6	1.1	G	35	36	Y	P	0	0	5.5	6.7	7.5	7.2	5.2	3	0
26.5	1.5	G	21.7	1.2	G	45	47	Y	P	0	0	6.4	6.5	6.7	6.6	5.8	5.2	4.3
24.3	2.8	P	19.4	1.4	P	20	20	Y	P	0	0	6.8	7.9	6.8	6.4	5.8	3.7	0
8.9	1.4	G	9	1.6	G	10	10	Y	P	0	0	4.7	4.7	3.7	0	0	0	0
12.1	0.6	P	13.9	0.8	P	16	16	U	B	11.2	0	4.2	0	0	0	0	0	0
16.2	2	P	20.8	2.8	P	12	15	U	B	0	0	4.4	0	0	0	0	0	0
17.2	1	P	16	1.6	P	13	15	Y	R	0	0	6	6	6	5.4	5.2	5.6	6
15.4	0.9	G	14.7	0.9	G	16	17	Y	P	0	0	4.8	6.1	5.1	4.2	0	0	0

9.2	1.1	G	9.1	0.5	P	13	13	Y	P	0	0	6.3	6.1	6.1	6.3	0	0	0
0	1	G	0	1	G	16	16	U	P	13	12	5.1	4.8	5.1	5.2	4.4	0	0
19.9	0.8	G	19.7	1.1	G	35	30	Y	P	0	0	5.7	6.5	5.6	5	5	3.7	0
33.7	1.4	G	30.2	1.4	G	31	33	Y	R	11	10	6.2	7.5	6.6	6.6	6.6	5.2	2.4
27.9	1.4	P	32	1.3	P	28	34	Y	R	11	0	6.9	6.5	6.2	6.3	7.8	6.4	4.4
6	1	P	8.2	1.4	G	11	0	Y	B	0	0	4.6	6.5	5.9	0	0	0	0
13.2	0.6	G	7.5	0.5	P	14	17	Y	P	0	0	5.4	6	5.9	3.5	0	0	0
9.4	1.3	P	10.5	1.7	G	15	13	Y	B	0	0	6.6	8.6	6.4	6.6	0	0	0
0	1	P	0	1	P	33	30	U	R	34	24	6	7.8	8.1	8.3	7.6	7.3	6.2
7.2	1.6	P	8.4	1.5	G	13	13	Y	P	0	0	6.4	6.8	6.9	6.8	0	0	0
30.2	1.5	G	28.3	1.4	G	32	34	Y	B	0	0	7.1	9.3	9.2	9.9	7.6	7.8	7
22	2.9	G	17.5	1.5	P	25	21	Y	P	0	0	6.5	7.3	8.3	9.3	7.7	4.4	4.5
17.9	1.4	G	15.3	1.3	G	30	33	Y	P	0	0	7.6	7	7.5	6.7	5.5	3	0
19.5	0.8	P	13.6	2.6	P	22	24	U	B	0	0	8.8	8.9	8	0	0	0	0
27.9	1.8	G	29.2	0.7	G	32	26	U	B	0	0	6.7	7.3	8.5	7.3	0	0	0
15.2	0.7	P	13.5	0.6	P	17	22	Y	B	0	0	7.1	8.1	8.2	0	0	0	0
25.1	0.8	P	20.2	1.1	G	21	23	U	B	0	0	0	0	0	0	0	0	0
27.2	1.8	G	22.5	1.7	G	19	23	Y	P	14	13	5.7	6.6	6.3	6.1	6.2	4.1	0
15.9	1.2	G	11.5	0.6	P	31	31	U	B	23	0	7.5	9.3	7.8	7.8	6.9	0	0
17.6	0.9	G	13.9	0.4	P	20	18	Y	P	0	0	6	5.9	5.1	5.5	5.3	4.6	0
14.9	0.9	G	19	0.6	G	25	20	Y	R	12	17	5.2	6.2	6.1	4.1	0	0	0
19.7	1	G	27	1	P	21	27	Y	P	0	0	7.1	7.6	7.1	6.8	6.1	2.6	0
30.7	1.7	G	35.8	2	G	31	32	Y	P	0	0	5.6	5.6	5.7	6	5.6	5.2	2.3
13.9	0.9	G	13.3	1	G	15	15	Y	P	0	0	4.8	5.2	3.7	4.6	0	0	0
0	1	G	0	1	G	21	18	Y	P	0	0	7.5	5.4	4.8	2.2	0	0	0
29	1.5	G	32.5	1.5	G	32	25	U	P	0	0	6	6.2	6.1	6.7	6.7	6.4	5.9
19.7	0.9	G	0	1	G	20	20	U	P	0	0	5.9	6.3	6.3	6.6	6.7	5.9	4.1
10	1	P	0	1	P	21	0	Y	P	0	0	8.9	7.5	5.9	3.9	0	0	0
26.2	0.4	G	24	0.6	G	32	29	U	R	22	25	5.9	6.3	7.9	8.4	7.4	5.2	0
33	1.2	G	30.8	1	G	42	35	U	R	14	0	4.9	6.6	6.2	5.9	5.1	5.4	5.6
24.4	3.2	G	24.8	3.1	G	28	30	Y	R	22	12	6.1	6.3	7.6	7.5	7.3	6.9	3.4
19.2	0.9	G	19.5	1.4	G	27	27	Y	P	16	0	4.9	5.5	5.4	5.6	4.9	0	0
21.8	1.5	G	23	1.9	G	21	25	U	R	16	21	5.2	6.1	6.5	6.4	6	6.7	4.8
23.2	1	G	31.2	1.4	G	37	35	U	R	14	21	5.7	7.4	7	7.3	6.4	3.8	0
25.9	1.7	G	25.3	1.9	G	28	27	U	R	21	20	4.9	5.9	6.4	6.1	5.9	5.2	2.4
28	1.4	G	22.9	1.6	G	20	18	U	PR	0	0	4.7	4.8	4.6	4.7	4.6	3.2	0
23.1	2.1	G	25.7	2	G	17	21	U	P	12	15	4.1	5.2	6	5.1	4.4	2.3	0
22.3	1.6	G	26.4	1.7	G	28	25	U	R	18	15	4.8	6.4	7.4	7.1	6.9	6.8	5.8
34.3	2.2	G	31	1.2	G	22	25	Y	R	0	0	7.1	6.3	7.3	6.8	5.9	4.9	2.2
27.1	2.1	G	41	2.2	G	28	25	Y	R	12	0	5.5	6.4	7.5	7.8	7.5	6.8	5.9
30.8	3.1	G	28.1	2.8	G	29	23	U	R	17	0	5.2	7.2	6.8	6.5	6.8	5.9	6
0	1	G	21.9	0.6	G	23	31	Y	P	0	0	6.4	7.1	7	7.1	6.2	5.2	4.6
24.8	1.3	G	22.7	1.5	G	23	22	U	P	0	0	5.2	5.2	5.3	5.8	5.8	5.3	3.2
0	1	G	34.3	0.6	G	20	20	Y	P	0	0	5.3	5.3	5.8	6	6.3	4.7	3.8
26.9	0.6	G	24.6	0.8	G	28	25	Y	R	20	19	5.7	6.7	7.6	7.7	5.9	3.9	0
0	1	G	18.8	0.8	G	27	32	Y	R	21	20	4.1	6.5	5.2	4.7	4.2	0	0
16	0.5	G	17	0.8	G	27	21	Y	R	15	0	4.5	5.8	5.9	6.7	4.8	0	0
21	7	G	25.6	0.9	G	33	29	U	R	24	11	5.2	6.7	7.7	5.9	5.9	4	0
11.8	1.2	G	11.7	0.7	G	14	14	Y	R	0	0	6.1	5.4	5.8	5.9	4.3	0	0
16.6	0.3	G	15	0.3	G	23	22	U	R	14	13	6.3	6.9	6	6.4	4	0	0
12.9	1.8	G	18.6	2.5	G	18	16	Y	P	12	0	5.6	7.4	6.2	6.8	6.7	5.5	0
23.2	1.6	G	23.4	1.4	G	18	18	U	PR	0	0	5.5	5.6	4.3	5.2	4.6	0	0
29.4	2.6	G	20	1.8	G	23	32	Y	PR	0	0	6.2	6.7	5.9	6.3	5.7	4.3	0
19.7	1.3	G	21.6	0.9	G	22	20	Y	PR	17	13	4.2	5.7	6	5.3	4.8	3.4	0
23.5	1.4	G	23.4	1.4	G	30	27	Y	P	17	9	5.9	6.8	6.5	5.3	3	0	0
0	1	G	0	1	G	18	0	U	P	12	11	6.3	6.5	6.2	5.4	2.4	0	0
22.4	0.4	G	0	1	G	24	0	Y	P	0	0	4.6	5.5	4.9	4.8	0	0	0
26.7	1.3	G	28.8	1.7	G	24	23	Y	R	13	12	6	5.8	6.1	6.4	5.2	0	0
23.9	1.5	G	29	1.9	G	34	30	Y	P	0	0	5.3	5.7	4.9	5.6	5.5	0	0
24.9	1.3	G	20.2	1.6	G	27	23	Y	R	14	11	4.9	6	5.7	6.3	4.9	0	0
27.5	2	G	20.5	2	G	18	24	Y	P	0	0	5.5	6.3	5.7	4.1	0	0	0
16.8	0.9	G	26.6	1.2	G	18	15	Y	PR	18	0	4.9	5.7	5.1	5.9	5.6	4.3	0

20.4	1.3	P	24	1.5	G	21	28	Y	PR	0	0	6.2	6.3	4.7	5.1	3.4	0	0
19.2	1.4	G	25.1	1.4	G	25	28	Y	R	21	0	5.4	7.6	8	7.8	7.9	5.8	0
26.5	1.6	G	22.2	1.6	G	27	32	Y	P	0	0	5.6	7.4	7.1	6.3	5.4	3.9	0
23.8	2.3	G	23.3	2.1	G	25	24	Y	PR	15	0	4.4	6.9	8.7	6.7	6.2	6.1	6
15.2	0.5	G	18.9	0.9	G	22	20	Y	PR	0	0	7.2	8.2	8.4	8.5	8.6	7.2	5.9
0	1	G	0	1	G	30	15	Y	R	10	4	4.7	5.4	5.1	4.5	3.7	3.6	0
32.2	1.1	G	30.1	1.4	P	32	40	Y	PR	6.6	6.7	6.5	6.8	7	6.7	5.9	5.7	4.6
18.5	0.6	G	37.7	1.4	G	26	25	Y	P	0	0	4.9	5.9	6.2	6.3	6.1	5.8	5
26	2.2	G	37.4	3.1	G	31	27	Y	P	0	0	6.4	5.6	6.9	7.1	6.4	6.4	4.9
22.3	1.8	G	25.4	2.3	G	18	22	Y	PR	0	0	5.5	7.2	7.2	6.5	5.8	5.6	4.2
36.1	1.9	G	33.3	1.9	G	22	20	Y	P	0	0	7	6.3	5.5	6.9	4.8	0	0
10.7	1	G	12.2	0.8	G	12	15	Y	P	0	0	4.7	4.5	4.2	0	0	0	0
19.7	1.9	G	20.3	1.6	G	22	21	Y	R	16	17	4.7	6.3	5.7	5.3	2.5	0	0
0	1	G	0	1	G	25	17	Y	P	0	0	7	8.8	6.4	3	0	0	0
21.9	1.4	P	24.5	2	G	25	24	U	R	0	0	6	8.1	7.2	6.2	4	0	0
13.1	0.9	G	15.1	0.8	G	22	30	Y	P	0	0	5.7	5.8	5.6	5.3	5.8	0	0
18	1.5	G	19	1.5	G	22	21	Y	P	0	0	6.4	6.9	7.9	5.8	0	0	0
20.4	1.4	G	17.8	1.3	G	23	23	Y	PR	0	0	6.2	7.4	7.3	5.3	0	0	0
20.6	0.4	G	21.1	0.8	G	26	26	Y	R	0	0	7	6.4	6.9	6.4	0	0	0
25.8	0.8	P	29.8	1	P	16	21	Y	PR	0	0	6.9	7.5	8	6.3	0	0	0
22.5	1.9	G	26.7	1.9	G	23	22	Y	PR	0	0	5.9	6	5.6	5.2	0	0	0
27.5	2.2	G	29.1	2.1	G	33	22	Y	P	0	0	6.3	6.2	6.1	6.8	5.2	0	0
23.9	1.1	P	26.7	1.9	G	21	20	Y	R	0	0	6.8	6.6	8.1	8.4	7.2	7.8	7.4
16.5	1.1	G	16.9	0.7	G	23	20	Y	P	0	0	7.4	8	7.3	7	6.2	6.2	3
25.5	2.2	G	23.6	0.4	G	33	32	Y	P	0	0	6.6	7.3	6.9	6.8	5.7	3.9	0
9.2	0.9	G	11.1	0.5	P	25	23	Y	P	0	0	7	7.6	7.2	7.1	6.1	4	0
27.8	1.6	G	28.6	2.3	G	31	28	Y	P	0	0	7	9	8.5	8.2	8.8	9.6	6
33.5	1.6	P	36.3	1.7	P	38	31	Y	P	0	0	6.5	7.5	8	8.1	7.9	6.5	6.6
38.8	3.3	G	40	2.4	G	23	30	Y	R	0	0	7	7.7	8.3	8.9	9.8	6.8	0
22.8	1	G	23.2	0.7	G	28	27	Y	P	0	0	7.8	7	7.1	7.4	5.7	0	0
0	1	G	0	1	G	26	31	Y	P	0	0	8.3	7.1	7.6	8	5.3	0	0
22.9	1.2	P	37.7	1.6	P	27	43	Y	P	0	0	6.6	7.7	8.2	7.3	6.5	6	4.9
25	1	G	27	0.9	P	35	25	Y	P	0	0	7.7	8.7	9.2	9.6	9	8	7.7
12.7	1	G	8	0.5	G	23	14	Y	P	38	24	6.7	8.8	9.7	9.6	8.5	5.9	0
20.1	1.1	G	14.6	1.1	G	20	23	Y	P	18	0	6.4	7.5	8.3	8.6	9	9.5	0
0	1	G	17.5	0.4	G	30	34	Y	R	0	0	6.4	7.1	7.7	0	0	0	0
0	1	G	0	1	G	24	22	Y	P	0	0	7.4	8.7	6.1	0	0	0	0
16.8	0.8	G	17.7	1.3	G	15	19	Y	R	0	0	5.1	4.8	2.1	0	0	0	0
13.9	1.2	P	14.4	0.6	G	12	16	Y	P	0	0	7.2	8.4	6.4	0	0	0	0
10.8	1.1	G	13.7	1.5	G	15	16	Y	P	0	0	7.9	7	4.4	0	0	0	0
18.7	1.3	G	18.5	1.1	G	21	21	Y	P	0	0	6.4	6.7	5.4	0	0	0	0
19.5	1	G	16.6	0.7	G	23	22	Y	P	0	0	6.7	7.1	5.6	5	4.2	0	0
16.5	1	P	0	1	P	15	23	Y	P	0	0	7.7	8.4	8.8	8.7	9.1	6.7	0
29.3	2.3	P	0	1	G	20	23	Y	R	0	0	6.2	7.4	6	6.4	5.2	0	0
0	1	G	0	1	G	10	12	Y	P	0	0	5.6	4.7	4.6	0	0	0	0
10.4	2.2	G	8.6	1.3	P	10	12	Y	P	0	0	7.1	6.3	0	0	0	0	0
10.3	1.3	G	9.1	0.7	P	16	19	Y	P	0	0	6.8	6.7	6.5	3.3	0	0	0
0	1	G	9.2	0.4	G	23	22	Y	P	0	0	7.5	7.6	7.8	5	0	0	0
0	1	P	18.2	0.6	G	18	10	Y	P	0	0	5.6	6.6	7.1	6.3	0	0	0
8	1.5	G	9.3	1.4	G	12	11	Y	P	0	0	8.3	7.7	7.1	6.2	0	0	0
16.7	1	G	19.7	0.9	G	16	19	Y	P	0	0	6	6.6	0	0	0	0	0
19.3	1	F	19.1	0.9	P	27	26	Y	P	14	13	5.9	6	5.2	5	0	0	0
9.9	1.4	G	19.4	1.2	P	14	14	Y	P	0	0	9.9	10.4	7.7	4.2	0	0	0
14	0.3	G	16	0.6	P	20	20	Y	X	0	0	3.6	4.3	4.3	3.8	0	0	0
0	1	G	0	1	G	17	0	Y	P	0	0	5.3	6.3	4.4	4.9	0	0	0
0	1	G	0	1	G	19	23	Y	P	0	0	4.9	5.7	5.9	4.3	0	0	0
33.4	3.5	G	28.7	1.9	G	31	38	U	P	0	0	7.4	8.9	9.9	8.9	10.3	0	0
3.1	1	G	18.1	1	P	20	20	Y	B	0	0	8.4	7.6	5.9	0	0	0	0
11	1	P	13.3	1.5	P	16	14	U	B	0	0	5.8	0	0	0	0	0	0
11.3	0.6	P	0	1	P	20	20	U	B	20	10	5.9	0	0	0	0	0	0
23.2	1.4	P	35	2	P	33	23	Y	R	0	0	5.8	6.3	5.7	5.1	5.2	4.4	0
0	1	P	13.7	1.1	G	14	18	U	P	0	0	5.7	5.8	6.7	6	6.3	5.9	4.8

21.2	1.4	G	18.5	1.3	G	30	23	Y	P	0	0	8.7	8.9	8.7	7.2	8.6	8.5	7
26.6	1.6	G	23.3	1	G	36	34	Y	P	0	0	7.5	9.8	9.5	8.6	8.8	8.2	6.2
21.5	1.5	G	22.5	1.8	G	27	26	Y	P	0	0	6.8	7.5	7.9	7.3	6	0	0
21.5	2.4	G	22.9	2.2	G	26	24	Y	P	17	0	6.9	8.4	6.9	6.1	6.2	5.5	0
18.6	0.7	G	0	1	G	25	20	Y	PR	0	0	6.9	7	6.9	6.1	0	0	0
14.3	0.8	G	10.7	0.9	G	18	17	Y	P	18	0	5.6	5.9	7.1	6.2	0	0	0
10.2	0.9	G	10.2	1.4	G	27	26	Y	P	0	0	6.8	7.5	7.9	7.3	6	0	0
0	1	G	0	1	G	26	24	Y	P	17	0	6.9	8.4	6.9	6.1	6.2	5.5	0
24.1	2.2	G	24.6	1.8	G	25	20	Y	P	0	0	6.9	7	6.9	6.1	0	0	0
28.1	1.6	G	25.9	2.2	G	18	17	Y	R	18	0	5.6	5.9	7.1	6.2	0	0	0
19.7	1.8	G	24	1.8	G	25	20	Y	PR	0	0	6.8	7.5	7.9	7.3	6	0	0
0	1	G	0	1	G	26	24	Y	P	17	0	6.9	8.4	6.9	6.1	6.2	5.5	0
20.9	1.4	G	18.7	1.7	G	25	20	Y	R	0	0	6.9	7	6.9	6.1	0	0	0
0	1	G	0	1	G	18	17	Y	X	18	0	5.6	5.9	7.1	6.2	0	0	0
0	1	P	33	1.7	G	37	11	Y	P	0	0	6.5	8.1	8.9	7.1	7.8	5.6	5.4
14.5	1.5	G	16.4	2	G	13	11	Y	P	0	0	11.8	11.3	8.4	0	0	0	0
13.3	1.5	G	7.9	1.2	G	12	15	Y	P	0	0	10.7	10.2	7.3	4.2	0	0	0
21.1	1.1	G	0	1	P	22	25	Y	R	0	0	6.9	6.9	6.9	6.1	0	0	0
28.2	1.1	P	0	1	P	28	21	U	B	0	0	6.5	6	0	0	0	0	0
20.5	0.6	G	21	1.5	P	23	22	Y	P	0	0	6.6	6.4	5.7	5.4	5.7	0	0
23.2	1	G	14	1	G	31	24	U	B	0	0	7	10	10.1	9.3	10	0	0
33.4	2.2	P	32.9	3.3	P	30	42	U	B	0	0	8	8.5	7.1	0	0	0	0
24	1.4	P	23.3	1.5	P	30	27	U	B	0	0	7.2	8	9.3	0	0	0	0
26.4	1.4	P	23.3	1.1	G	28	27	U	B	0	0	7	7.5	8.1	7.6	7.7	0	0
12.6	1.3	G	12.5	1	G	14	13	Y	R	0.9	0.6	6.8	6.8	6.4	0	0	0	0
22	1.5	G	21.7	1.4	G	31	29	U	B	0	0	6.1	8	8	0	0	0	0
24	0.4	G	0	1	G	28	26	Y	B	14	14	5.1	6.1	6.4	4.4	0	0	0
18.6	1	G	17.3	0.9	G	26	32	Y	B	0	0	5.9	6.7	7.8	8.3	7.4	0	0
22.5	0.9	P	26.8	2.1	P	22	10	U	B	0	0	6	6.7	6.8	0	0	0	0
32.9	2.5	G	31.4	1.8	G	41	40	Y	B	0	0	6.9	5.6	7.2	7.8	8.3	8.4	0
11	0.3	G	25	0.4	G	36	32	U	B	0	0	7.6	7.4	7.2	0	0	0	0
9.5	0.6	G	11	0.5	P	17	14	Y	B	0	0	6.2	6.1	6.4	0	0	0	0
19.9	1.9	G	23.1	1.6	G	22	22	Y	R	0	0	5.9	6.6	6.9	6.7	3.6	0	0
18.9	1.3	G	20.5	1.5	G	30	22	U	P	0	0	5.9	7	7	6.9	6.9	5	0
22.4	0.9	G	32.2	2	G	39	25	Y	P	0	0	7.4	7.9	8.4	7.5	8	7	7.8
0	1	G	16.6	1.8	P	21	18	Y	P	0	0	6.3	7.5	7.3	6.7	5.9	0	0
16.4	0.6	G	16.6	0.4	G	20	27	U	R	15	18	5.5	6.2	6.1	5.4	4.6	0	0
30.5	1.9	G	23.4	1.6	G	22	29	Y	P	0	0	6.2	6	4.9	4.8	3.6	0	0
20.5	1	G	23.7	1.3	G	32	30	U	R	16	0	7	8.4	7.3	7.5	4.5	0	0
19.4	2	G	16.3	1.5	G	23	22	Y	P	0	0	5.8	6.8	6.6	6.5	6.6	6.4	6.2
18.8	1.1	G	13.5	1.8	G	23	29	Y	P	0	0	6.7	7.5	7.6	7	5.9	4.6	2.9
51.4	1.7	G	55.9	1.3	G	22	0	Y	P	0	0	7.3	6.9	7.6	6.9	8.3	8.1	7.9
31.9	1.6	G	31.2	1.9	G	33	36	U	P	0	0	6.6	7.4	7.5	7.1	7	7.1	6.6
40.9	2.7	G	23.7	0.9	G	44	47	Y	P	13	16	4.9	6.2	6.8	7.4	7.4	8	6.4
17.5	0.9	G	19.4	1	G	30	35	Y	R	0	0	7.5	8.2	8.1	8	6.8	3.1	0
5.1	0.5	G	9.4	0.6	G	12	10	U	R	6	0	4.7	4.8	0	0	0	0	0
26	1.8	P	32.4	2.1	G	28	23	U	B	20	15	5.3	6.7	8.4	8	0	0	0
28.4	1.8	P	0	1	P	28	14	Y	B	0	0	6.6	7.1	6.2	0	0	0	0
27.3	1.4	G	40.3	2.5	P	28	26	Y	B	0	0	8.3	8.7	6.6	6.8	0	0	0
24.1	1.4	G	40.7	2.1	P	45	45	Y	B	0	0	7.4	8	6.9	7.2	0	0	0
13	1	G	18.4	1.2	G	22	48	Y	B	0	0	7.2	8	9.3	7.3	0	0	0
27	0.9	P	26	0.9	P	22	32	Y	P	0	0	5.7	5.8	5.2	4.7	5.4	4.8	0
24.5	1	G	30.7	1.4	P	31	35	U	B	0	0	8	8.1	0	0	0	0	0
0	1	G	0	1	P	13	0	Y	B	0	0	4.8	5.8	5.7	0	0	0	0
15.6	1.3	P	17.6	1.3	P	36	33	Y	B	0	0	6.4	6.4	6.2	6.8	6.3	5.8	4
31	1.7	G	18.4	1.2	P	37	30	Y	B	13	0	6.2	6	5.8	8.2	8.5	7.9	7.3
13	0.9	P	15	1.5	G	20	18	Y	P	0	0	8.5	8.4	7.9	6.6	4.8	0	0
18.4	1.2	G	25.9	1.7	G	18	15	Y	B	0	0	6.7	7	7.1	7.5	7.3	5.4	0
0	1	G	0	1	G	20	20	U	P	0	0	7.3	7.1	6.7	6.9	0	0	0
12.8	0.7	G	11.9	0.5	P	12	11	Y	P	0	0	5.7	5.2	5.6	4.7	4.2	0	0
18.1	1.4	G	19.6	1	G	22	19	Y	RP	0	0	6.4	6.8	6	6.3	5.7	0	0
12.7	1	P	11	0.8	P	18	10	Y	R	10	0	6.6	6.9	7.6	6.9	4.8	0	0

24.6	0.6	P	20.4	0.5	P	25	28	U	P	0	0	5.8	6.6	8.7	8.1	7.7	6.8	0
13.6	0.5	P	24.7	1.2	G	17	16	Y	RP	0	0	6.9	6.7	6.8	5.9	4.5	0	0
27.7	1.4	G	28.8	1.1	G	34	33	U	B	0	0	6.4	6.5	8.4	8.2	9.1	0	0
13.5	0.8	G	13.5	0.9	G	16	14	Y	B	0	0	6.1	6.8	7.2	5.7	0	0	0
19.4	1.5	G	20.3	1.4	G	23	22	U	R	17	9	5.4	6.4	6	6.7	6.8	3.7	0
19.3	1.3	P	17.8	1.9	G	15	15	U	B	10	0	4.6	3.7	0	0	0	0	0
36.2	1.4	P	36.7	1.5	P	38	38	U	B	0	0	5.5	5.3	4.9	5.1	0	0	0
37.9	1.2	P	35.5	2.4	P	40	37	U	B	0	0	8.1	8.3	8.4	7.1	0	0	0
0	1	P	42.9	0.8	P	38	41	U	B	0	0	6.2	7.3	7.2	7.7	0	0	0
24.4	0.9	P	6.7	0.3	P	26	25	U	B	0	0	6	7.9	8.2	0	0	0	0
43.2	2.5	P	30.5	0.6	P	25	32	U	B	0	0	7.7	8.7	8	9.6	0	0	0
33.8	1.7	P	42	1.3	P	25	35	U	B	0	0	7.7	9.1	8.8	8.3	0	0	0
27.7	1.3	G	23.6	2.3	G	34	32	U	B	0	0	5.5	5.8	7.3	7.5	7.2	0	0
27.2	1.4	G	19.7	1.2	P	30	22	U	B	0	0	6	7.2	0	0	0	0	0
25.3	1.9	P	26.2	1.6	P	30	29	U	B	0	0	6.2	6.8	6	0	0	0	0
19.1	1.9	G	21.1	2.2	G	27	30	U	B	0	0	4.3	5	5.3	3.7	0	0	0
0	1	P	0	1	P	18	20	U	B	18	18	6.7	0	0	0	0	0	0
0	1	G	0	1	G	18	23	U	B	23	0	5.3	5.9	5.4	0	0	0	0
28.8	1.2	G	0	1	G	23	37	Y	B	0	0	7.2	7.5	8.5	7.8	8.5	0	0
24.4	1.3	G	23.8	0.9	G	28	27	Y	PR	18	11	5.9	8.1	7.9	6.3	4.5	0	0
0	1	G	0	1	G	19	17	Y	P	0	0	5.3	5.7	5.8	4.8	2.7	0	0
29.3	1.3	P	33.8	2.1	G	22	36	Y	B	0	0	5.2	6.3	6.5	6.4	7.1	7.6	6
25	0.6	G	22.1	0.4	G	24	32	Y	R	36	20	6	7.8	7.6	7.4	5.1	0	0
24.6	1	G	27.3	1	G	21	20	Y	PR	0	0	6	5.5	6.2	6.2	6.9	5.3	5.7
13.4	0.5	G	23.2	0.4	G	28	32	Y	R	26	0	6.3	6.3	6.8	6.5	6.2	3.2	0
22.9	0.8	G	21.8	0.7	G	25	32	Y	P	0	0	6.7	6.6	6.1	5.9	6.9	6.9	6.8
21.3	0.8	G	17	0.5	P	24	30	Y	P	0	0	5.5	6.9	7.3	7.6	6.9	6.8	6.3
31.6	1.3	G	30.4	0.6	P	25	23	Y	P	0	0	6.9	6.9	8.4	7.4	7.4	6.6	6.3
0	1	P	25.1	1	P	22	10	Y	PR	25	0	7.1	7.7	7.6	7.6	6.5	6.1	5
32.2	1.1	G	0	1	G	45	49	Y	R	0	0	5.1	6.4	6.7	6.5	5.8	4.8	3.7
28.8	1.7	G	28.8	1.9	G	26	30	Y	P	0	0	7	5.6	3	5.1	4.8	3.3	0
0	1	G	10.4	0.3	G	23	25	Y	PR	0	0	5.4	6.6	5.8	0	0	0	0
24	2.1	P	23.7	1.3	P	30	16	U	B	0	0	4.3	5.6	5.3	0	0	0	0
27.2	1.5	G	0	1	G	16	12	Y	PR	0	0	6.2	7.1	6.3	6.1	5.6	4.9	3.5
19.4	1.2	G	20.8	1.5	G	16	16	Y	P	0	0	7.2	7.4	7.8	6.9	4.6	2.8	0
34.6	2.2	G	28	2.1	G	20	20	Y	P	0	0	6.8	7.1	8.6	8.8	6.1	5.3	5.5
0	1	G	0	1	G	19	16	Y	P	0	0	4.3	4.9	5.4	5.2	5.2	4.3	0
14.2	0.4	G	14.5	0.8	G	19	18	Y	P	0	0	6.1	6.8	7.9	6.8	5.8	5.6	0
0	1	G	0	1	G	12	0	Y	P	11	0	5.6	4.6	3.7	0	0	0	0
9.8	0.6	G	0	1	G	14	13	U	PR	0	0	5.1	5.3	4.4	4	0	0	0
21.1	1.7	G	22	1.9	G	20	20	Y	P	0	0	6.5	6.3	6.6	6.4	5.7	0	0
13.4	0.6	G	13.9	0.4	G	15	20	Y	PR	0	0	6.4	6.8	5.9	6.4	0	0	0
13.8	0.3	G	10.2	0.4	G	20	20	Y	P	16	11	0	0	0	0	0	0	0
14.4	0.9	G	17.8	1.1	G	20	14	Y	P	14	0	6.2	6.8	7.2	6	3.7	0	0
19	0.8	G	28.9	1.6	G	22	32	U	PR	40	0	5.6	5.6	6.2	6.4	6.6	6.5	6.6
23.3	1.2	G	27.7	1.3	G	28	21	U	B	0	0	4.8	5.9	6.1	6	5.9	6.2	0
33.4	2.7	P	44.3	3.1	P	25	28	U	P	0	0	7.4	8.3	7.8	6.7	7.5	7.7	7.6
36.2	2.2	G	38.2	2.5	G	20	20	U	P	0	0	5.3	6.6	6.3	6	6.7	6.3	6
20.2	1	G	23.6	0.9	G	22	26	Y	P	0	0	6.3	7.2	7.1	7.3	7.2	6.3	5.4
31.5	0.8	G	16.7	0.4	G	50	37	Y	PR	0	0	8.9	8.8	7.6	5.1	6.7	7.1	8.3
38	2	G	24.7	1.8	G	31	30	Y	P	0	0	7.1	7.5	7.6	7.2	5.9	5.9	5.5
11.7	0.3	G	25.3	0.8	G	34	32	U	PR	0	0	6.6	7.4	6.3	5.9	5.7	5.7	5.7
34.3	1	G	24.9	1	G	34	10	Y	P	0	0	7.1	7.8	6.7	7.4	6.6	6.2	5.4
19.6	1.7	G	18.2	1.3	G	20	19	Y	P	0	0	5.1	6.5	6.2	7.1	6.3	6.2	5.5
27.3	0.9	G	20.2	1	G	24	19	U	PR	0	0	5.3	4.7	4.6	5.2	4.6	3.3	0
23	0.9	P	20.2	1.1	G	15	26	U	PR	0	0	5.3	4.8	5	4.9	4.1	4	0
23.1	1.2	G	28.5	1.1	G	30	28	U	PR	13	0	6.1	7	6.9	5.8	4.9	5.6	4.4
26.6	2	G	28.5	2	G	27	23	U	R	21	23	6.7	7.8	9.6	8.5	8.1	7.6	0
26.2	2.4	G	25.5	1.7	G	22	29	U	P	0	0	7.7	8.5	8.2	7.2	7.2	6.4	0
31.7	1.3	G	27.7	1.4	G	25	28	Y	P	0	0	6.3	6.5	7.3	6.7	5.7	4.4	0
23.6	1.1	G	28.2	1.3	G	20	24	Y	P	0	0	7.8	7.9	7.8	8.2	6	3.9	0
25	2.3	G	26.9	2.7	G	23	29	U	R	0	0	6	6.9	6.7	6.5	5.9	4.6	0

33.5	0.7	G	25.7	0.9	G	21	30	U	R	17	14	6.1	7.1	8.5	9.1	8.2	6.6	3.7
0	1	G	0	1	G	22	27	Y	P	23	0	5.3	5.8	5.2	4.8	5	5.1	5.2
26	1	G	31.2	1.3	P	37	33	U	P	0	0	5.2	4.9	6.2	5.8	5.3	5.2	6.1
29	1.5	P	25.8	1.5	P	20	20	U	R	0	0	5.9	6.2	7.1	7.9	7.3	7	6.9
28.9	1	G	0	1	P	33	33	Y	P	0	0	6.8	7.8	8.3	8	7.9	7.5	7.3
47.7	1.3	G	22.5	1.4	G	27	21	Y	PR	0	0	6.7	6.6	6.5	6.4	7.3	6.7	6.3
16.4	0.8	G	19.8	0.8	G	17	22	U	R	12	0	5.7	6.4	6.1	6.1	4.2	0	0
0	1	G	16	0.5	G	27	27	U	R	23	0	6	7	6.9	6.2	5.2	0	0
19	1.1	G	21	1.2	G	23	22	Y	R	0	0	5.7	6.7	5.9	5	0	0	0
13.8	0.9	G	21.6	0.9	G	24	23	Y	R	10	0	5.7	6.5	7.2	6.2	5.7	0	0
20.3	0.5	G	24.1	0.5	P	23	34	U	R	22	20	4.9	7	7.2	6.1	5.1	0	0
0	1	G	0	1	G	22	18	Y	PR	9	0	5.3	4.4	3.2	0	0	0	0
16.6	0.8	G	16.6	1.1	G	18	15	Y	P	19	18	5.1	5.3	5.1	4.3	0	0	0
21.4	0.8	G	19.2	0.7	P	13	27	Y	P	0	0	5.1	5.5	5.8	5	5	3.9	0
13.8	0.3	G	18.8	0.4	G	28	17	U	P	0	0	5.9	5	6.1	4.8	4.5	3.8	0
15.7	0.6	G	17.3	0.7	G	21	18	Y	R	0	0	5.8	6.1	5.9	6.2	0	0	0
0	1	G	19.2	0.3	G	21	18	Y	P	20	15	4.3	5.8	5.4	4.7	3.5	0	0
31.8	0.6	P	36.6	1.7	G	32	29	Y	P	0	0	5.8	6	6.6	6.7	5.6	5.5	4.9
28.1	1.6	G	24.2	1.9	G	21	25	Y	P	0	0	7.1	6.5	6.1	5.2	0	0	0
20.8	1.5	G	29.1	1.4	G	23	23	U	R	0	0	6.9	7.3	7.2	7.5	9.4	9.4	7.1
29.5	2	G	30.4	1.1	G	34	32	Y	P	0	0	6.3	6.2	7.8	7.7	6.8	7	7.2
45	1.5	G	42.5	2.1	G	30	30	U	P	0	0	5.2	6.8	7.2	6	6.3	6.8	6
29.6	1.8	G	27.9	2.1	G	33	31	Y	R	18	0	6.4	8.4	8.8	8.7	4	0	0
25.9	1.7	G	28.8	2.1	G	16	0	U	P	0	0	5.4	6.9	6.3	6.1	8.6	7.7	6.1
32	2.4	G	31.8	1.5	G	22	32	U	PR	28	18	4.5	5.6	6.8	6.3	5.3	5.1	4.9
38.8	2.9	G	36.6	2.4	P	42	40	U	P	0	0	7.3	7.4	6.1	6.2	5.3	6	6
32	2.6	G	27.2	2.3	G	27	22	Y	PR	16	27	4.6	5.6	5	6.5	6.5	5.3	5.1
33.2	1.7	G	41	2.5	G	27	26	Y	R	13	0	6.3	7.9	8.4	9	8	7.1	6.2
31.8	1.1	G	27.5	1.1	G	21	26	Y	R	0	0	5.1	5.6	4.8	4.5	4.2	3.4	0
30.5	1.4	G	27.1	1.2	G	27	30	Y	R	0	0	5.2	5.8	6.2	7	6.7	6.3	4.7
0	1	G	0	1	G	34	30	U	PR	31	22	5.2	6.2	8.2	7.4	6.6	5.9	5.4
0	1	G	0	1	G	44	42	U	P	28	52	3.6	4.1	6	6.7	6.4	6.3	5
50	0.7	G	0	1	G	48	43	U	PR	18	28	5.2	5.8	5.8	5.3	5.8	6.3	6.3
0	1	G	0	1	G	18	28	U	R	30	39	4.9	5.7	7.7	7.4	8.3	7	6.4
26.3	0.8	G	25.9	0.7	G	28	38	U	P	42	20	4.8	7.1	6.5	5.9	5.9	5.4	4.4
43.6	2.6	G	42.2	3	G	37	43	Y	P	0	0	6.5	6.6	6.9	8	7.5	6.9	5.9
35	2.3	G	29.5	1.7	G	31	35	Y	P	0	0	7.8	7.9	6.8	7.2	7.5	7	7.5
32.6	1.3	G	33.6	0.9	G	30	39	Y	P	0	0	6.7	6.5	5.9	7	6	5.4	5.3
18.9	1.2	P	38.5	2.5	G	25	40	N	R	0	0	6.2	7.6	7.1	7.2	7.2	7.4	6.4
37.8	2.9	G	48	3.1	G	30	0	Y	P	0	0	6.3	7	7.4	8.4	8.7	8.9	8.1
50	2	G	39.1	1.1	G	42	55	Y	P	0	0	6.1	6	7.9	8.6	8.6	7.7	7.2
37.3	2.4	G	32.1	1.8	G	29	28	Y	P	0	0	5.2	6.3	7	6.4	7.8	6.7	6.3
29.5	0.8	G	30.9	1	G	38	37	Y	P	0	0	6.9	7.4	8	7.3	7.7	7.8	5.7
22	1.3	G	30.6	1.7	G	25	28	Y	R	25	0	6.9	7.3	7.1	7.3	6.5	5.8	5.1
39.3	1.4	G	31.5	1.5	G	33	28	Y	P	0	0	7.1	7.5	6.6	7.7	7.9	6.8	6.5
28.4	1	G	0	1	G	32	22	Y	R	0	0	7.3	8.3	8.1	8	7.5	7.3	6.4
32.2	0.4	G	17.3	0.5	G	33	38	Y	P	0	0	7.2	8	8.3	8.9	8.9	8.3	6.9
27.7	1.6	G	30.2	0.8	G	18	15	Y	R	0	0	5.6	6.2	6.1	6	6.3	6	4.3
19.2	1	G	17	0.7	G	24	20	Y	P	0	0	5.6	5.8	5.1	4.9	2.5	0	0
35.2	1.5	G	34.2	1.5	G	20	20	Y	P	0	0	6	6.9	7.4	8.3	7.5	6.8	0
24.8	1.4	G	27.3	1.9	G	28	28	Y	R	18	10	4.7	6.2	6.3	5.6	4.3	0	0
18.3	1	G	20.7	1.4	G	22	21	Y	P	0	0	5.1	6.4	7.2	7.2	6.5	5.4	0
23.4	1.3	G	25.4	1.3	G	25	22	Y	P	0	0	5.9	5.4	6.4	5.9	5	0	0
26.6	0.7	G	27.5	1.6	P	30	30	Y	P	0	0	4.6	6	6.9	6.5	4.8	0	0
25.5	1.9	P	33.3	1.5	G	20	24	Y	P	0	0	6.9	7.4	7.1	5.3	6.7	5.8	4
21.5	1.6	G	18.7	1.1	P	24	27	Y	R	20	0	5.9	6.6	7.1	7.4	6.8	4.9	0
32.7	1.2	P	28.5	1.5	G	28	28	Y	P	0	0	6.9	7.9	7.9	7	6.7	4.7	0
29.8	2.5	G	25.9	2.3	G	21	20	Y	R	14	0	5.7	7.5	6.2	6.7	6.7	4.4	0
22.8	1.7	G	26	0.5	P	12	12	Y	P	0	0	5.5	6.5	5.9	5.5	4.3	4.8	0
27.3	1	P	22.6	0.9	G	33	28	Y	P	0	0	7.3	8.1	8.5	8.5	7.2	3.7	0
18.6	1.4	G	18.8	2.5	P	21	16	Y	R	17	0	5.5	6.1	5.9	0	0	0	0
25.7	0.5	G	16.4	0.4	G	12	5	Y	P	0	0	6.4	6.5	5.4	4.7	3.7	0	0

22.1	0.8	G	21.2	0.8	G	18	37	Y	R	0	0	6.5	7.3	7.9	7.7	5.8	4.8	4.3
46.9	2.2	G	42.3	1.6	G	41	40	Y	P	0	0	7.2	7.2	6.9	8.7	9.1	8.3	9.3
35.9	1	P	36.1	1.7	G	37	27	Y	P	0	0	6	7.7	8.7	7.6	7.1	6.3	6.5
24.7	1	G	24.4	1.1	G	25	24	Y	P	0	0	7.4	8.4	8	7.4	6.2	5.5	4.7
13	0.4	G	15.2	0.5	P	20	18	Y	P	0	0	5.9	6.5	5.8	6	4.9	3.9	0
14	0.6	G	13.6	0.8	G	15	10	Y	R	0	0	5	6.1	6.7	0	0	0	0
13	0.9	G	11.5	0.8	G	15	18	Y	P	0	0	5.1	5.6	6.2	5.3	5.5	4	0
15.8	1.7	G	15.8	1.5	G	15	18	Y	P	0	0	6.1	5.3	6	5.6	5.6	3.8	0
11.5	1.3	G	10.9	0.7	G	14	13	Y	P	15	27	4.7	6.2	5.2	6.4	4.6	0	0
15.1	1.3	G	15.9	0.8	P	18	18	Y	P	0	0	4.8	5.5	5.7	5.5	5.4	5.8	4.8
14.4	1.2	G	11.4	1.3	G	13	12	Y	P	0	0	5.9	6.5	7.1	7.5	0	0	0
9.7	1.3	G	10.2	1.1	G	12	12	Y	R	0	0	4.9	5.9	5.7	4.8	0	0	0
10.7	1.1	G	13	1.2	G	19	17	Y	R	0	0	5.4	5.9	5.8	5.8	5.4	3.9	0
10.8	0.8	G	11.3	0.5	G	16	13	Y	P	0	0	4.5	5.8	5.3	5.5	6.4	4.9	0
12.6	0.7	G	13.4	0.8	G	14	12	Y	P	0	0	5.2	6.2	6.5	5.8	4.4	0	0
11.6	0.6	G	12.3	1.2	G	16	15	Y	R	0	0	5.5	5.5	3.8	0	0	0	0
14.7	1.8	G	14.7	1.5	G	14	13	Y	P	0	0	4.1	5.9	7.6	8.3	7.1	7	5.8
21.8	1.5	G	22.5	2.6	G	19	17	Y	P	0	0	6.5	7.6	7.6	7.8	7.3	5.5	0
18.2	0.8	G	18.4	1.3	G	20	20	Y	R	0	0	5.2	6.6	8	6.1	6.5	0	0
13.8	0.6	G	14.3	0.4	G	17	16	Y	R	0	0	6.1	5.9	5.7	6	0	0	0
28	0.8	G	25.5	1.2	G	28	31	Y	R	0	0	6.5	8	8.4	8.6	7.7	7.3	0
16	0.4	G	21.7	0	P	24	22	Y	R	0	0	7.8	7.8	5.7	0	0	0	0
27.1	0.9	P	29.5	1.1	G	33	28	Y	R	0	0	6.9	6.2	6.5	7	6.3	4.3	0
16	1	G	0	0	P	18	0	Y	R	0	0	7.6	9	10.2	0	0	0	0
20.4	1.7	G	21.4	1.5	G	25	24	Y	P	0	0	6.1	6.6	7.5	8.3	8.1	7.6	7.8
23	1.8	G	27.8	0.9	G	43	31	Y	P	0	0	5.5	7.7	8.6	8.9	9	7.9	7
27	1.8	G	44.9	1.6	G	31	29	Y	P	0	0	6.2	8.4	6.8	8.7	9.5	7.6	6.3
31.6	1.1	G	34.9	1.3	G	31	29	Y	P	0	0	6.4	6.5	6.7	8.3	7.9	7.4	7.9
22.9	2.4	G	23.7	2.3	G	24	23	Y	P	0	0	6.9	8.2	8.7	9.4	9.3	8.2	8.7
37.5	1.4	G	41	1.5	G	30	28	Y	P	0	0	7.2	8.3	9	8.6	9.2	9	7.5
34.8	2.2	G	32	2.3	G	35	34	U	U	0	0	5.8	7.3	6.8	7.5	7.5	7.5	6.4
31.1	1.1	P	22.6	0.8	P	23	20	U	U	0	0	5.9	6.3	6.6	7.4	7.3	5.1	4
0	1	G	49.2	0.9	G	34	25	Y	P	0	0	5.2	6.2	5.5	5.4	7	6.9	7
13.2	1.8	G	19	2	G	19	18	Y	P	0	0	6.3	6.8	8.2	7.8	6.8	7.8	6.7
40	1.7	G	32.8	2.2	G	30	27	Y	P	0	0	6.1	7	7.6	8	7.6	8.2	6.3
0	1	G	0	1	G	36	51	Y	P	0	0	5.1	5.6	5.3	5.7	6.4	6.1	6.3
35.3	2	G	24	1.4	P	23	21	Y	P	0	0	6.8	6.7	6.8	7	7.3	8.4	7.1
12.2	0.7	P	17.4	0.7	G	20	15	U	B	0	0	6.3	7	6.2	6.2	4.5	0	0
48.3	4.4	G	44.1	4.5	G	33	36	U	B	0	0	7.6	8	8.6	8.6	7.1	6.8	0
34.7	1.7	G	35.2	1.5	G	25	28	Y	B	0	0	7.5	9.2	10.1	11.2	10.1	11	11
14.9	0.6	P	31.2	1.7	P	42	25	U	B	0	0	7.7	8.6	9.6	8.1	3.9	0	0
27.8	1	P	33.4	0.5	P	25	23	U	B	0	0	7.7	9	8.9	7	6	0	0
33.1	1.1	G	35.2	1.7	G	29	28	U	P	0	0	6.4	6.7	5.6	5.4	5.6	4.9	4
25.3	1.3	P	27.5	1.5	G	15	13	Y	P	0	0	5.7	6.9	6.3	5.9	5.2	0	0
0	1	G	0	1	G	34	33	Y	R	21	21	7.6	10.1	9	7.5	5	0	0
37.4	1.6	P	36	1.3	G	35	39	Y	P	0	0	5.8	6.6	8	6	5.4	4.9	2.7
25.5	1.4	P	25.6	1.8	G	22	18	Y	R	28	23	6.2	7.2	8.2	8.4	7.6	5.2	0
28.9	1.6	G	24.3	1.7	G	26	25	Y	R	0	0	6	6.5	6	6.2	6.3	0	0
25.1	0.6	G	16.4	0.9	P	28	28	Y	P	0	0	5.6	5.5	5.4	4.4	4.1	0	0
20.2	1.4	G	19	1	G	22	21	Y	R	20	0	6.1	7	6.9	5.4	0	0	0
13.7	1.3	G	12.1	0.8	G	17	17	Y	R	0	0	5.1	5.8	5.6	5.5	5.2	0	0
14.9	1.1	G	18.9	0.9	G	15	18	U	R	0	0	5.1	5.9	6	4.8	0	0	0
19.2	0.7	G	14.6	0.6	G	20	17	U	R	23	0	7.1	7.2	5.2	4.4	3.2	0	0
0	1	G	13.3	0.7	G	13	11	Y	P	0	0	5.5	5.3	4	0	0	0	0
19.1	1.2	G	18.2	1.3	G	15	18	Y	R	0	0	4.4	5	4.1	4.1	3.7	3.4	0
28.5	1.2	G	32.6	2.1	G	30	25	Y	P	0	0	6.1	6.4	6.8	7.5	7	6.8	5.5
26.3	1.9	G	24.8	2.3	G	20	26	Y	P	0	0	5.4	7.1	7.5	6.5	6.8	6.5	6.7
19.1	0.8	G	19.3	0.8	G	20	24	Y	P	0	0	6.5	6	7.4	8	8.2	7.1	6.5
16.4	1.2	G	26	11	G	24	23	Y	P	0	0	6.8	7.6	7.5	6.9	6.6	6	5.4
0	1	G	0	1	G	7	7	Y	P	0	0	5.1	4.7	4	0	0	0	0
22.8	2.1	G	21.7	1.3	G	18	17	Y	R	0	0	5.1	6.5	6.3	5.8	4.9	3.4	0
15	1.2	G	13.8	1.2	G	16	15	Y	R	20	0	5.5	5.9	7	6.9	6.5	3.8	0

19.9	0.7	P	19.3	0.9	P	21	18	Y	R	0	0	5.2	5.7	6.2	5.6	4.4	0	0
13.6	0.7	G	12.6	0.6	G	15	19	Y	R	0	0	4.8	5.5	5	4.1	0	0	0
15.4	1.9	G	15.4	1.5	G	17	14	Y	P	0	0	6.5	5.3	5.5	5.3	5.3	0	0
19.6	1.7	G	19.7	1	G	22	22	Y	P	0	0	6.6	7.2	6.9	6.1	5.9	3.9	0
22.1	1.5	G	22.4	1.2	G	25	23	Y	P	0	0	6.1	6.9	7.2	7.1	6.7	6.1	4.7
18.8	1.6	G	19	1.8	G	20	20	Y	P	18	0	6.6	7.9	6.5	7	6.6	4.6	0
16.4	1.7	G	24.8	2.4	G	10	9	Y	P	0	0	6	5.9	6.1	6.3	5.1	3.9	3.4
54.6	3	G	46.4	1.6	G	28	28	U	P	0	0	7.2	8.5	8	7.4	7.7	9.3	9.1
31	1.3	P	16.7	0.9	G	15	15	Y	P	0	0	5.8	6.6	6.8	8	7.4	6.3	4.9
22.1	0.5	P	18.3	0.7	P	19	19	Y	P	0	0	6.9	7.5	7.4	9.1	6.6	6.5	0
10.2	0.6	P	7.3	0.4	G	10	13	Y	P	0	0	5.7	6.7	7.1	6.3	5.1	0	0
0	1	G	20.3	0.6	G	23	36	Y	P	0	0	5.4	4.5	4.3	4.3	5	5	5.1
21.8	0.9	G	25.5	0.9	G	24	23	U	P	0	0	3.5	5.8	6	6.1	5.8	4.2	3.5
22.9	0.7	G	23.4	1.7	P	18	31	Y	P	0	0	7.8	7.6	6.1	5.5	4.7	0	0
11.6	0.7	P	15.9	1	G	17	15	Y	B	0	0	5.1	6.2	6.5	7.1	5.7	0	0
28.2	4.3	G	31.3	3.8	G	20	23	Y	P	0	0	5.4	5.2	5.7	4.8	3.3	0	0
17	0.7	G	17.9	0.7	G	15	18	Y	P	0	0	5.5	5.7	6	4	0	0	0
0	1	G	0	1	G	12	15	U	P	10	0	3.4	3.1	0	0	0	0	0
15.1	0.7	G	16.6	0.7	G	21	20	U	R	0	0	5.3	6.3	4.6	4.2	4.2	0	0
22.8	1.3	G	27.6	1.9	G	23	21	Y	P	0	0	6.3	6.8	6.7	6.2	6	5.1	0
25.6	1.4	G	23.5	1.3	P	13	24	Y	P	0	0	5.7	6.4	6.6	5.6	4.6	0	0
18	0.4	G	16.2	0.4	G	19	18	Y	P	0	0	5.9	6.9	8.2	7	6.5	5.6	0
0	1	G	0	1	G	11	10	U	P	0	0	6.4	6.6	4.9	4	0	0	0
19.1	2.3	G	17.2	1.9	G	18	18	U	P	0	0	6.5	7.8	8.4	7.2	7.5	5	0
34.7	3.7	G	33.3	3.4	G	26	34	U	B	0	0	5.4	7.1	7.4	6.6	0	0	0
17.9	1.2	P	18.5	0.7	P	23	22	U	B	0	0	6.6	6.7	4.2	0	0	0	0
16.7	1.1	G	14	0.4	G	20	16	Y	P	0	0	6	5.4	4.8	5.2	4.1	0	0
26	1	G	29.2	0.8	G	32	36	Y	B	19	17	4.7	6.8	7.4	7.3	8	7.4	0
0	1	P	32.5	1.1	P	34	40	U	B	0	0	6.5	7.9	7.5	0	0	0	0
32.7	2.4	P	34.1	1.8	P	38	35	U	B	0	0	6.3	7.3	6.8	0	0	0	0
33.6	1.3	P	28	1.9	P	28	45	U	B	0	0	6	9.3	9.3	10.2	0	0	0
23.5	1.3	P	26.9	1.7	P	30	25	U	B	0	0	6.9	6	0	0	0	0	0
19.9	2	P	19.2	1	P	15	20	U	B	0	0	4.9	5.4	0	0	0	0	0
15.2	1.7	G	18.5	1.5	G	19	18	Y	B	0	0	5.2	7.1	7.2	9.6	7.6	7.8	7.1
39.1	3.3	G	43.8	3.8	G	25	30	Y	B	0	0	5.1	6.2	7.8	7.6	7.8	0	0
28.4	1.7	G	30.1	1.5	G	31	30	U	B	0	0	6.9	7.6	7.3	7.4	7.4	6	0
25.7	1	P	25.5	0.7	P	26	30	U	B	0	0	5.6	5.3	0	0	0	0	0
0	1	P	0	1	P	22	20	U	B	0	0	5.4	0	0	0	0	0	0
18.5	1.1	G	22.7	1.2	P	21	23	Y	B	20	0	4.2	5	5.2	0	0	0	0
42.9	1.3	G	35.6	1.6	G	31	35	Y	P	0	0	6.7	7	6.8	7	6.7	6.1	6.3
9.8	2.3	G	11	2.3	G	10	9	Y	P	0	0	7.4	6.9	6.8	6.3	5.1	0	0
24.1	0.4	G	13.3	0.4	G	23	28	U	R	0	0	6	6.3	7.1	6.7	6.9	5.6	0
23.7	1.1	G	24	1.1	G	25	23	Y	R	10	0	6.3	7.1	7.5	5.8	0	0	0
24.8	1.9	G	29	1.5	P	32	30	Y	P	0	0	5.3	5.5	5.6	5.7	5.4	4	0
0	1	G	0	1	G	11	14	Y	P	0	0	6	5.8	7	4.3	4.2	0	0
20.3	1.2	P	25.3	1.5	G	17	27	Y	B	0	0	5	6.1	5.4	5.7	6.2	5.6	0
9.1	1.9	G	9.1	1.7	G	13	0	Y	B	0	0	6.2	6.7	5.2	0	0	0	0
8	0.7	G	9.1	1.5	G	12	12	Y	P	0	0	5.5	5.1	3.4	0	0	0	0
7.1	0.9	G	7.2	1.4	G	11	10	Y	P	0	0	4.9	5.1	6	5.4	0	0	0
23.8	1.1	G	24	1.7	G	22	21	Y	P	0	0	8.4	8.4	8.1	6	5.2	0	0
18.6	0.8	G	22	1.1	G	20	24	Y	P	0	0	7.3	7.7	7.6	7.4	7.5	6.8	5.3
17.8	1	G	17.1	0.7	G	20	20	Y	R	12	10	5.2	6.3	5.8	3.6	0	0	0
0	1	G	0	1	P	19	18	Y	P	0	0	5.8	6.9	5.4	4.6	3.9	0	0
0	1	G	0	1	G	19	17	Y	P	0	0	5.9	6	5.4	4.9	0	0	0
11.3	3.1	G	12.3	2.7	G	15	15	Y	B	0	0	4.1	4.8	4.4	3.8	0	0	0
23	0.7	G	23.1	0.8	G	23	28	U	P	0	0	5	6	6.8	6.4	6.6	4.2	0
19.4	0.7	G	19.5	0.4	P	18	28	Y	P	12	8	4	4.1	4.7	3.8	3.5	2.1	0
30.1	2.2	G	32.9	2.2	G	35	34	U	R	0	0	5.6	7.6	7.1	7	6.6	5.7	4.3
40	4.2	G	41.5	4	G	34	38	N	P	0	0	7	7.7	7.5	6.4	5.3	5.8	6.1
26.5	1.3	G	33	1.9	G	22	20	Y	R	0	0	5.9	6.6	7.1	8	7.8	5.9	6.4
23.1	0.5	P	25.5	1.5	P	18	15	U	B	16	12	5.5	6.9	6.2	0	0	0	0
20	1	P	23.8	0.5	P	28	28	U	B	0	0	5.6	6.8	6.5	0	0	0	0

0	1	G	0	1	G	13	8	Y	P	0	0	5.5	6.6	4.8	0	0	0	0
0	1	P	0	1	P	30	25	U	B	23	18	6.8	7.5	7.4	7.3	7.5	6.8	6.2
14.4	0.8	G	15.5	0.4	P	20	18	Y	R	13	16	6	5.2	5.3	5.2	3.8	0	0
21	0.5	G	29.1	0.6	G	25	31	Y	R	14	17	4	6.3	6.3	5.7	5.7	2.3	0
20.3	0.9	G	20.2	1.3	G	25	23	Y	B	0	0	5.8	7.1	7.5	7.1	6.9	5.6	0
42.6	2.9	G	42.7	2.5	G	38	45	U	P	28	17	6.3	7.5	8.2	8.4	8.5	8.6	7.9
20.5	0.4	G	19.6	1.2	G	25	30	Y	P	0	0	7.5	8	8.1	7.1	8.4	8.7	7.6
1	0	P	0	1	P	10	18	Y	R	0	0	5.6	6.3	6.4	4.4	0	0	0
25.7	1.9	G	28	1.8	P	28	22	Y	P	0	0							
26.5	1.4	G	22.3	0.7	G	15	18	Y	R	0	0	5.6	6	6.6	6.8	6.5	4.5	0
19	1.4	P	0	1	G	18	5	Y	P	0	0	6.1	6.6	5.5	4.9	0	0	0
18.8	1.2	P	29.8	1.4	G	22	15	Y	P	14	0	6.6	6.8	7.2	7.3	7.1	6.3	4.6
40.7	1.6	G	34.1	1.6	G	12	23	Y	P	0	0	6.2	7.5	7.8	6.4	6.6	7.2	8.3
24	0.7	G	13.3	0.6	G	17	16	Y	P	0	0	5.9	6.2	6.2	5.9	5.3	0	0
13.4	1	G	15.6	1	G	20	18	Y	P	16	0	6.1	6.1	6.9	7.2	6.1	6.2	5.3
31.8	1.3	P	34.6	1.1	P	36	34	U	B	0	0	6.3	7.1	6.1	5.2	0	0	0
15	1	P	15.4	0.8	G	15	0	Y	B	0	0	6.3	6.4	5.6	0	0	0	0
22.5	0.8	P	27.1	0.8	G	15	21	Y	P	0	0	6.7	7.6	6.4	6.7	5.6	0	0
23.7	1.3	P	36.2	2.7	G	27	25	Y	P	0	0	5.8	7.7	8.2	7.8	8.3	8.2	8
35	2.3	P	39	1.8	P	37	0	Y	P	0	0	7.3	8.5	8.5	8.2	7.4	6.4	5.2
24.9	1	P	31.1	1.2	P	13	22	Y	P	0	0	5.9	6.9	7.1	6.6	5.3	0	0
19.9	0.8	G	18.4	0.6	G	25	18	Y	P	0	0	7.4	7.2	6.4	6.6	6.2	3.7	0
12.6	2.3	G	11.3	2.7	P	13	13	Y	P	0	0	6.1	6	6.3	6.3	4.5	0	0
34.7	2.4	G	36.2	1.6	G	25	34	U	B	0	0	6.1	6.9	6.4	5.4	4.8	6.2	0
0	1	P	30	0.8	G	31	0	U	B	0	0	5.6	7	8	0	0	0	0
36.2	2.4	P	40.2	2.5	P	31	35	U	B	0	0	6.7	7.1	7.4	6.8	0	0	0
18	1.5	P	18.6	1.8	P	20	20	U	B	0	0	5.5	6.8	0	0	0	0	0
31	1	P	32	0.8	P	38	31	U	B	0	0	5.6	7.2	8.8	0	0	0	0
41	1.5	P	44.8	1.4	G	24	48	U	B	0	0	7.1	8.2	7.6	7.6	8.5	8.4	5.9
21.3	1.3	P	22.3	1.4	P	25	24	U	B	0	0	6.6	7	8.2	0	0	0	0
31.6	2	G	29.6	1.8	G	30	28	U	B	0	0	6.9	7.7	7	7.2	8	0	0
24.7	2.9	P	28.1	2.7	P	22	25	U	B	0	0	7.8	6.7	7.8	0	0	0	0
22.5	0.5	P	20	1	P	25	23	U	B	0	0	7.3	7.7	0	0	0	0	0
20	0.6	P	22	0.7	P	23	23	U	B	0	0	8.4	7.6	0	0	0	0	0
15.5	0.9	P	13.1	1.5	P	18	14	U	B	0	0	7.4	0	0	0	0	0	0
24	1.8	P	28.5	1.4	P	18	28	U	B	0	0	6.2	5.9	5.2	0	0	0	0
27	2	P	24.7	1.3	P	28	28	U	B	0	0	6.8	7.3	0	0	0	0	0
30	0.8	P	33	0.7	P	28	24	U	B	0	0	6.3	6.5	4.8	5.5	0	0	0
28	1	P	21	0.8	P	28	0	U	B	0	0	6.6	7.7	7.8	0	0	0	0
18.1	0.9	G	18.7	1.4	G	20	14	Y	B	0	0	6.9	7.7	7.1	6.5	0	0	0
19.5	1.2	G	18.8	0.8	G	20	18	Y	B	0	0	5.7	5.9	4.2	0	0	0	0
22.5	1.2	P	27.1	1.6	P	34	30	U	B	0	0	6.5	6.3	0	0		0	0
23	1	G	0	1	P	25	15	Y	B	0	0	6.5	7.3	8.2	8.4	0	0	0
24	1.4	P	28.9	1.7	P	25	31	U	B	20	0	6.6	7	0	0	0	0	0
32.2	2.5	P	32.4	2.4	P	30	28	U	B	0	0	6.9	7.3	7.9	8.8	0	0	0
16.3	0.8	P	17.9	0.9	P	20	18	U	B	0	0	7.4	7.8	0	0	0	0	0
17.7	1.2	P	18	1.2	P	18	18	U	B	0	0	5.1	6.3	0	0	0	0	0
19.5	1.7	P	18.9	1.3	P	17	12	U	B	0	0	4.2	4.3	0	0	0	0	0
20.7	1.3	G	23.7	0.8	P	26	24	Y	B	0	0	6.7	7.6	9	8.2	0	0	0
17.2	2.6	P	14.6	2.4	P	17	15	U	B	0	0	5.3	0	0	0	0	0	0
10.8	1	G	13	0.5	G	14	13	U	B	0	0	5.3	5.3	0	0	0	0	0
28.8	1.7	P	34	2.5	P	15	12	U	B	0	0	6.5	5.5	5.3	0	0	0	0
16.6	1.2	P	22.2	1.1	P	21	18	U	B	0	0	4.7	4.9	0	0	0	0	0
15.1	1.5	G	15.3	0.7	P	18	18	Y	B	0	0	6.7	8.3	9.1	9	9.5	0	0
7.3	0.6	P	14	1	G	18	12	Y	B	0	0	5	5.6	6	6	0	0	0
0	1	P	0	1	P	30	35	U	B	0	0	7	7.6	6.5	0	0	0	0
0	1	P	0	1	P	34	30	U	B	0	0	6.5	7.7	7.9	7.5	0	0	0
21.3	1.2	P	23.4	0.9	P	27	34	U	B	0	0	7.3	7.7	7.8	6.8	0	0	0
22	1	P	22	1	P	20	0	U	B	0	0	6.1	7.1	6.2	0	0	0	
28	1	P	27	1	P	18	22	U	B	0	0	4.6	3.9	5	0	0		0
12.8	1.1	P	0	1	P	10	0	U	B	0	0	5.1	6.1	6.5	0	0	0	0
9.6	0.7	P	13.5	1	G	15	13	U	B	0	0							

0	1	G	0	1	G	28	27	Y	B	0	0	5.6	6.2	6.3	7.6	6.7	0	0
44	3.1	P	33.9	1.8	P	35	33	Y	B	0	0	6.7	7.2	7.5	7.9	7.8	0	0
35.2	0.8	G	49	1	P	40	39	U	B	17	0	5.7	7.2	6.8	7.6	0	0	0
20	0.8	P	24	0.5	G	24	27	Y	B	17	16	5.4	7.2	6.8	6.1	6.3	0	0
15.1	0.8	P	33	0.9	P	31	0	Y	B	15	0	6.1	7.8	7	7.6	6.5	0	0
25.3	1.3	P	29.3	0.8	P	37	32	Y	B	0	0	7	6.7	6.5	6.1	7.6	0	0
0	1	G	0	1	G	18	16	Y	B	0	0	7.1	8.3	7.7	6.9	6.1	0	0
34	1.9	P	38.2	1.6	P	38	27	U	B	0	0	7	8.4	6.5	0	0	0	0
31.9	1.7	P	33	1.6	P	13	18	U	B	0	0	6.9	5.9	6.6	0	0	0	0
17.6	1.3	P	21.6	0.9	G	27	25	U	B	0	0	6.6	6.8	6.2	5.4	0	0	0
31	0.7	P	13.9	0.5	P	18	17	U	B	0	0	6.6	6.2	7.3	6.7	0	0	0
0	1	P	40	0.8	G	42	12	Y	P	0	0	6.4	5.8	7	7.8	6.9	6.5	0
0	1	P	21	0.8	P	23	16	Y	P	0	0	5.2	4.9	5.6	4.2	0	0	0
0	1	P	0	1	P	15	31	U	B	0	0	8.4	9.6	9.5	8.8	0	0	0
51.7	2.3	G	53.5	1.4	G	35	33	U	B	0	0	5.8	7	8.3	8.7	8.1	8.1	7.1
17.4	1	G	23.3	1.6	G	21	25	Y	B	0	0	6.6	8.1	10.3	8.1	7.5	0	0
17.8	2	G	22.4	1	G	12	0	Y	P	0	0	5.4	5.7	6.6	5.2	4.4	0	0
12.1	1	G	15.9	0.7	G	23	17	U	P	0	0	6.5	7.1	7.2	6.4	7.1	4.5	0
24.8	1	G	23.4	1.2	G	27	17	Y	R	0	0	5.8	7.6	9.2	9.3	8.1	6.2	0
34.7	2.7	G	28.6	1.5	G	28	23	Y	R	0	0	7.4	7.4	8.8	5.9	0	0	0
10.3	1.1	G	14.8	1.3	G	18	16	U	P	18	0	6	6.5	6.3	5.6	6.7	0	0
13.1	0.4	P	0	1	G	16	27	Y	P	0	0	5.9	7.2	7.4	5.6	5.7	3.3	0
11.3	0.8	G	11.3	0.8	G	14	13	Y	P	0	0	5.9	6.2	8.1	6.8	3.4	0	0
17.4	1.4	G	19	1.9	G	20	20	Y	P	0	0	6.8	8.7	7.7	6.3	7	6.1	0
14	0.9	G	10	0.5	P	26	23	U	P	0	0	7.4	7.3	6.2	6.4	5.7	4	0
21.4	1.3	G	25.2	2	P	18	25	Y	P	10	0	7.3	9.1	8.3	8.4	8.4	8.4	7.8
28.5	1.8	G	24.8	1.7	P	22	20	Y	P	0	0	5.7	6.6	6.2	6.3	5.5	4.4	3
23.7	0.8	G	0	1	P	20	23	Y	R	0	0	6.7	6.9	6.1	6.9	5.8	4.7	2.8
22.7	0.6	G	19.6	0.6	G	26	25	Y	R	26	15	5.7	6.2	5.9	7	4.8	0	0
22.2	0.7	G	36.2	0.6	G	20	23	Y	P	0	0	6	7.2	6.5	6.4	5.1	5	3.6
14.7	1.2	G	21.1	0.9	G	13	13	Y	P	0	0	6.5	6.9	8.6	8	8	6.3	3.7
1	0	G	1	1	G	20	18	Y	P	0	0	5.7	5.8	5.8	3.7	4.7	0	0
32.2	1.4	G	28.6	1.4	G	25	38	Y	P	0	0	7	8.6	9.9	9.1	8.3	6.9	5.8
23.6	1.1	P	23.4	1.1	G	24	23	Y	P	0	0	5.5	5.8	5.4	5.6	5.3	4.2	4
0	1	G	0	1	G	12	12	Y	P	0	0	4.6	4.6	4.4	3.2	0	0	0
28	2.2	G	26.1	2.4	G	23	26	Y	R	0	0	5.8	6.4	6.6	6.8	7.3	5.4	4.8
19.4	1.6	P	15.1	0.5	P	24	22	Y	P	0	0	6.5	6.1	6.4	5.1	4.3	0	0
19.1	1.2	G	16.5	0.8	G	20	20	Y	P	0	0	6.2	5.6	5.2	5.8	5.1	4	0
0	1	P	33.9	1.4	G	35	34	Y	P	0	0	7.2	5.8	7.9	8.4	8.5	6.8	0
22	0.6	P	18.4	0.6	P	26	25	Y	P	0	0	5.7	5.7	6.3	5.2	0	0	0
29.4	1.4	G	28.1	1.4	G	33	32	U	B	0	0	6.8	6.2	6.2	5.4	0	0	0
22.6	1.4	P	22.9	1.2	P	33	28	U	B	0	0	5.3	7.1	0	0	0	0	0
32.6	0.9	G	30.3	0.8	G	38	35	Y	R	20	18	4.6	7.1	7.3	7.6	6.5	6.8	6
22.9	0.7	G	18.2	1	G	25	25	Y	P	20	11	6.2	6	7.6	9	7.7	5.8	0
23.9	0.8	G	27.8	0.8	G	25	30	Y	R	20	25	4.7	6.2	6.5	7	5.9	3.9	0
18.6	1.2	P	19.9	0.6	G	20	20	Y	R	0	0	4	5	5.6	4.1	0	0	0
33.4	1.7	G	28	0.6	P	28	25	Y	P	0	0	6.3	7.3	0	0	0	0	0
18	0.6	G	15.4	0.9	G	17	20	Y	R	0	0	5.5	6.3	7.5	8.8	0	0	0
12.1	1.1	G	8.8	1	G	18	18	Y	P	0	0	4.7	5.2	4.8	3.8	3.1	0	0
11.8	1.2	G	12.7	0.3	G	15	13	Y	P	0	0	5.2	4.6	4.9	4.6	0	0	0
7.9	0.7	G	10.1	0.5	G	9	7	Y	P	0	0	5.8	4.3	4.4	3.1	0	0	0
40.1	2.7	G	39.3	2.6	G	35	40	Y	P	0	0	7.6	8.4	8.9	7.9	8.3	7.7	6.2
36.6	1.7	P	36.9	1.5	P	25	25	Y	R	0	0	6	6.4	6.8	6.3	6.6	5.8	5.2
0	1	G	0	1	P	20	18	Y	B	0	0	6.6	7.6	7.1	6.3	0	0	0
0	1	G	0	1	G	17	13	Y	P	0	0	6.2	5.9	5.3	5.3	0	0	0
0	1	G	0	1	G	15	13	Y	P	0	0	5.6	5.6	4.9	5.1	3.9	0	0
0	1	G	0	1	G	12	15	Y	P	0	0	5.1	5.3	5.3	5.3	4.7	0	0
0	1	P	0	1	G	17	17	Y	P	0	0	5.1	5.2	5	4.1	3.4	0	0
0	1	P	15.1	1	G	21	20	Y	P	0	0	4.9	5.4	5.3	4.5	2.9	0	0
10	0.8	G	10	0.7	G	11	10	Y	P	0	0	5.1	3.9	3.7	0	0	0	0
11.4	0.3	G	7.4	0.4	G	12	11	Y	P	0	0	5	4.8	4.5	3.2	0	0	0
1	0	G	0	1	G	12	9	Y	P	0	0	4.3	4.9	3.6	0	0	0	0

19.8	0.7	G	28.3	0.8	G	22	18	Y	P	0	0	5.2	4.8	5.3	5.6	3.2	0	0
1	1	G	0	1	G	12	10	Y	P	0	0	5.3	4.7	5.4	4.4	4.5	3.3	0
21.6	1.8	G	20.4	1.5	G	14	13	Y	P	0	0	7.5	8.4	8.4	6.3	0	0	0
9.5	0.6	G	15.8	0.6	G	10	7	Y	P	0	0	6	5.4	4	3.3	0	0	0
10.5	0.6	G	15.6	1.9	G	8	7	Y	P	0	0	5.1	4.9	4.6	3.8	0	0	0
22.3	0.6	G	24.4	1.5	G	7	5	Y	P	0	0	4.5	5	4.5	4.5	3.6	0	0
12.2	1.2	G	11.2	0.9	G	10	8	Y	P	0	0	6.1	6.4	5.9	4.4	0	0	0
13.7	2.2	G	12.2	2.7	P	12	8	Y	P	0	0	5.1	5.3	5.1	4.5	3.8	0	0
9.2	1.3	G	9.8	2.6	G	12	12	Y	P	0	0	4.8	4.9	3.4	3.6	0	0	0
7.6	0.4	G	8.6	0.3	G	10	9	Y	P	0	0	3.4	3.5	3.5	0	0	0	0
13.7	0.7	G	7.7	0.4	G	13	12	Y	P	0	0	4.7	4.2	4.2	0	0	0	0
33.8	1.3	P	40.8	0.7	P	22	18	U	B	0	0	8.1	8	7.8	0	0	0	0
21.9	1.8	G	27.8	1.8	G	25	25	N	R	13	0	4.7	6.5	6	6.3	6	5.6	4.9
25.8	0.9	G	24.3	1.3	G	30	28	Y	P	25	0	4.5	4.6	5.6	5.9	6.1	5.1	4.2
27.3	1.3	G	20.3	1.2	G	23	29	Y	R	24	0	4.3	6.7	7.2	6.3	0	0	0
21.3	0.8	G	22.9	1.5	G	24	27	Y	P	15	9	5.7	6.8	6.6	5.8	5.1	0	0
17.2	0.9	G	21.6	1.1	G	28	23	Y	R	0	0	6.1	5.7	6.2	7.2	0	0	0
0	1	G	0	1	G	22	22	Y	P	13	22	4.6	5.5	6.8	6.3	0	0	0
26.5	1.2	G	26.5	1	G	28	26	Y	P	0	0	5.8	6.5	6.6	5.3	5	4.3	0
24.3	0.7	G	25.7	1.1	G	28	28	Y	P	17	0	6.6	7.6	8.6	8	6.1	0	0
27.7	1.8	G	36.7	3.5	G	35	30	U	P	0	0	6.5	6.7	7.6	8.5	8	8.1	7
24.9	0.9	G	21.9	0.8	G	18	15	Y	P	25	0	4.6	5	6.7	5.8	5.2	5.3	4.6
22.7	1.5	G	40	1.9	G	28	22	Y	P	0	0	5	6.6	7.2	8.3	8	7.1	6
43	3	G	39.4	2.5	G	35	31	Y	P	0	0	5.8	6.9	6.9	8.4	7.1	6.8	7.1
10.4	0.3	G	20.7	0.7	G	13	13	Y	P	0	0	6.4	5.4	4.8	0	0	0	0
42.4	1.4	G	35.3	0.8	G	18	18	Y	P	20	0	6.2	6.4	7.6	6.2	6.5	6.9	5.9
0	1	G	0	1	G	20	27	Y	P	28	12	3.8	6.6	8.5	8	8	7.5	7.4
53.5	4.4	P	55.8	3.8	P	50	48	U	B	21	0	5.7	6.5	7.4	8.4	7.9	0	0
60.2	4.7	G	56.2	5.3	G	35	55	N	P	0	0	4.8	6.6	6.5	6.6	5.9	6	7
56.3	6.3	G	52.5	6.7	G	37	40	N	P	0	0	5.4	6.8	7.8	8	7.9	7.2	6.8
31.2	1.3	G	26.2	1.6	G	33	30	Y	P	0	0	5.2	6	6.9	6.4	5.4	3.6	0
8.8	0.6	G	8.7	0.6	G	13	13	Y	P	0	0	5.4	4.8	4	3.3	0	0	0
11.1	0.9	G	13.5	1	G	12	18	Y	P	14	0	3.5	4.7	3.5	3	0	0	0
34.3	1.6	G	33.1	2.1	G	25	25	Y	P	0	0	5.8	6	5.4	5.8	5	4.2	0
0	1	G	13.9	0.7	G	10	15	U	P	0	0	5.4	6.6	6.5	4.6	4.8	3.8	0
25.1	1	G	24.4	1	G	27	26	Y	P	16	0	6.2	7.8	8.2	7.4	7.4	5.7	3.5
13.3	0.6	G	14.3	1.3	G	18	13	Y	P	0	0	5.6	6	5.4	3.5	0	0	0
17.3	3.1	G	18.6	3.3	G	17	15	Y	P	0	0	6	5.4	5.8	4.1	3.7	0	0
0	1	G	0	1	G	20	20	Y	P	0	0	6.7	5.9	5.4	4.7	2.9	0	0
9	0.3	G	7.5	0.4	G	12	11	Y	P	0	0	5.9	6.2	6.1	0	0	0	0
7.3	0.4	G	9.6	0.6	G	15	20	Y	P	0	0	6.3	7	6	4.1	0	0	0
13.3	0.5	G	7.6	0.4	G	12	12	Y	P	0	0	6.1	5.2	6.2	3.4	2.7	0	0
20.3	0.9	G	7.6	0.5	G	20	17	Y	P	0	0	7.5	7.6	7.5	5.5	0	0	0
12.3	0.7	G	0	1	P	20	15	Y	P	0	0	7.5	6.5	6.2	5.9	0	0	0
0	1	P	0	1	G	10	8	Y	P	17	0	6.1	6.3	5.5	4.5	2.7	0	0
25.2	1.4	G	28.7	1.9	G	20	20	Y	P	19	0	4.6	6.4	6.6	6.8	6.4	4.5	3.6
0	1	G	0	1	G	22	22	Y	P	0	0	5.5	4.3	4.6	0	0	0	0
0	1	G	0	1	G	19	19	U	B	0	0	5.7	7.7	7.5	0	0	0	0
31.7	0.7	G	26.6	0.9	G	25	16	Y	R	0	0	9.5	10.5	11	11.8	11.2	11	10
10	0.5	P	0	1	G	13	13	Y	P	0	0	6.3	5.9	6.3	5	0	0	0
22.4	2.8	P	16	1	P	16	10	Y	P	0	0	5.1	5.9	6.6	7.7	5.1	4.2	0
7.2	0.5	G	0	1	P	10	8	Y	P	0	0	6.6	6.6	6.5	6.7	0	0	0
0	1	P	0	1	P	13	13	Y	B	0	0	5.5	5.3	5.3	0	0	0	0
7.8	1.3	G	11	1.3	G	8	10	Y	B	0	0	5.1	4.9	4	0	0	0	0
22.4	0.8	G	22.2	1.3	G	16	16	Y	R	22	10	6.4	7.3	6.6	5.9	3.3	0	0
16.6	0.6	G	21.2	0.8	P	19	19	Y	P	0	0	7.2	6.8	5.7	5.9	6.3	4.4	0
8.9	1	G	10.3	0.6	G	20	20	Y	P	0	0	5	4.2	3.2	0	0	0	0
18.4	0.6	G	21.3	0.3	G	19	22	Y	R	29	38	4.4	5.6	6.3	6.7	5.3	0	0
0	1	G	0	1	G	20	20	Y	P	0	0	6.4	8	7.4	7.2	6.4	0	0
11.5	0.5	G	14.3	0.3	G	19	19	Y	P	0	0	5.9	5.9	5.6	5.7	5	3.6	0
10.5	0.3	G	11.4	0.4	G	20	20	Y	P	0	0	5.3	6	6	0	0	0	0
7.4	0.6	P	0	1	P	19	19	U	B	13	0	5.8	5.9	0	0	0	0	0

10	0.6	P	20	0.4	P	19	19	U	B	0	0	6.4	0	0	0	0	0	0
0	1	P	0	1	P	13	13	U	B	0	0	4.1	0	0	0	0	0	0
9	1	G	19.8	1.5	G	19	22	Y	P	0	0	6.5	6.5	6.9	6.8	6.9	0	0
27.6	0.4	G	20.2	0.6	G	25	25	Y	P	19	16	7.2	7.6	8.6	6.7	5.5	4.9	4.6
22.3	1.1	G	21.9	0.7	P	25	22	Y	R	16	14	5.9	6.2	6.4	6.1	6.8	5.5	0
17.6	0.9	G	18.1	1.2	G	19	19	Y	R	19	22	4.9	5.7	7.3	4.2	0	0	0
8.9	0.3	P	10.2	0.3	G	18	13	Y	P	0	0	5.1	4	0	0	0	0	0
12.6	2.5	G	16	2.6	G	13	16	Y	P	0	0	5.7	5.8	6.3	5	4.2	0	0
10.2	1.2	G	8.5	1.1	G	10	10	Y	P	0	0	4.6	4.7	5.2	4.4	0	0	0
14.2	0.3	P	14.1	0.9	G	13	16	7	P	0	0	5.9	5.7	6	5.6	5.7	5.8	5.2
28.1	1.7	G	28	1.7	G	40	32	Y	B	0	0	7.3	8.3	9.8	8.8	6.8	6.3	0
25.4	0.8	G	27.6	0.4	P	23	18	Y	R	0	0	8.5	7.6	7.9	6.7	5.2	0	0
1	0	P	27.8	0.5	P	30	0	Y	B	0	0	5.9	5.8	6.1	4.9	4.8	5.4	5.7
31.2	1	G	30.8	0.8	P	38	33	Y	B	0	0	6.8	8.6	8.1	8.2	7.6	6.5	6.8
24.5	0.9	P	26	0.8	P	25	28	Y	B	0	0	6.6	7.4	7.8	7.1	7.9	7.2	5.3
24	0.7	P	32.2	2	G	20	8	Y	P	0	0	5.6	7	7.3	6.6	5.1	4.8	0
0	1	G	0	1	G	20	20	Y	R	17	15	4.6	5.5	5.2	0	0	0	0
24.5	0.4	G	17	0.3	G	42	41	U	P	35	34	4.8	6.3	6.7	8.1	8.1	7.1	7.5
0	1	P	0	1	G	10	25	Y	P	15	14	5	5.8	6.4	5.3	3.3	0	0
23	1.1	G	22.7	0.8	G	26	31	Y	R	13	0	5	7.7	7.9	8.8	6.9	0	0
9.5	2.2	G	8.8	2.6	G	14	13	Y	P	0	0	4.3	3.1	0	0	0	0	0
9.9	1.9	G	6.5	0.9	P	11	10	Y	P	0	0	4.9	4	0	0	0	0	0
9.9	2.6	G	11.8	2.9	G	14	12	Y	B	0	0	6.3	5.9	4.8	0	0	0	0
9.6	1.3	G	9	1	G	12	10	Y	P	0	0	6.1	6.7	6	0	0	0	0
9.4	1.7	G	8.8	1.3	G	10	9	Y	P	0	0	5.7	6.5	6	7	5.4	0	0
12.3	2.4	G	13.8	3.1	G	13	12	Y	P	0	0	7.6	8.2	6.9	7.7	4.8	0	0
10.3	1.3	G	11.7	1.7	G	13	11	Y	P	0	0	5.9	8.7	5.2	0	0	0	0
10.4	1.7	G	9.4	1.3	G	10	10	Y	P	0	0	6	6.1	5	0	0	0	0
11.6	1.4	G	12.4	1.8	G	14	14	Y	P	0	0	5.3	5.6	5.9	0	0	0	0
9.3	2.4	G	10.9	2.3	G	9	8	Y	P	0	0	6.6	8	8	8.2	3.7	0	0
9.1	1.8	G	9.1	2	G	9	8	Y	P	0	0	5.3	6.4	7	0	0	0	0
9	2.3	G	8.4	1.8	G	8	8	Y	P	0	0	6.3	6.8	5.4	0	0	0	0
26.4	1.7	G	26.9	2.2	G	13	11	Y	P	0	0	5	5	3.4	4.1	4.1	0	0
11.9	0.4	G	18.9	0.2	G	12	9	Y	P	0	0	5	4.8	4.2	0	0	0	0
14.3	1	G	13.6	0.6	G	14	13	Y	P	0	0	5.6	7.7	5.7	0	0	0	0
13.3	1	G	13.9	0.7	G	15	14	Y	P	0	0	4.7	6.3	5.6	0	0	0	0
0	1	P	11.4	0.3	G	13	0	Y	P	0	0	6	6.5	6.5	4.6	0	0	0
12	0.4	G	14.6	0.8	G	9	8	Y	P	0	0	9.3	8	7.4	0	0	0	0
15.7	0.6	P	17.5	0.6	P	17	22	Y	B	0	0	6.1	5.5	0	0	0	0	0
11.4	0.4	G	13.4	0.3	G	18	17	Y	P	0	0	5	5.6	5.2	5.5	5.1	4.9	0
22.5	1.5	G	15.7	0.8	G	29	26	Y	R	0	0	6.7	7.4	7	7.3	8.8	7.2	6.7
18.9	1.2	G	21	1.7	G	23	22	Y	B	0	0	7	8.1	7.8	6.5	0	0	0
38.6	1	G	34.7	1	G	33	36	Y	B	0	0	7.2	7.6	8	8.9	9.8	0	0
20.1	0.9	P	7.9	0.3	P	22	20	Y	P	15	0	7.4	9.3	9.2	8.6	8.5	8.3	7.3
45.4	1.9	P	35.1	0.9	P	38	42	U	B	0	0	8.1	9.5	10.1	9.9	0	0	0
0	1	P	0	1	P	28	25	U	B	0	0	8.1	8.2	9	8.6	8.5	7.1	0
17.7	0.4	G	21.3	0.7	P	30	22	Y	P	0	0	6	7.3	6.4	5.7	5	3.6	0
14.8	1	P	0	1	P	15	19	Y	B	0	0	4.5	5.3	6.1	7	6.2	0	0
25	2.9	P	0	1	P	18	6	Y	B	0	0	7.5	8.4	0	0	0	0	0
25.7	2.4	P	37.2	2.3	P	18	16	Y	B	0	0	4.8	5.2	4.3	4.1	0	0	0
11.6	1	G	10.8	0.5	P	14	13	Y	P	0	0	4.7	5.3	5.8	6.2	0	0	0
23.8	1.4	G	40.8	1.9	P	25	28	Y	B	0	0	6.7	6.8	8.1	8.8	0	0	0
21.3	1.8	P	29.6	1.6	P	21	20	Y	B	0	0	7.5	7.7	7.9	0	0	0	0
19.1	1.6	P	20	0.5	G	20	20	Y	B	0	0	7.7	5.6	5.3	0	0	0	0
31.1	0.9	P	21.5	0.8	P	27	37	Y	B	0	0	5.5	5.3	5.1	4.5	0	0	0
16.3	0.8	G	17.4	0.6	G	19	16	Y	B	0	0	7.1	5.8	5.1	0	0	0	0
25.1	1.1	G	24.8	0.8	P	25	0	Y	P	0	0	6.1	5.9	6.8	7.2	5.6	4.6	2.9
26.2	1.2	G	19.7	1.3	P	30	22	Y	P	0	0	5.6	6.5	7.3	7.8	6	6	5.7
19.3	0.6	G	0	1	P	23	13	Y	P	0	0	5.8	5.6	4.8	5.5	4.7	4.4	0
29.5	1.6	G	16.2	0.4	P	30	30	Y	B	0	0	6.6	5.4	5.3	0	0	0	0
23.5	0.4	G	21.1	0.4	P	30	25	U	B	0	0	5.6	6.3	0	0	0	0	0
27.6	1.3	G	30.5	1.6	P	27	34	Y	B	14	0	5.8	6.3	6.9	5.8	0	0	0

18.4	0.6	P	23.3	0.6	G	17	22	Y	P	0	0	4.4	6.4	6	5.2	3.1	0	0
11.2	0.3	G	0	1	G	18	22	Y	P	15	0	6.5	7.7	7.3	7.9	7	5.6	5.6
29.4	1.5	G	26	0.8	G	28	21	Y	P	15	12	5.1	6	6.7	5	4.3	0	0
29.2	2.5	G	20.7	1.8	P	22	22	Y	P	16	18	4.8	5.3	5.6	5.7	4.9	0	0
31	2.5	G	34.3	3.4	G	25	18	Y	P	0	0	6	6.8	5.9	6.6	7.1	6.1	5.6
34.7	0.6	G	22.6	0.7	G	38	35	Y	P	0	0	6.7	6.3	5.3	6	6.1	5.9	0
38.8	1.1	G	25.3	1.5	G	38	30	Y	P	0	0	5.2	6.8	8.3	6.2	6.4	6.4	5.8
19.3	0.5	G	17.4	0.6	G	21	27	Y	P	0	0	6	6	5.7	6.4	6.9	0	0
25.5	0.8	G	27.4	1.5	G	12	18	Y	P	0	0	4.8	5.8	4.5	3.7	0	0	0
26.1	2	G	25	0.6	P	30	29	Y	P	14	18	4.8	4.9	5.8	5.1	0	0	0
26.9	2.4	G	26	2.3	P	25	24	Y	P	16	15	4.8	6.5	6.3	5.9	4.5	3.9	0
17.9	0.7	G	17.7	1.6	G	12	11	Y	P	0	0	5.9	6.4	6.4	5.1	4.3	0	0
24.9	0.7	G	25.7	0.6	G	28	27	Y	P	0	0	5.4	5.8	6.1	6.8	6.7	5.2	0
29.7	1.1	G	28.2	1.7	G	31	31	Y	P	0	0	5.1	5.2	6	5.9	5.3	0	0
23.4	1.4	G	27.3	0.8	P	18	16	Y	P	0	0	5.8	4.9	4.7	5.7	5.1	0	0
21.9	1	G	19.5	1.3	G	25	36	Y	P	0	0	7.9	8.7	7.7	7.5	6.9	6.8	0
20.2	0.5	G	19.3	0.6	G	25	25	Y	P	0	0	6.4	7.6	7.8	7.5	6.4	6.2	3.3
28.4	0.6	G	27.4	0.6	G	41	40	Y	P	0	0	8.5	9.2	9.4	8.3	8.3	8	6.4
22.1	1.1	G	23.1	0.4	P	32	22	Y	P	0	0	7.4	7.7	8.7	8.7	9	9	8.1
12.3	0.6	G	25.1	0.8	G	15	5	Y	P	0	0	4.4	6.1	5.7	6.2	4.4	2.9	0
18.4	1	P	19	1.5	G	20	18	Y	P	0	0	5.7	6	5.7	4.1	0	0	0
12.4	0.7	G	17.6	0.6	G	20	18	Y	P	0	0	4.4	4.7	4.5	4.4	0	0	0
5.6	0.2	G	0	1	G	13	12	Y	P	0	0	6.4	8.1	6.8	4.4	0	0	0
27.5	1.6	G	25.4	1.3	G	30	22	Y	R	18	0	5.5	6.3	6.8	5.2	2.7	0	0
32.1	0.6	G	34.1	1	G	28	32	Y	P	0	0	4.9	5.9	6.1	5.3	5.3	5	4.1
16.7	0.7	P	16.3	0.3	P	10	13	Y	P	0	0	6.6	6.8	6.4	5.9	5.7	4.9	0
19.4	0.9	G	19.3	0.8	G	22	20	Y	P	0	0	4.6	6.8	6.5	7.9	6.4	5.8	0
17.1	1.2	G	23	1.1	G	20	13	Y	R	0	0	6	6.4	7.3	5.4	0	0	0
21.4	1.3	G	19.3	0.9	P	20	0	Y	P	0	0	6.3	6.8	6	7.3	4.5	0	0
22	0.8	G	25.5	0.6	G	25	30	Y	P	0	0	7.3	8.5	8.6	8	7.6	6.8	5
26	1.5	G	24.3	1.2	G	32	30	Y	P	0	0	7.3	7.3	7.1	6.9	6.5	5	0
22.3	1.7	G	23.6	1.2	G	20	15	Y	P	0	0	4.7	6.7	6.9	6.6	5.9	4.5	0
24	2.3	G	24	1.6	G	25	20	Y	P	0	0	5.9	6.4	6.1	6.4	6.7	6.6	0
25.3	1.7	G	23.7	2.1	G	15	18	Y	P	0	0	5.1	4.5	5.4	4.3	3.5	0	0
18.9	0.9	G	21.2	1.3	G	22	18	Y	P	0	0	7.4	7.9	6.1	6	4.2	2.5	0
35.7	3	G	25.7	2.5	G	21	18	Y	P	0	0	4.4	6.5	6.3	5	4.2	1.9	0
37.4	2.3	G	27.5	1.9	G	27	17	Y	P	0	0	6	6	6.2	6.4	7.7	5.3	4.8
45.3	3.2	G	48.3	2.9	G	35	35	Y	P	0	0	7.8	8.7	7.4	6.6	6.2	6.3	6.3
64.1	1.1	G	28.7	0.5	G	40	45	Y	P	0	0	6.3	8.5	8.7	10	10.7	9.7	9.1
22.7	1.3	G	23.4	1	P	10	10	Y	P	0	0	8	7.9	7.5	8.7	8.8	8.2	8.6
10.5	0.4	G	0	1	G	10	10	Y	R	0	0	4.9	6	5.2	2	0	0	0
44.3	2.5	P	45.5	1.5	P	14	21	U	B	0	0	4.6	5.6	7.2	5.6	0	0	0
38.9	1.2	G	55.6	1.9	P	30	23	U	B	0	0	7.7	7.6	7.1	6.9	0	0	0
20.3	1.1	G	16.6	0.4	G	21	25	Y	P	0	0	6.2	7.7	7.7	8.3	8.4	8.2	7.3
28.9	1.3	G	29	1.4	G	32	25	Y	P	0	0	8.1	8.9	8	7.9	7.8	6.7	6.3
22.7	1.6	G	30.5	2.2	G	25	23	Y	P	0	0	5.1	6.2	6.4	5.8	5.1	2.8	0
21.5	0.8	G	31.8	1.1	G	25	23	Y	P	0	0	6.3	7.2	7.4	6.7	6	0	0
16.5	0.9	G	11.4	0.3	G	15	18	Y	P	0	0	5	5	6.8	6.8	5.8	5	3.9
29.1	0.8	G	18	0.4	G	28	34	Y	P	0	0	6.9	7.2	7	6.2	5.6	5.5	0
19.9	0.4	P	18.8	0.8	G	20	18	Y	P	0	0	7.2	6.6	6.7	7.2	6.2	5.6	3.3
0	1	G	18.6	0.7	G	25	23	Y	R	0	0	6.1	5.8	5	4.9	5.2	4.7	0
24	2.3	G	28	1	G	28	28	Y	P	0	0	4.8	5.4	6.7	6.7	5.6	7	6.2
12.7	1.3	P	0	1	G	30	30	Y	P	0	0	6.2	7.1	7.2	5.8	5.7	6.6	6.6
15.4	0.4	G	31.9	1.1	G	37	35	Y	P	0	0	7.1	9	10.1	9.1	10.2	8.5	7.5
65.8	2.5	G	50	2.1	G	35	38	Y	P	0	0	7.4	9	9.4	9.4	9.6	10	8.8
19.8	0.8	G	13.9	0.5	G	27	23	Y	P	0	0	6.2	5.9	6	4.4	2.7	0	0
26.1	1.2	G	28.4	1.9	G	25	23	Y	P	0	0	7.2	6	4.9	4.6	3.7	0	0
24.3	1.1	G	21.2	1.1	G	27	22	Y	P	0	0	4.4	5.2	4.8	4.7	3.5	2.9	0
19.4	1.3	G	25.1	1.5	G	28	16	Y	P	0	0	7.3	5.9	5.8	5.4	3.4	0	0
29	0.6	G	33	1	G	28	22	Y	P	0	0	7.3	6.9	6.7	7.4	7.1	6.2	0
37.8	2.3	G	36.7	1.1	G	30	30	Y	P	0	0	5.9	5.7	5.1	7.1	6.8	6.5	5.5
32.3	2.5	G	31.4	1.5	G	32	25	Y	P	0	0	5.4	4.9	5	6	6.6	5.8	0

25	1.2	G	24.1	0.8	G	28	28	Y	P	0	0	6.3	6.6	6.9	7.2	8.7	9.7	7.2
14.1	1	G	17.1	0.4	G	16	19	Y	P	0	0	6.6	8.4	9.2	7.5	6.8	6.6	4.9
33.4	1.4	G	31.7	1.5	P	20	16	Y	P	0	0	7.2	7.5	6.1	6.5	5.4	0	0
27.3	1.1	G	19.3	1.4	G	25	18	Y	P	0	0	6.6	7.8	7.9	8	5.8	5.4	0
32.7	4.2	G	31.4	2.5	G	26	31	Y	P	0	0	7.5	8.2	7.7	8.1	8.5	8.1	5.6
20.2	1	G	26	0.5	G	28	25	Y	P	18	0	6.5	6.8	6.4	6.7	6.8	6.2	4.3
21.1	0.9	G	17.9	0.9	G	23	22	Y	P	0	0	7.1	6.7	7.5	8.2	8	7.5	6
16.8	0.4	P	0	1	P	16	15	Y	R	20	13	5.6	5.6	5.9	6.1	4.5	0	0
21.8	1	P	18.2	0.8	G	23	20	Y	P	12	0	5.6	5.7	5.4	4.4	0	0	0
0	1	G	0	1	G	47	45	U	P	32	38	7.2	7	7.2	9.1	8.9	8.5	8.5
26.5	1	G	27.3	0.6	G	28	28	U	B	13	0	5.3	6.7	6.5	6.9	4.1	0	0
28.1	1.5	G	25.2	1.3	G	30	28	Y	P	0	0	6.6	7.8	7.6	8.7	5.6	0	0
0	1	P	27.9	1.9	P	25	2	U	B	0	0	6.7	7.9	0	0	0	0	0
0	1	P	24.3	0.8	P	35	23	U	B	0	0	8.4	7.1	0	0	0	0	0
32.2	1.5	G	20.5	0.4	P	23	30	Y	B	0	0	7.8	8.6	8.5	6.7	6.3	0	0
31.2	0.9	G	31.7	1.2	P	27	25	Y	B	0	0	6.9	6.4	6.6	0	0	0	0
22.4	0.5	G	35.6	1	G	27	20	U	B	0	0	6	6.6	6.4	0	0	0	0
22.3	2	P	20.8	1.4	P	24	22	U	B	0	0	5.8	6.4	0	0	0	0	0
0	1	G	0	1	G	16	20	Y	P	0	0	6	4.5	4.5	0	0	0	0
19	0.4	G	0	1	P	21	19	Y	R	0	0	6.1	7.7	8.2	6	4.5	0	0
24.6	0.8	P	27.6	0.5	P	30	23	U	B	0	0	5.2	3.2	3.9	0	0	0	0
29.6	1.4	P	19.4	1	P	28	21	Y	B	0	0	5.2	7.1	8.3	0	0	0	0
21.3	1.1	P	20.1	0.7	P	20	18	U	B	0	0	4.9	5.3	0	0	0	0	0
13.7	1.2	P	15.9	0.8	G	20	16	U	B	0	0	5.4	5.8	0	0	0	0	0
27.8	1.4	P	11.6	0.9	P	13	18	U	B	0	0	5.4	5.4	5.8	0	0	0	0
26	1.6	P	26.6	0.6	P	13	21	U	B	0	0	5.3	6.7	0	0	0	0	0
40.2	0.6	G	42.7	0.6	G	22	22	U	B	0	0	6.5	7.1	7.7	7.7	7.8	7.3	0
23.6	1.4	G	22.2	1.3	P	22	20	U	B	0	0	7	5.9	0	0	0	0	0
26	1	P	24.1	0.9	P	33	30	Y	B	0	0	6.6	7.7	8.9	0	0	0	0
0	1	P	23.7	0.5	P	15	25	U	B	0	0	5.9	6.5	0	0	0	0	0
23.4	0.7	P	25.7	2.5	P	25	28	U	B	0	0	6.5	7.7	8.9	0	0	0	0
28.2	1.5	G	20.8	0.9	G	18	25	U	B	0	0	5.8	7.4	7.6	5.2	0	0	0
26	1.7	P	26.6	1.3	P	30	27	U	B	0	0	60	5.9	5.5	0	0	0	0
14.8	1	G	28.8	1.2	G	25	9	U	B	0	0	6.2	7.1	6.8	6.8	5.7	0	0
10.8	1.4	G	11.2	1.1	G	13	12	U	B	0	0	5	6.5	0	0	0	0	0
17.1	1.9	P	18.7	2	P	25	18	U	B	0	0	6.5	8.4	0	0	0	0	0
0	1	P	21	0.4	P	23	22	U	B	0	0	6.7	7.7	8.2	0	0	0	0
0	1	P	15.2	0.8	P	19	15	U	B	0	0	6.4	7.8	7.4	0	0	0	0
18.6	0.6	P	0	1	P	18	28	U	B	0	0	4.9	5.2	5.4	0	0	0	0
51.1	2.7	P	19.7	1.3	P	24	23	U	B	0	0	7.4	7.3	8.4	8.5	8	0	0
42	1.1	P	49.4	1.4	P	40	43	U	B	0	0	8.6	8.9	9.2	9.7	9.4	8.1	0
33.4	2.8	G	30.8	1.4	G	35	32	U	B	0	0	6.3	6.6	7.1	8	5.9	0	0
47.7	2.2	P	44	1	G	38	32	Y	B	0	0	6.5	7.5	8.2	9.5	8.9	0	0
41	1.2	G	48.2	2.7	P	30	22	U	B	0	0	6.7	8.1	7.5	7.8	9.4	12	13
14.1	0.6	G	13.8	0.6	G	17	17	U	B	0	0	6.1	6.8	5	0	0	0	0
10.1	2.5	G	8.3	3.5	G	12	10	Y	P	0	0	8.4	8.8	7.6	8.2	5.2	0	0
12.3	4.6	G	11.8	4.6	G	13	12	Y	P	0	0	7.4	7.2	7.5	7.6	5.7	0	0
6.3	2.2	G	8.8	2.3	G	8	7	Y	P	0	0	6.7	7.4	6.9	3.9	0	0	0
6.4	2	G	7.8	1.7	G	8	6	Y	P	21	0	5.9	6.8	4.7	0	0	0	0
5.6	3.1	G	6.8	2.8	G	8	5	Y	P	0	0	4.5	5.6	5.2	2.8	0	0	0
9.2	2.4	G	8.8	3.3	G	10	10	Y	P	0	0	6.5	7.3	6.9	2.9	0	0	0
10.5	3.3	G	11.8	3.1	G	12	10	Y	P	0	0	6.5	6.6	7.3	5.7	5.7	4.2	0
10.6	2.4	G	9.3	2.3	G	10	9	Y	P	0	0	7.1	7.8	8.2	6	5.3	0	0
19.2	1.1	G	26.3	1.3	G	15	20	Y	P	0	0	6.1	6.4	6.3	5.9	4.1	0	0
5.7	0.4	G	7	0.4	G	22	16	Y	P	0	0	4.8	4.7	5.1	5.1	0	0	0
5.6	0.3	G	11.4	0.5	G	15	12	Y	P	0	0	6.3	6.2	5.2	5.2	0	0	0
0	1	G	0	1	G	16	14	Y	P	0	0	4.9	6.4	5.2	5.9	4.3	0	0
21.6	0.8	P	20.8	0.4	P	22	20	U	B	0	0	8.2	8.3	7.5	0	0	0	0
36.2	1.7	P	37.8	1.7	P	25	30	U	B	0	0	7.9	8.4	7.3	0	0	0	0
0	1	P	10.6	0.5	P	30	15	U	B	0	0	7.6	6.9	0	0	0	0	0
17.9	1	P	20.5	0.7	G	26	20	U	R	0	0	8.1	8	8.1	0	0	0	0
0	1	G	30.5	0.8	G	25	21	Y	P	0	0	5.9	7.1	6	6.7	6.1	5.5	6

23.9	1	G	15.3	0.9	G	17	16	Y	R	0	0	5.1	5.4	6.7	5.4	0	0	0
25.4	0.8	G	30.2	0.9	G	18	14	Y	P	0	0	4.8	5.7	5.4	5.2	5.4	3.8	0
10.5	0.3	G	0	1	G	18	16	Y	P	0	0	5.9	5.6	5.7	5.4	5.9	4.2	0
13	0.9	G	15.5	0.9	G	17	16	Y	P	0	0	5.5	5.5	5.8	6	5.3	5.5	4.5
9.8	0.7	G	9.7	0.8	G	12	10	Y	P	0	0	5.1	5.1	5.6	5.7	0	0	0
0	1	G	0	1	G	20	12	Y	P	0	0	6	6.5	6	4.7	0	0	0
12.2	0.6	G	6.9	0.4	G	12	15	Y	P	0	0	5.3	6.5	6.5	4.9	0	0	0
8.7	0.6	G	8.9	0.3	G	13	12	Y	P	0	0	5.7	6.1	5.2	4.6	3.6	0	0
22.7	0.4	G	19.9	0.9	G	18	15	Y	P	0	0	5.1	6.1	6.1	6.5	5.7	0	0
10.6	0.3	P	8.7	0.6	G	13	13	Y	P	0	0	5.3	6.6	6.4	0	0	0	0
9.9	0.3	G	9.1	0.5	G	12	10	Y	P	0	0	5.4	4.9	4	0	0	0	0
21.5	1	G	24	0.8	G	27	25	Y	P	0	0	5.1	5.2	4.8	4.6	0	0	0
21.1	1.8	P	25.5	2.2	G	21	27	Y	P	0	0	5.6	6.1	5.8	4.5	3.6	0	0
25.8	1	G	29.4	1.1	G	20	20	Y	P	0	0	0	0	0	0	0	0	0
34.5	2.6	G	42.3	2.1	P	20	20	Y	P	0	0	4.5	5	5	5	5	5.6	4.2
35.1	1.8	P	36.4	1.4	G	28	20	Y	P	0	0	7.3	8.1	8.7	8.3	7.4	6.4	5.7
40.1	1.5	G	33.6	0.5	G	25	22	Y	P	0	0	5.6	5.4	6.7	7.5	7.9	7.7	8.3
22.4	0.7	G	22.9	0.5	G	25	15	Y	P	0	0	5.3	5.8	6.3	6.4	7.4	6	6.3
11.8	1.1	G	9.7	1.6	G	11	10	Y	P	0	0	6.7	7.9	7.8	7.7	6	6.4	0
24.6	1	G	22	0.6	G	26	25	Y	P	0	0	6.4	6.9	7.6	7.6	7.1	5.7	0
19.6	1.2	G	23.6	0.8	G	20	18	Y	P	0	0	5.7	6.7	6.1	3.9	0	0	0
15.8	0.3	G	22	0.4	G	22	20	Y	P	0	0	6.7	6.6	6.2	7.4	0	0	0
18.3	0.6	G	15.8	0.6	P	20	30	Y	P	0	0	6.2	6.4	7.4	5.2	4.1	3.5	0
33.2	1.2	G	30.4	1.2	G	32	35	Y	R	21	0	5.7	6.1	7.5	8.4	7.3	0	0
21.9	0.8	P	29.2	1	G	23	22	Y	P	18	0	5.2	7.2	7.8	7.2	7.4	6.5	5.9
20.9	1.2	G	20.2	0.5	G	23	18	Y	R	18	0	6.9	7	7.3	5.7	0	0	0
0	1	G	0	1	G	17	24	Y	P	0	0	6.5	6.3	6.3	4.2	0	0	0
27.4	1.3	G	25.3	1.4	G	16	15	Y	R	0	0	6.1	6.3	7.3	6.3	6	0	0
18.7	0.7	G	20.3	0.5	G	15	15	Y	P	0	0	4.9	4.7	4.9	4.8	4.5	3.1	0
18.7	1.2	G	15.6	1.3	G	20	16	Y	P	0	0	7.2	7.5	6	5.3	4.2	0	0
16.2	0.2	G	12	0.2	G	18	17	Y	P	16	0	6.3	5.9	6.1	4.9	5.5	5.7	0
0	1	G	0	1	G	15	18	Y	R	0	0	5.9	7.2	6.5	6.2	4.4	0	0
27	2.5	G	26.9	2.8	G	21	26	Y	P	0	0	7.3	8.1	7.6	7.3	5.1	0	0
37	1.8	G	29.5	1.4	G	28	25	Y	P	0	0	6.6	7.2	5.9	7.1	6.9	5.4	0
0	1	G	10.4	0.7	G	20	18	Y	P	0	0	6.3	6.7	6.3	5.2	4.5	0	0
7.6	2.4	G	7.5	1.6	G	10	10	Y	P	0	0	6.1	7.1	7.3	7.32	6.9	0	0
9.7	1.8	G	10.2	2.2	G	10	10	Y	P	0	0	5	4.6	4.8	5.3	3.7	0	0
8.3	1.6	G	12.7	1.9	G	13	11	Y	P	0	0	6.3	7.5	8.5	7.1	7.3	0	0
11.3	2.8	G	8.5	2	G	12	12	Y	R	0	0	5.8	7.4	7.5	7.6	6.6	0	0
7	1.7	G	8.6	1.8	G	7	7	Y	P	0	0	5.3	7.8	7.5	4.3	0	0	0
9.9	2.2	G	10.6	2.8	G	10	10	Y	P	0	0	6.5	6.6	6.5	7.8	3.8	0	0
10.4	1.4	G	9.7	1.4	G	11	11	Y	P	0	0	6.6	7.4	7.7	6.7	0	0	0
9.4	1.2	P	10.7	1.9	G	10	10	Y	P	0	0	5.4	6.8	6.6	0	0	0	0
10.1	0.6	P	13.4	0.8	P	15	15	U	B	0	0	4.9	0	0	0	0	0	0
15.1	1.4	G	13.3	1.1	G	15	13	Y	P	0	0	5.7	6.9	6.3	5.9	5.2	0	0

T80	T90	T100	Av Th	STD th	Location	Region	Lat	Long
2.5	0	0	5.871	0.739	SANTA FE #1	SS	29.871915	-82.59001
5.9	3.7	2.7	5.975	0.819	SANTA FE #3	SS	29.869899	-82.589515
0	0	0	8.14	0.808	LAKE LOCHLOOSA	SJ	29.49	-82.14
0	0	0	6.383	0.556	STAFFORD'S ISLAND	SS	29.19	-82.78
0	0	0	6.367	0.3	STAFFORD'S ISLAND	SS	29.19	-82.78
0	0	0	4.725	0.467	SANTA FE #2	SS	29.845563	-82.632085
2.7	0	0	4.571	0.976	STEINHATCHEE	SS	29.74	-83.34
6.2	4.7	0	6.6	0.45	SANTA FE #2	SS	29.845563	-82.632085
0	0	0	6.025	0.275	MARION PT.	SS	29.847291	-82.6174
0	0	0	5.4	0.4	WACISSA PT.	SS	29.851323	-82.62268
6.5	5.7	3.9	7.022	0.613	SANTA FE #2	SS	29.845563	-82.632085
4.7	4.5	2	7.386	0.678	WACISSA PT.	SS	29.851323	-82.62268
4.7	0	0	6.886	0.588	WACISSA PT.	SS	29.851323	-82.62268
0	0	0	6.783	0.856	SANTA FE #4	SS	29.847435	-82.631622
0	0	0	6.34	0.833	WACASSASSA	SS	29.24	-82.75
0	0	0	5.1	1.432	SANTA FE #3	SS	29.869899	-82.589515
4.3	0	0	6.471	1.09	WACISSA PT.	SS	29.851323	-82.62268
0	0	0	6.025	0.413	SANTA FE #3	SS	29.869899	-82.589515
10	7.9	7.2	8.19	0.492	SUNSHINE STATE	SJ	29.34	-81.89
0	0	0	6.6	0.7	SANTA FE #4	SS	29.847435	-82.631622
0	0	0	6.867	0.956	SUNDAY BLUFF	SJ	29.34	-81.89
0	0	0	4.175	0.475	RAPIDS	A	30.273321	-83.970339
6.3	5.9	4.7	6.756	0.795	SANTA FE #4	SS	29.847435	-82.631622
7.4	7.5	2	7.589	0.543	SANTA FE #1	SS	29.871915	-82.59001
0	0	0	6.78	0.544	MARION PT.	SS	29.847291	-82.6174
0	0	0	5.725	0.225	SANTA FE #3	SS	29.869899	-82.589515
0	0	0	5.94	0.216	MARION PT.	SS	29.847291	-82.6174
0	0	0	6.36	0.368	SANTA FE #3	SS	29.869899	-82.589515
0	0	0	7.02	0.568	WACISSA PT.	SS	29.851323	-82.62268
3.7	2.2	0	6.243	0.278	STROZIER'S CAMP	SS	29.83	-82.6
0	0	0	5.32	0.696	MARION PT.	SS	29.847291	-82.6174
0	0	0	4.625	0.311	FT. WHITE	SS	29.9	-82.77
0	0	0	5.2	0.7	SANTA FE #3	SS	29.869899	-82.589515
0	0	0	5.367	0.489	SANTA FE #4	SS	29.847435	-82.631622
0	0	0	5.6	0.68	WACASSASSA	SS	29.24	-82.75
0	0	0	6.283	0.25	SANTA FE #3	SS	29.869899	-82.589515
0	0	0	5.825	0.575	WACISSA PT.	SS	29.851323	-82.62268
0	0	0	6.925	1.012	SANTA FE RISE	SS	29.871915	-82.59001
0	0	0	5.28	0.264	WACISSA RAPIDS	A	30.273321	-83.970339
11.4	12	0	9.511	1.785	SANTA FE #1	SS	29.871915	-82.59001
0	0	0	7.4	0.5	SANTA FE #3	SS	29.869899	-82.589515
0	0	0	6.725	0.363	SANTA FE #3	SS	29.869899	-82.589515
0	0	0	8.383	1.55	SANTA FE #3	SS	29.869899	-82.589515
0	0	0	8.1	0.733	SANTA FE #3	SS	29.869899	-82.589515
0	0	0	7.05	0.283	SANTA FE #3	SS	29.869899	-82.589515
0	0	0	4.943	1.192	SANTA FE	SS	29.83	-82.6
5.3	0	0	6.7	0.475	CHIPOLA	C	30.73	-85.211
2.7	0	0	6.2	0.514	CHIPOLA	C	30.73	-85.211
0	0	0	7.786	0.935	BORROW PIT SR 40 TO ALTAMONTE SPRINGS	SJ	28.66	-81.35
0	0	0	6.46	0.512	SANTA FE	SS	29.83	-82.6
0	0	0	7.125	0.975	MARION CO.	SJ	29.19	-82.14
0	0	0	6.95	0.95	BORROW PIT SR 40 TO ALTAMONTE SP	SJ	28.66	-81.35
0	0	0	4.75	0.4	SANTA FE #3	SS	29.869899	-82.589515
0	0	0	4.36	0.712	SANTA FE #1	SS	29.871915	-82.59001
0	0	0	5.94	0.432	SANTA FE #3	SS	29.869899	-82.589515
0	0	0	4.95	0.4	MARION PT.	SS	29.847291	-82.6174
0	0	0	7.075	0.275	MARION PT.	SS	29.847291	-82.6174
0	0	0	5.54	0.232	MARION PT.	SS	29.847291	-82.6174
0	0	0	5.24	0.192	MARION PT.	SS	29.847291	-82.6174
0	0	0	6.26	0.592	HWY 27 BRIDGE	SS	29.841675	-82.630435
0	0	0	6.28	0.536	BEN'S BRIDGE	SS	29.917189	-82.771146

0	0	0	5.733	0.622	TELUN + SANTA FE	SS	29.897633	-82.17212
0	0	0	7.2	1.088	CRYSTAL RIVER	H	29.92	-82.52
0	0	0	4.08	0.264	BRANFORD	SS	25.95509	-82.930032
0	0	0	6.433	0.222	PRAIRE CREEK	SS	29.8	-82.49
0	0	0	6.7	0.48	WILSON'S SPRING	SS	29.54	-81.2416
0	0	0	6.217	0.36	27 BRIDGE	SS	29.841675	-82.630435
0	0	0	5.44	1.25	SUWANNEE VISTA	SS	30.09	-83.17
0	0	0	5.45	0.65	LOWER SANTA FE	SS	29.94	-82.81
3.5	2	0	7.429	1.139	CHIPOLA	C	30.73	-85.211
0	0	0	6.575	0.438	UPPER SUWANNEE	SS	30.38	-83.18
0	0	0	5.917	0.744	UPSTREAM 27	SS	29.842555	-82.631457
0	0	0	7.68	1.024	SILVER RIVER SP	SJ	29.21	-82.03
0	0	0	5.1	0.6	PERRY	A	30.12	-83.59
0	0	0	5.433	0.289	SUWANNEE	SJ	29.44	-81.93
3.5	0	0	6.914	0.567	SANTA FE #3	SS	29.869899	-82.589515
0	0	0	5.775	0.675	SUMPTER PT.	SS	29.856939	-82.620535
0	0	0	6.86	0.408	MARION PT.	SS	29.847291	-82.6174
0	0	0	7.425	1.125	SANTA FE #3	SS	29.869899	-82.589515
0	0	0	5.75	0.15	STAFFORDS ISLAND	SS	29.19	-82.78
0	0	0	8.78	1.616	SANTA FE #4	SS	29.847435	-82.631622
0	0	0	5.25	0.45	SILVER SPRINGS CAVE	SJ	29.21	-82.03
0	0	0	5.55	0.517	SANTA FE	SS	29.83	-82.6
0	0	0	5.12	0.256	SANTA FE	SS	29.83	-82.6
0	0	0	6.643	0.482	MARIANNA	C	30.73	-85.211
0	0	0	6.683	0.389	SANTA FE	SS	29.83	-82.6
6	4	0	6.25	0.375	SANTA FE #2	SS	29.845563	-82.632085
0	0	0	4.7	0.2	SUMPTER PT.	SS	29.856939	-82.620535
0	0	0	5.54	0.338	SAVANNAH R. PT.	SS	29.854635	-82.620535
0	0	0	6.367	0.64	SANTA FE #3	SS	29.869899	-82.589515
5.6	0	0	6.05	1.4	SANTA FE #3	SS	29.869899	-82.589515
0	0	0	5.029	0.624	MARION PT.	SS	29.847291	-82.6174
0	0	0	5.233	0.867	WACISSA PT.	SS	29.851323	-82.62268
0	0	0	7.3	1.1	WACISSA PT.	SS	29.851323	-82.62268
0	0	0	8.267	0.511	SANTA FE #3	SS	29.869899	-82.589515
0	0	0	5.46	0.168	NEAR FT. WHITE	SS	29.93	-82.77
0	0	0	5.92	0.672	WACISSA PT.	SS	29.851323	-82.62268
2.5	0	0	6.5	0.64	SUMPTER PT.	SS	29.856939	-82.620535
0	0	0	6.433	0.578	SANTA FE #1	SS	29.871915	-82.59001
4.9	0	0	8.814	0.669	HIGH SPS. + RISE	SS	29.861115	-82.59298
0	0	0	5.575	0.363	WACISSA PT.	SS	29.851323	-82.62268
0	0	0	3.375	1.688	8LE73	A	30.43854	-84.4227
0	0	0	4.25	2.125	8LE73	A	30.43854	-84.4227
0	0	0	7.975	0.788	HILLSBORO	H	28.01	82.35
0	0	0	8.525	0.613	8HI507	H	28.0317	-82.34515
0	0	0	5.75	0.875	8HI507	H	28.0317	-82.34515
0	0	0	3.35	3.35	8HI507	H	28.0317	-82.34515
0	0	0	7.075	1.275	8HI507	H	28.0317	-82.34515
0	0	0	6.45	3.225	8DI 112	SS	29.81704	-82.93212
0	0	0	5.775	0.575	8CO15	SS	29.95968	-82.77193
0	0	0	6.6	0.5	Santa Fe Boat Launch/Ft. White	SS	29.917189	-82.771146
0	0	0	7.467	2.8	Suwannee R	SS	30.09	-83.17
0	0	0	8.067	3.025	Suwannee R	SS	30.38	-83.18
0	0	0	7.033	0.5	8GI20	SS	29.83234	-82.67427
4.8	4	1.9	7.483	0.263	8Je1004	A	30.19374	-83.97397
0	0	0	6.725	0.625	8Je1004	A	30.19374	-83.97397
0	0	0	5.929	0.1	8Je1004	A	30.19374	-83.97397
0	0	0	6.74	0.463	Hwy 98 & Wakulla River	A	30.23	-84.3
0	0	0	4.7	1.638	L. Miccasokee	A	30.5	-83.98
0	0	0	4.2	1.575	Tallahassee	A	30.48	-84.29
0	0	0	4.4	1.65	St. Marks Lighthouse	A	30.09	-84.18
4.3	0	0	5.743	0.225	Wacissa R.	A	30.2	-83.97
0	0	0	5.05	0.55	Half Mile Rise	A	30.1696	-83.95818

0	0	0	6.2	0.1	Below Goose Pasture	A	30.195143	-83.97204
0	0	0	4.92	0.125	Apalachicola	C	30.65	-84.89
0	0	0	5.56	0.4	Half Mile Rise	A	30.1696	-83.95818
0	0	0	6.725	0.388	above Half Mile Rise	A	30.156685	-83.95818
0	0	0	6.683	0.225	above I-10 bridge on Apalachicola	C	30.65	-84.89
0	0	0	5.667	2.125	Below Goose Pasture	A	30.195143	-83.97204
0	0	0	5.767	0.85	below Aspulaga landing	C	30.65	-84.89
0	0	0	7.05	0.775	Goose Pasture - Cow Creek	A	30.202605	-83.96973
5.8	5.8	0	6.989	0.775	Gaines Cr. Below I-10 above Bristol	C	30.44	-84.99
0	0	0	6.725	0.163	Near Branford	SS	29.97	-82.96
0	0	0	8.271	0.888	Near Branford	SS	29.97	-82.96
0	0	0	7.82	0.95	Near Branford	SS	29.97	-82.96
0	0	0	7.2	0.35	Near Branford	SS	29.97	-82.96
0	0	0	8.567	3.213	Near Branford	SS	29.97	-82.96
0	0	0	7.5	0.525	Near Branford	SS	29.97	-82.96
0	0	0	7.8	2.925	Near Branford	SS	29.97	-82.96
0	0	0	0	0	Near Branford	SS	29.95509	-82.930032
0	0	0	6.18	0.275	Near Branford	SS	29.97	-82.96
0	0	0	7.86	0.6	Near Branford	SS	29.97	-82.96
0	0	0	5.56	0.325	Ruth	SS	30.01	-82.98
0	0	0	5.833	0.75	Wacissa land	A	30.4	-83.96
0	0	0	6.94	0.225	Shingle	SS	29.96	-82.95
0	0	0	5.617	0.138	S. of Fanning Springs	SS	29.582505	-82.944351
0	0	0	4.575	0.438	Fl. Ga. Border	SS	30.64	-83.19
0	0	0	5.9	1.475	S. of Fanning Springs	SS	29.582505	-82.944351
5.7	5	4.2	6.078	0.225	Sandanista site	SS	29.94	-82.81
0	0	0	6.283	0.188	Wakulla R.	A	30.23	-84.3
0	0	0	7.433	1.65	above Wannee	SS	29.73	-82.94
0	0	0	7.18	1.025	Luraville-Branford, Dowling Park area	SS	30.07	-83.04
0	0	0	5.671	0.5	Santa Fe	SS	29.83	-82.6
0	0	0	6.95	0.675	Aucilla	A	30.13	-83.97
0	0	0	5.26	0.225	High Sp. Boat ramp btw bridges	SS	29.845563	-82.632085
0	0	0	6.15	0.425	Suwannee R?	SS	30.39	-83.2
0	0	0	6.76	0.575	above White Springs	SS	30.32	-82.74
0	0	0	5.733	0.462	1 mi. above Branford	SS	29.995557	-82.972772
0	0	0	4.68	0.05	Below Rt. 90, Ellaville	SS	30.38414	-83.177895
0	0	0	4.96	0.5	Palatka	SJ	29.67	-81.63
3	0	0	6.567	0.825	Luraville-Branford, Dowling Park area	SS	30.07	-83.04
0	0	0	6.68	0.325	probably Branford	SS	29.96	-82.93
5.3	0	0	6.771	0.85	U	SS	30.38	-83.18
6.3	5.7	0	6.267	0.613	Chipola	C	30.73	-85.211
0	0	0	6.76	0.25	N. Withlacochee	SS	30.55	-83.26
0	0	0	5.433	0.213	Santa Fe	SS	29.83	-82.6
2.9	0	0	5.74	0.3	Dowling Park	SS	30.244671	-83.244938
0	0	0	6.925	0.725	Mouth of Santa Fe	SS	29.88644	-82.878816
0	0	0	5.3	0.725	Btwn Tater Hill above Peacock Bridge	C	30.73	-85.211
0	0	0	5.725	0.613	Luraville Shoals, above Luraville Bridge	SS	30.098474	-83.17212
0	0	0	6.533	0.825	Silver River	SJ	29.21	-82.03
0	0	0	5.8	0.2	above Hwy. 27 bridge	SS	29.847435	-82.62169
0	0	0	6.4	0.25	Power Plant Shoals, below Ellaville	SS	30.38414	-83.177895
0	0	0	6.54	0.6	Brooksville, land find	H	28.56	-82.39
0	0	0	5.15	0.425	Palatka	SJ	29.67	-81.63
0	0	0	6.16	0.225	Palatka	SJ	29.67	-81.63
0	0	0	5.2	0.55	Ft. McComb above Branford	SS	30.01	-82.99
0	0	0	6.125	0.525	Power Plant Shoals, below Ellaville	SS	30.38414	-83.177895
0	0	0	6.1	0.35	probablynear Hollingsworth Bluff	SS	29.832747	-82.67637
0	0	0	4.95	0.275	Mouth of the Suwannee	SS	29.38	-83.18
0	0	0	6.075	0.175	Johnny Boyd Landing	C	30.73	-85.211
0	0	0	5.4	0.275	Peacock Slough, below Luraville	SS	30.103353	-83.14209
0	0	0	5.725	0.425	Clay Shoals, below Rt. 6	SS	30.48	-83.24
0	0	0	5.833	0.65	U	SS	30.07	-83.04
0	0	0	5.44	0.4	U	SS	29.83	-82.6

0	0	0	5.575	0.675	Peacock Slough, below Luraville	SS	30.103353	-83.14209
0	0	0	7.34	0.9	Homossassa	H	28.79	-82.61
0	0	0	6.36	0.65	Santa Fe	SS	29.83	-82.6
6	4.9	3.5	6.375	1.138	Luraville-Branford	SS	30.07	-83.04
0	0	0	8.017	0.438	U	H	28.03	-82.34
0	0	0	4.925	0.325	Willow Bend site below Rt. 6	SS	30.48	-83.24
0	0	0	6.433	0.15	U	SJ	29.21	-82.03
4.4	0	0	5.743	0.463	U	SS	30.55	-83.26
3.6	0	0	6.467	0.5	McComb Boat ramp above Branford a couple of miles	SS	30.01	-82.99
0	0	0	6.3	0.6	Mouth of Itchnetuckee	SS	29.948	-82.8161
0	0	0	6.425	0.525	U	SS	29.83	-82.6
0	0	0	4.467	1.675	Hillsborough Co.	H	28.01	-85.35
0	0	0	5.5	0.5	Dade City	H	28.27	-82.14
0	0	0	7.4	1.65	Drayton Island	SJ	29.35	-81.64
0	0	0	6.875	0.775	Lake George Pt.	SJ	29.37	-81.62
0	0	0	5.64	0.15	Lake George Pt.	SJ	29.37	-81.62
0	0	0	7.067	0.65	Lake George Pt.	SJ	29.37	-81.62
0	0	0	6.967	0.8	Lake George Pt.	SJ	29.37	-81.62
0	0	0	6.767	0.275	Lake George Pt.	SJ	29.37	-81.62
0	0	0	7.467	0.575	Lake George Pt.	SJ	29.37	-81.62
0	0	0	5.675	0.275	Lake George Pt.	SJ	29.37	-81.62
0	0	0	6.35	0.225	Lake George Pt.	SJ	29.37	-81.62
0	0	0	7.471	0.775	Lake George Pt.	SJ	29.37	-81.62
0	0	0	7.017	0.288	Lake George Pt.	SJ	29.37	-81.62
0	0	0	6.66	0.2	Lake George Pt.	SJ	29.37	-81.62
0	0	0	7	0.188	Lake George Pt.	SJ	29.37	-81.62
0	0	0	8.517	0.587	Lake George Pt.	SJ	29.37	-81.62
5.8	3.2	0	7.113	0.525	Lake George Pt.	SJ	29.37	-81.62
0	0	0	8.34	0.625	Lake George Pt.	SJ	29.37	-81.62
0	0	0	7.325	0.275	U	SS	30.38	-83.18
0	0	0	7.75	0.4	U	SS	30.07	-83.04
2.3	0	0	7.05	0.5	Tooke Lake	H	28.57	-82.55
6.2	4.7	0	8.557	0.6	Breezy Point	SJ	29.41	-81.49
0	0	0	8.66	1	N. of Palatka	SJ	29.67	-81.63
0	0	0	8.217	0.75	N. of Palatka	SJ	29.67	-81.63
0	0	0	7.067	2.65	Drayton Island	SJ	29.35	-81.64
0	0	0	7.4	2.775	Drayton Island	SJ	29.35	-81.64
0	0	0	4.95	1.95	N. of Palatka	SJ	29.67	-81.63
0	0	0	7.8	2.75	Lake George Pt.	SJ	29.37	-81.62
0	0	0	7.45	2.625	Lake George Pt.	SJ	29.37	-81.62
0	0	0	6.55	2.313	Lake George Pt.	SJ	29.37	-81.62
0	0	0	6.1	0.8	Lake George Pt.	SJ	29.37	-81.62
0	0	0	8.54	0.35	Lake George Pt.	SJ	29.37	-81.62
0	0	0	6.24	0.45	Lake George Pt.	SJ	29.37	-81.62
0	0	0	4.967	1.863	Lake George Pt.	SJ	29.37	-81.62
0	0	0	6.7	3.35	Lake George Pt.	SJ	29.37	-81.62
0	0	0	6.667	1.263	Lake George Pt.	SJ	29.37	-81.62
0	0	0	7.633	0.988	Lake George Pt.	SJ	29.37	-81.62
0	0	0	6.4	0.45	Lake George Pt.	SJ	29.37	-81.62
0	0	0	7.325	0.675	Lake George Pt.	SJ	29.37	-81.62
0	0	0	6.3	3.15	Lake George Pt.	SJ	29.37	-81.62
0	0	0	3.683	0.425	Lake George Pt.	SJ	29.37	-81.62
0	0	0	8.05	2.1	Breezy Point	SJ	29.41	-81.49
0	0	0	4	0.3	Breezy Point	SJ	29.41	-81.49
0	0	0	5.225	0.575	U	SJ	29.41	-81.49
0	0	0	5.5	0.6	U	SJ	29.41	-81.49
0	0	0	9.08	0.688	U	SJ	29.41	-81.49
0	0	0	8	2.738	U	SS	30.39	-83.2
0	0	0	5.8	2.175	U	SJ	29.41	-81.49
0	0	0	5.9	2.213	U	SJ	29.49	-82.14
0	0	0	5.417	0.325	Crescent Lake	SJ	29.41	-81.49
3.9	0	0	6.067	0.325	Crescent Lake	SJ	29.41	-81.49

2.8	0	0	8.229	0.588	Crescent Lake	SJ	29.41	-81.49
0	0	0	8.733	0.8	Crescent Lake	SJ	29.41	-81.49
0	0	0	7.375	0.325	Crescent Lake	SJ	29.41	-81.49
0	0	0	6.667	0.663	Crescent Lake	SJ	29.41	-81.49
0	0	0	6.725	0.313	Crescent Lake	SJ	29.41	-81.49
0	0	0	6.2	0.45	Crescent Lake	SJ	29.41	-81.49
0	0	0	7.375	0.325	Crescent Lake	SJ	29.41	-81.49
0	0	0	6.667	0.663	Crescent Lake	SJ	29.41	-81.49
0	0	0	6.725	0.313	Crescent Lake	SJ	29.41	-81.49
0	0	0	6.2	0.45	Crescent Lake	SJ	29.41	-81.49
0	0	0	7.375	0.325	Crescent Lake	SJ	29.41	-81.49
0	0	0	6.667	0.663	Crescent Lake	SJ	29.41	-81.49
0	0	0	6.725	0.313	Crescent Lake	SJ	29.41	-81.49
0	0	0	6.2	0.45	Crescent Lake	SJ	29.41	-81.49
0	0	0	7.68	0.85	Lake George Pt.	SJ	29.37	-81.62
0	0	0	10.5	3.938	Lake George Pt.	SJ	29.37	-81.62
0	0	0	9.4	2.35	Lake George Pt.	SJ	29.37	-81.62
0	0	0	6.7	0.3	.5 mi. up from Munroe Quarry	SS	29.852763	-82.623175
0	0	0	6.25	3.125	Up from 441 bridge	SS	29.852475	-82.60552
0	0	0	5.96	0.475	1.5 mi. up from 27 bridge	SS	29.95	-82.62532
0	0	0	9.28	1.05	.5 mi. up from Munroe Quarry	SS	29.852763	-82.623175
0	0	0	7.867	2.95	2 mi. up from 129/51 bridge	SS	30.460029	-82.93178
0	0	0	8.167	3.063	Yearty property near Wekiva R.	SS	29.29	-82.77
0	0	0	7.58	0.3	U	SS	29.83	-82.6
0	0	0	6.667	2.5	.5 mi. up from I-75 bridge, Swift Creek	SS	30.36	-83.2
0	0	0	7.367	2.763	U	SS	29.83	-82.6
0	0	0	5.867	0.75	U	SS	29.83	-82.6
0	0	0	7.22	0.875	1 mi. up from 441 bridge	SS	29.857515	-82.59925
0	0	0	6.5	2.438	1.5 mi. up from 441 bridge	SS	29.858611	-82.59298
0	0	0	7.367	0.638	U	SS	29.83	-82.6
0	0	0	7.4	2.775	down from 27 bridge	SS	29.38939	-82.63456
0	0	0	6.233	2.338	.75 mi. Up from 441 bridge	SS	29.858523	-82.595785
0	0	0	6.525	0.313	1 mi. down from 27 bridge, ~100 yds from powerlines	SS	29.830875	-82.636375
0	0	0	6.74	0.4	.5 mi. down from 441 bridge	SS	29.865867	-82.586545
0	0	0	7.714	0.35	1.5 mi. up from 27 bridge	SS	29.847435	-82.62532
0	0	0	6.74	0.45	~ 1 mi. up from 441 bridge	SS	29.857515	-82.59925
0	0	0	5.56	0.35	1.75 mi. down from Fox Trail boat ramp	SS	30.42	-83.02
0	0	0	5.475	0.625	1 mi. up from 441 bridge	SS	29.857515	-82.59925
0	0	0	7.55	0.425	.25 mi. up from I-75 bridge, Swift Creek	SS	30.36239	-83.19258
3.3	0	0	6.414	0.313	in front of Yearty's house	SS	29.29	-82.63
0	0	0	6.94	0.35	1.5 mi. up from 441 bridge	SS	29.858611	-82.59298
5.7	5.7	3.7	7.571	0.275	.5 mi. down from River Rise	SS	29.865867	-82.586545
6.3	6.5	5.3	6.9	0.3	Munroe quarry	SS	29.845995	-82.618555
4.8	0	0	6.783	0.775	.75 mi. down from mouth of Withlacoochee	SS	30.383702	-83.189775
0	0	0	7.95	0.225	~1mi. Up from 441 bridge	SS	29.857515	-82.59925
0	0	0	4.75	2.375	3/8 mi. up from I-75 bridge, Swift Creek	SS	30.36239	-83.19258
0	0	0	7.1	1.1	Up from 27 bridge	SS	29.847435	-82.62169
0	0	0	6.633	2.488	Up from 27 bridge	SS	29.847435	-82.62169
0	0	0	7.6	0.9	Up from 27 bridge	SS	29.847435	-82.62169
0	0	0	7.375	0.325	Up from 27 bridge	SS	29.847435	-82.62169
0	0	0	7.95	0.7	Down from 27 bridge	SS	29.38939	-82.63456
0	0	0	5.267	0.4	Up from 27 bridge	SS	29.847435	-82.62169
0	0	0	8.05	4.025	Up from 27 bridge	SS	29.847435	-82.62169
0	0	0	5.433	2.038	Down from 27 bridge	SS	29.38939	-82.63456
0	0	0	6.317	0.175	Up from 27 bridge	SS	29.847435	-82.62169
0	0	0	7.129	0.825	Down from 27 bridge	SS	29.38939	-82.63456
0	0	0	7.85	0.625	Down from 27 bridge	SS	29.38939	-82.63456
0	0	0	7.12	0.225	Up from 27 bridge	SS	29.847435	-82.62169
0	0	0	7	0.2	Up from 27 bridge	SS	29.847435	-82.62169
0	0	0	5.08	0.35	Down from 27 bridge	SS	29.38939	-82.63456
0	0	0	6.24	0.225	Down from 27 bridge	SS	29.38939	-82.63456
0	0	0	7	0.3	Down from 27 bridge	SS	29.38939	-82.63456

0	0	0	7.283	1.1	Up from 27 bridge	SS	29.847435	-82.62169
0	0	0	6.575	0.337	Up from 27 bridge	SS	29.847435	-82.62169
0	0	0	7.72	0.925	Up from 27 bridge	SS	29.847435	-82.62169
0	0	0	6.7	0.55	Up from 27 bridge	SS	29.847435	-82.62169
0	0	0	6.26	0.425	Down from 27 bridge	SS	29.38939	-82.63456
0	0	0	4.15	2.075	Down from 27 bridge	SS	29.38939	-82.63456
0	0	0	5.2	0.2	Above powerline, Hwy 27	SS	29.847	-82.641
0	0	0	7.975	0.438	U	SS	30.39142	-83.2015
0	0	0	7.1	0.45	U	SS	29.8311	-82.611
0	0	0	7.367	2.763	U	SS	30.39141	-83.2014
0	0	0	8.5	0.65	U	SS	29.9314	-82.7872
0	0	0	8.475	0.475	U	SS	30.3913	-83.2012
0	0	0	6.66	0.875	Under powerline	SS	29.844	-82.64
0	0	0	6.6	3.3	Hillsborough Co.	H	28.01	-82.35
0	0	0	6.333	2.375	Hillsborough Co.	H	28.01	-82.35
0	0	0	4.867	0.575	Hillsborough Co.	H	28.01	-82.35
0	0	0	6.7	2.513	Hillsborough Co.	H	28.01	-82.35
0	0	0	5.533	2.075	U	H	28.707	-82.621
0	0	0	7.9	0.4	U	H	28.917	-82.288
0	0	0	7.05	0.95	Upper Aucilla	A	30.31	-83.82
0	0	0	5.4	0.35	Nuttal Rise	A	30.147788	-83.97204
0	0	0	6.517	0.45	Upper Aucilla	A	30.31	-83.82
0	0	0	7.2	0.6	Lower Aucilla	A	30.135447	-83.97501
0	0	0	5.971	0.238	Lower Aucilla	A	30.135447	-83.97501
0	0	0	6.42	0.175	Ginnie Springs	SS	29.835483	-82.69914
4.6	4.3	0	6.557	0.325	Lower Aucilla	A	30.135447	-83.97501
4.9	0	0	6.757	0.663	West Run	A	30.135447	-83.97501
6.1	5.4	4.6	7	0.5	West Run	A	30.135447	-83.97501
0	0	0	7.1	0.2	Upper Aucilla	A	30.53	-83.82
0	0	0	6.1	0.538	Sink Hole	A	30.53	-84.32
0	0	0	5.1	1.125	Sink Hole	A	30.53	-84.32
0	0	0	5.933	2.225	Sink Hole	A	30.53	-84.32
0	0	0	5.067	1.9	Upper Aucilla	A	30.53	-83.82
0	0	0	6.033	0.338	Luraville	SS	30.098474	-83.17212
0	0	0	7.325	0.275	Ellaville	SS	30.383702	-83.189775
3	0	0	7.825	0.875	Ellaville	SS	30.383702	-83.189775
0	0	0	4.883	0.35	U	SS	29.74	-83.34
0	0	0	6.5	0.5	U	SS	30.38	-83.18
0	0	0	4.633	1.738	Ellaville	SS	30.383702	-83.189775
0	0	0	4.7	0.5	Ellaville	SS	30.383702	-83.189775
0	0	0	6.3	0.1	U	A	30.29	-83.98
0	0	0	6.375	0.238	Taylor Co. land	A	30.21	-83.55
0	0	0	0	0	St. Marks	A	30.19	-84.18
0	0	0	6.733	0.45	Lower Aucilla	A	30.135447	-83.97501
5.8	5.6	5.6	6.05	0.35	Lower Aucilla	A	30.135447	-83.97501
0	0	0	5.817	0.45	Lower Aucilla	A	30.135447	-83.97501
6.5	4.4	0	7.567	0.5	Wakulla/Taylor	A	30.21	-83.55
5.9	5.3	4.4	6.044	0.4	Wakulla/Taylor	A	30.21	-83.55
5.3	3.3	0	6.156	0.338	Santa Fe #1 site	SS	29.83	-82.6
7.4	5.4	0	7.488	1.25	U	SS	30.07	-83.04
5.8	3.4	0	6.563	0.2	Confl. Santa Fe and Itchnetuckee	SS	29.931589	-82.800186
3.7	0	0	6.186	0.45	Ft. White Site	SS	29.9	-82.77
3	0	0	6.743	0.35	Above Hwy. 27 bridge	SS	29.841675	-82.632085
0	0	0	6.129	0.575	1st rapids above falls	SS	29.74	-83.34
0	0	0	4.88	0.3	Ft. White Site	SS	29.9	-82.77
0	0	0	4.683	0.15	I/2 mi. rise	A	30.1696	-83.95818
0	0	0	6.05	0.5	1/2 mi. up from Rum Island, Alachua Co.	SS	29.832747	-82.67637
0	0	0	8.05	0.9	1/4 mi. up from park boundary	SS	29.19	-82.78
0	0	0	7.533	0.45	2nd big bend up from Wilson Spring	SS	29.924821	-82.770981
0	0	0	6.5	0.3	U	SS	30.38	-83.18
0	0	0	7.54	0.138	U	SS	29.83	-82.6
0	0	0	6.4	0.275	N. of Hwy. 27 bridge	SS	29.845563	-82.632085

0	0	0	7.6	1.1	U	SJ	29.209	-82.05
3.7	0	0	5.2	0.275	Above power plant	SS	30.38414	-83.177895
5.7	5.5	0	5.544	0.475	Findley site?	SS	29.83	-82.6
7.2	6.1	3.9	6.844	0.725	U	SJ	29.34	-81.89
6.6	5.4	0	7.289	0.463	U	C	30.73	-85.211
6	5.9	0	6.489	0.1	U	C	30.73	-85.211
0	0	0	6.075	0.187	Santa Fe site #1	SS	29.83	-82.6
0	0	0	6.26	0.425	East of Sanford	SJ	28.73	-81.11
0	0	0	5.825	0.475	U	SS	29.97	-82.96
0	0	0	6.26	0.45	confluence with Itchentuckee	SS	29.931589	-82.800186
0	0	0	6.06	0.8	U	SS	29.83	-82.6
0	0	0	4.85	1.625	I-10 bridge	SS	30.357062	-83.19258
0	0	0	4.95	0.325	Fanning Springs	SS	29.59	-82.94
0	0	0	5.28	0.3	near junction of I-10 and US90	SS	30.38414	-83.177895
0	0	0	5.017	0.55	U	SS	29.83	-82.6
0	0	0	6	0.15	~200 yds. below Site #1	SS	29.83	-82.6
0	0	0	4.74	0.55	Below Itchnetuckee	SS	29.94	-82.81
0	0	0	5.871	0.375	Hills. Co., Hwy 301	H	28.09	-82.25
0	0	0	6.225	0.575	near Ft. White	SS	29.9	-82.77
4.3	0	0	7.829	0.175	Upper Santa Fe	SS	29.83	-82.6
6.8	5.9	3.5	6.856	0.75	U	SS	30.07	-83.04
6	5	4.7	6.288	0.7	U	SS	29.83	-82.6
0	0	0	8.075	0.838	Marion Co., off sr326	SJ	29.23	-82.06
4.5	0	0	6.729	0.425	Ginnie Springs	SS	29.835483	-82.69914
2.2	0	0	5.5	0.75	Mouth of Santa Fe	SS	29.931013	-82.801836
0	0	0	6.329	0.6	U	SS	29.83	-82.6
3.7	0	0	5.514	0.625	Santa Fe site # 1	SS	29.83	-82.6
3.7	0	0	7.557	0.8	Ft. White Site	SS	29.93	-82.77
0	0	0	4.6	0.35	Ft. White Site	SS	29.92	-82.77
2.7	0	0	6.2	0.55	U	SS	29.83	-82.6
4.4	3.5	0	6.414	1.05	U	A	30.13	-83.97
5.1	3.7	0	5.4	1.25	U	A	30.23	-84.3
6.5	5.3	4	5.875	0.275	Up from Rum Is.	SS	29.832603	-82.67704
5.9	4.4	0	6.663	1.125	Lowell Borrow Pit, Marion Co.	SJ	29.23	-82.06
1.7	0	0	5.933	0.725	U	SS	29.83	-82.6
4.3	0	0	7.067	0.5	Near Ft. White	SS	29.9	-82.77
6.2	0	0	7.386	0.425	Santa Fe Site #1	SS	29.83	-82.6
4.9	3.8	2.5	5.963	0.325	Lake Bird	A	29.98	-83.62
6.4	5.5	4.9	6.778	0.413	in mound	SS	29.74	-83.34
7.8	7.1	5.8	7.744	0.625	Dog Camp, near Tallahassee	A	30.45	-84.29
7.4	6.4	6	7.322	1.1	Confl. Itchnetuckee	SS	29.931589	-82.800186
5.9	5.7	3.7	6.367	0.513	High Bluff	SS	29.83	-82.6
4.2	0	0	7.517	0.3	Near Ft. White	SS	29.9	-82.77
0	0	0	6.571	0.15	U	SS	29.83	-82.6
6.3	0	0	7.05	0.375	U	SS	29.83	-82.6
5.5	5.1	3.8	7.056	0.313	12-C Site	SS	29.83	-82.6
4.9	5.6	4.1	7.444	0.5	Lake Bird	A	29.98	-83.62
0	0	0	6.033	0.188	U	SS	29.83	-82.6
0	0	0	5.35	0.35	Near Lake Monroe, Enterprise	SJ	28.84	-81.32
0	0	0	7.15	0.7	Santa Fe, Alachua Co.	SS	29.845	-82.63
0	0	0	5.7	0.55	Aucilla	A	30.132	-83.972
0	0	0	6.48	0.725	Wacasassa	SS	29.24	-82.75
0	0	0	5.72	0.25	Up from Hwy 27	SS	29.847435	-82.62169
0	0	0	6	0.7	U	SS	30.3914	-83.2013
0	0	0	6.533	0.688	Ellaville	SS	30.38414	-83.189775
0	0	0	6.76	0.5	200 yds above Ginnie Sps.	SS	29.836	-82.677
0	0	0	7.28	0.475	Sfe & Ichne	SS	29.938	-82.807
0	0	0	6.56	0.575	U	SS	29.93171	-82.7874
0	0	0	5.417	0.35	I mi. above Hwy 27	SS	29.93	-82.55
0	0	0	7.92	0.4	U	A	30.16	-83.998
0	0	0	5.833	2.188	Johnson's Lake, Levy Co.	SS	29.45	-82.4
0	0	0	5.75	0.7	Near Ft. White	SS	29.9	-82.77

0	0	0	7.35	0.45	near where rt. 347 crosses Suwanne R., Lafayette Co.	SS	29.39	-83.044
6.8	4.9	0	8.1	0.6	Broken Pt. Creek site off hwy 326, Marion Co.	SJ	29.23183	-82.082
5.5	0	0	7.129	0.75	Gilchrist Co.	SS	29.757	-82.96
0	0	0	7.15	0.4	Alachua Co.	SS	29.834	-82.637
0	0	0	6.05	0.225	Cow Creek, Taylor Co.	A	30.218	-83.9685
0	0	0	5.933	2.225	Btwn Ichne & Wilson Spr.	SS	29.2357	-82.7893
0	0	0	5.54	0.35	Johnson's Lake, Levy Co.	SS	29.45	-82.4
0	0	0	5.72	0.3	Johnson's Lake, Levy Co.	SS	29.45	-82.4
0	0	0	5.625	0.675	Rum Island	SS	29.84	-82.68
0	0	0	5.45	0.288	Rum Island	SS	29.84	-82.68
0	0	0	6.75	0.55	Or Lake, Marion Co.	SJ	29.31	-82.08
0	0	0	5.325	0.475	1 mi. up from Suwannee	SS	29.36	-83.09
0	0	0	5.66	0.163	Johnson Lake site	SS	29.45	-82.4
0	0	0	5.5	0.388	Kenwood, Putnam Co.	SS	29.609	-81.684
0	0	0	5.925	0.425	U	SS	29.9317	-82.7872
0	0	0	5.5	1.85	Alachua Co.	SS	29.834	-82.6374
0	0	0	6.667	1.475	Kill Site	SS	29.909	-82.882
0	0	0	7.36	0.438	near Land 'o Lakes, Pasco Co.	H	28.18	-82.5
0	0	0	6.48	0.825	Ft. White bridge	SS	29.92	-82.77
0	0	0	5.925	0.125	U	SS	30.418	-83.197
0	0	0	7.75	0.688	Marion County	H	28.917	-82.288
0	0	0	7.1	2.663	Site #1	SS	29.183	-82.796
0	0	0	6.58	0.3	Marion Co.	H	28.917	-82.288
0	0	0	8.933	3.35	Volusia Co.	SJ	29.294	-81.11
7.8	7.4	0	7.467	0.775	Site #3	SS	29.8493	-82.6373
5.8	4.7	0	7.8	1.088	Conf. Ichne	SS	29.943	-82.811
6.7	6.5	5.6	7.411	1.025	U	SS	29.8322	-82.6573
7.1	4.4	3.7	7.275	0.663	above hwy 27	SS	29.847435	-82.62169
6.5	5.2	0	8.486	0.75	1st rapids below Wilson Springs	SS	29.934	-82.789
7.8	8	5.7	8.289	0.538	Georgetown Pt.	SJ	29.67	-81.62
5.3	4.2	0	7.067	0.55	Ft. White Site	SS	29.91	-82.773
0	0	0	6.7	0.45	.5 mi. up from Rum Island	SS	29.841	-82.661
6	5	3.4	6.171	0.313	below Rum Is.	SS	29.8388	-82.687
6.1	6.4	5.4	6.989	0.725	Hillsborough Co.	H	28.01	-85.35
7	5.9	5.2	7.417	0.625	U	SS	29.9316	-83.201
5.4	4.6	4.4	5.786	0.225	Johnny Boy Landing	C	30.73	-85.211
6.9	5.7	5.5	7.125	0.088	Cedar landing	SJ	29.51	-81.87
0	0	0	6.425	0.288	U	SS	30.3912	-83.201
0	0	0	7.783	0.4	Ft. White Site	SS	29.91	-82.772
0	0	0	9.914	1.15	Wilson Springs	SS	29.93	-82.781
0	0	0	8.5	0.6	Lake Eaton	SJ	29.266	-81.88
0	0	0	8.15	0.8	near Ft. White	SS	29.93	-82.77
0	0	0	5.767	0.525	NW corner of Hernando Co.	H	28.67	-82.62
0	0	0	6	0.4	near Johnson Lake, Marion Co.	SJ	29.45	-82.4
0	0	0	8.55	1	Gumroot Swamp, Alachua Co.	SS	29.6868	-82.2294
0	0	0	6.117	0.7	near Santa Fe, Gilchrist Co.	SS	29.87	-82.768
0	0	0	7.133	0.8	Palatka	SJ	29.67	-81.63
0	0	0	6.2	0.175	Suwannee Co.	SS	30.313	-83.242
0	0	0	5	0.413	Alachua Co.	SS	29.834	-82.6371
0	0	0	6.35	0.6	Suwannee Co.	SS	30.313	-83.242
0	0	0	5.44	0.2	2.5 mi. above Ichne	SS	29.898	-82.76
0	0	0	5.667	0.5	Lake Walkin, Polk Co., near Lake Wales	H	27.864	-81.581
0	0	0	5.975	1.175	Peacock Slough, near Luraville	SS	30.103353	-83.14209
0	0	0	5.4	1.85	Island above Ft. White	SS	29.855	-82.7234
0	0	0	4.4	0.3	Eridu, Taylor Co.	A	30.3091	-83.7987
0	0	0	6.767	0.45	U	SS	29.8381	-82.695
6	0	0	6.563	0.675	Lime Mine on Thrasher Rd, Hernando Co.	H	28.655	-82.598
4.6	0	0	7.1	0.725	Hillsborough Co.	H	28.01	-85.35
3.7	0	0	6.686	0.35	U	SS	29.8384	-82.6952
0	0	0	4.6	1.725	U	SS	29.838	-82.696
0	0	0	5.72	0.475	U	SS	29.8382	-82.6951
0	0	0	6.36	0.625	U	SS	30.346	-82.79

0	0	0	5.675	0.275	U	SS	30.313	-83.242
0	0	0	4.85	0.4	Prairie Creek, Alachua Co.	SS	29.59	-82.31
0	0	0	5.58	0.425	Alachua Co.	SS	29.834	-82.6372
0	0	0	6.54	0.35	.5 mi. up from Rum Is., Site 50	SS	29.84	-82.66
0	0	0	6.683	0.363	near Williston, Levy Co.	SS	29.437	-82.49
0	0	0	6.92	0.45	Lake County	SJ	28.7355	-81.86
0	0	0	5.88	0.125	1 mi. up from Ichne	SS	29.931	-82.787
9.5	8.9	8.9	8.4	0.475	Upper	SS	30.332	-83.227
0	0	0	6.817	0.6	Reddick, Marion Co.	SJ	29.415	-82.22
0	0	0	7.333	0.688	near Ft. White	SS	29.93	-82.77
0	0	0	6.45	0.45	Ft. White site	SS	29.92	-82.771
5	4.7	0	4.811	0.388	near Itchne river bank	SS	29.948	-82.8161
0	0	0	5.233	0.925	NE corner of Lake Tarpon, Pinellas Co.	H	28.134	-82.728
0	0	0	6.34	0.95	McCoy Bridge site	SS	29.945	-82.503
0	0	0	6.225	0.575	Lake Tuskawalla, Micanopy	SS	29.505	-82.2834
0	0	0	5.433	0.275	Blackwater Pond,Mysaraktown	H	28.434	-82.478
0	0	0	5.733	0.65	U	SS	30.446	-83.087
0	0	0	3.25	1.625	Phosphoria Mine, Polk Co.	H	27.882	-81.89
0	0	0	5.8	0.7	Green Swamp, Polk Co.	H	28.32	-81.79
0	0	0	6.4	0.25	Troy Springs	SS	30.021	-83.002
0	0	0	6.075	0.425	Alachua Co.	SS	29.834	-82.6373
0	0	0	6.683	0.6	near jct. 90 & i-10	SS	30.38414	-83.177895
0	0	0	5.475	1.025	Siko Site, near Gray Eagle Lodge	H	28.917	-82.288
0	0	0	7.48	0.625	U	SS	30.307	-83.25
0	0	0	6.625	0.625	1.75 mi. from Foxtrail Boat ramp	SS	30.424	-83.021
0	0	0	6.65	2.275	U	SS	30.307	-83.25
0	0	0	5.35	0.35	U	SS	30.443	-83.225
0	0	0	6.933	0.925	U	SS	30.512	-83.243
0	0	0	7.3	2.738	Hernando Co.	H	28.607	-82.269
0	0	0	6.8	2.55	Hernando Co.	H	28.607	-82.269
0	0	0	8.7	1.35	Lake Iola, Pasco Co.	H	28.397	-82.301
0	0	0	6.45	3.225	Hudson, Pasco Co.	H	28.04	-82.713
0	0	0	5.15	2.575	Lake Iola, Pasco Co.	H	28.3976	-82.3012
3.4	0	0	7.371	1.163	Hernando Co.	H	28.607	-82.269
0	0	0	6.9	1.025	Alachua Co.	SS	29.806	-82.53
0	0	0	7.32	0.2	Gilchrist Co.	SS	29.757	-82.96
0	0	0	5.45	2.725	Hernando Co.	H	28.607	-82.269
0	0	0	5.4	2.025	Pasco Co.	H	28.32	-82.333
0	0	0	4.8	1.8	Levy Co.	SS	29.45	-83.009
6.4	7	6.5	6.667	0.125	near 441	SS	29.858	-82.612
0	0	0	6.85	0.3	near 441	SS	29.858	-82.612
0	0	0	6.6	0.375	Pasco Co. Landfill, I-10 past hwy 52	H	28.32	-82.333
0	0	0	6.967	0.625	Sloth Hole	A	30.146	-83.991
0	0	0	5.5	0.125	U	A	30.16	-83.998
0	0	0	6.267	0.738	Ward Is., East Run	A	30.16	-83.97501
0	0	0	5.667	0.35	Below Power Line	A	30.23	-84.3
0	0	0	6.45	2.263	Sloth Hole	A	30.146	-83.991
0	0	0	5.3	1.8	U	A	30.23	-84.3
0	0	0	5.35	0.35	Sloth Hole	A	30.146	-83.991
0	0	0	8.3	0.863	Rodman	SJ	29.3	-81.49
0	0	0	7.383	0.15	E. Palatka	SJ	29.38	-81.63
0	0	0	5.767	0.825	Ring Jaw Is.	C	30.519	-85.189
0	0	0	5.675	0.675	I-10 bridge	C	30.75	-85.224
0	0	0	5.55	0.4	Calvert Creek, near Alabama line	C	30.998	-85.249
0	0	0	4.275	0.325	Magnolia landing	C	30.75	-85.224
0	0	0	6.16	0.55	Kepler Site, Indian Rocks Beach	H	27.88	-82.856
0	0	0	4.02	0.275	Kepler Site, Indian Rocks Beach	H	27.88	-82.856
0	0	0	6.6	0.613	1/2 mi. from Everson's house	H	27.803	-82.75
5.5	4.7	3	6.413	0.45	Below Williams Fish camp	A	30.125	-83.999
6.4	5.4	0	6.611	0.65	Below Williams Fish camp	A	30.125	-83.999
0	0	0	6.2	2.325	Goose Pasture	A	30.226	-83.981
0	0	0	6.3	2.363	Goose Pasture	A	30.226	-83.981

0	0	0	6.05	2.113	8JA513, For Sale Site	C	30.99183	-85.28559
4	0	0	7.071	0.225	U	SS	29.8371	-82.6764
0	0	0	5.425	0.288	Mouth of Aucill	A	30.111	-84.01
0	0	0	5.6	0.788	1/2 way down Silver River	SJ	29.207	-82.012
0	0	0	6.88	0.538	U	SS	29.907	-82.773
7.2	5.6	0	7.825	0.7	Tallahassee	A	30.48	-84.29
7.6	5.8	0	7.875	0.375	U	SS	29.848	-82.714
0	0	0	6.1	0.675	U	SS	29.8482	-82.7142
			#####	#NUM!	Ichne confluence	SS	29.943	-82.811
0	0	0	6.3	0.45	Fla/Ga border	SS	30.595	-82.72
0	0	0	6.067	0.575	Hillsborough Co.	H	28.01	-85.35
0	0	0	6.883	0.275	Hillsborough Co.	H	28.01	-82.35
6.1	4.8	4	7.143	0.675	Hillsborough Co.	H	28.01	-82.35
0	0	0	6.05	0.15	Hillsborough Co.	H	28.01	-82.35
0	0	0	6.575	0.475	Hillsborough Co.	H	28.01	-82.35
0	0	0	6.175	0.525	confluence SF and Suw	SS	29.903	-82.895
0	0	0	6.1	2.288	Hillsborough Co.	H	28.01	-82.35
0	0	0	6.6	0.375	U	H	27.867	-82.236
5	0	0	7.714	0.788	Hillsborough Co.	H	28.01	-82.35
4.4	0	0	7.717	0.413		H	28.917	-82.288
0	0	0	6.625	0.375	Hillsborough Co.	H	28.01	-85.35
0	0	0	6.76	0.4	above hwy 27	SS	29.847435	-82.62169
0	0	0	6.175	0.125	U	SS	29.914	-82.918
0	0	0	6.467	0.45	Newnan's Lake	SJ	29.646	-82.248
0	0	0	6.867	2.575	20-32-01	SS	29.8362	-82.6772
0	0	0	7	0.25	Georgetown Pt.	SJ	29.37	-81.62
0	0	0	#####	3.075	Georgetown Pt.	SJ	29.37	-81.62
0	0	0	7.2	2.7	Georgetown Pt.	SJ	29.37	-81.62
0	0	0	7.9	0.288	Georgetown Pt.	SJ	29.37	-81.62
0	0	0	7.267	2.725	Georgetown Pt.	SJ	29.37	-81.62
0	0	0	7.36	0.25	Georgetown Pt.	SJ	29.37	-81.62
0	0	0	7.433	2.788	Georgetown Pt.	SJ	29.37	-81.62
0	0	0	7.5	3.75	Georgetown Pt.	SJ	29.37	-81.62
0	0	0	8	4	Georgetown Pt.	SJ	29.37	-81.62
0	0	0	7.4	2.775	Georgetown Pt.	SJ	29.37	-81.62
0	0	0	5.767	2.163	Georgetown Pt.	SJ	29.37	-81.62
0	0	0	7.05	3.525	Georgetown Pt.	SJ	29.37	-81.62
0	0	0	5.775	0.625	Georgetown Pt.	SJ	29.37	-81.62
0	0	0	7.367	2.763	Georgetown Pt.	SJ	29.37	-81.62
0	0	0	7.05	0.35	Georgetown Pt.	SJ	29.37	-81.62
0	0	0	5.8	1.975	Georgetown Pt.	SJ	29.37	-81.62
0	0	0	6.4	3.2	Crescent Lake	SJ	29.4031	-81.481
0	0	0	7.6	0.7	Crescent Lake	SJ	29.403	-81.48
0	0	0	6.8	3.4	Crescent Lake	SJ	29.403	-81.48
0	0	0	7.725	0.625	Crescent Lake	SJ	29.403	-81.48
0	0	0	7.6	3.8	Crescent Lake	SJ	29.403	-81.48
0	0	0	5.7	2.85	Crescent Lake	SJ	29.403	-81.48
0	0	0	4.25	2.125	Crescent Lake	SJ	29.403	-81.48
0	0	0	7.875	0.725	Crescent Lake	SJ	29.403	-81.48
0	0	0	5.3	1.988	Crescent Lake	SJ	29.403	-81.48
0	0	0	5.3	2.65	U	H	29.0713	-82.4361
0	0	0	5.767	2.163	Down from Hart Springs	SS	29.685	-82.971
0	0	0	4.8	2.4	Btwn Hwy 27 & Poe springs	SS	29.837	-82.647
0	0	0	8.52	0.788	Btwn Wilson spring & Oasis boat ramp	SS	29.9241	-82.83221
0	0	0	5.65	0.35	U	H	29.071	-82.436
0	0	0	7.033	2.638	Btwn Wilson spring & Oasis boat ramp	SS	29.924	-82.8322
0	0	0	7.4	0.45	Btwn Wilson spring & Oasis boat ramp	SS	29.9242	-82.83223
0	0	0	7.6	0.35	Ellaville	SS	30.38414	-83.189775
0	0	0	6.467	2.425	U	H	29.0712	-82.4362
0	0	0	4.5	1.688	River Rise - 441	SS	29.865	-82.6
0	0	0	5.9	2.213	Hollingsworth Bluff	SS	29.832747	-82.67637
			#####	#NUM!	U	SS	29.834	-82.64

0	0	0	6.48	0.588	Btwn Wilson spring & Oasis boat ramp	SS	29.9243	-82.83224
0	0	0	7.42	0.375	River Rise - 441	SS	29.865	-82.6
0	0	0	6.825	0.575	Btwn Wilson spring & Oasis boat ramp	SS	29.9242	-82.83226
0	0	0	6.36	0.625	Lower - Middle	SS	29.914	-82.918
0	0	0	7	0.575	Lower - Middle	SS	29.914	-82.918
0	0	0	6.78	0.275	Lower - Middle	SS	29.914	-82.918
0	0	0	7.22	0.5	Lower - Middle	SS	29.834	-82.926
0	0	0	7.3	2.738	Lower - Middle	SS	29.914	-82.918
0	0	0	6.467	2.425	Lower - Middle	SS	29.834	-82.926
0	0	0	6.25	0.45	Lower - Middle	SS	29.834	-82.926
0	0	0	6.7	0.3	Lower - Middle	SS	29.834	-82.926
0	0	0	6.733	0.65	Lower - Middle	SS	29.834	-82.926
0	0	0	5.233	0.425	Lower - Middle	SS	29.834	-82.926
0	0	0	9.075	0.475	Lower - Middle	SS	29.834	-82.926
0	0	0	7.667	1.05	Lower - Middle	SS	29.914	-82.918
0	0	0	8.12	1.013	Lower - Middle	SS	29.914	-82.918
0	0	0	5.46	0.438	Columbia Co.	SS	29.85	-82.71
0	0	0	6.86	0.35	Below Fanning Springs	SS	29.602	-82.95
0	0	0	8	1.275	Gilchrist Co., below Sandy Pt. mouth	SS	29.757	-82.96
0	0	0	7.375	0.738	Gilcrist Co.	SS	29.757	-82.96
0	0	0	6.22	0.3	Below 27 bridge	SS	29.8532	-82.637
0	0	0	6.36	0.775	Layfayette Co.	SS	30.0495	-83.04336
0	0	0	6.75	0.7	Gilchrist Co.	SS	29.757	-82.96
0	0	0	7.1	0.825	Putnam Co.	SS	29.54	-81.72
0	0	0	6.6	0.525	North Florida, near Suwannee	SS	29.35	-83.1
6.7	3.5	0	8.05	0.488	Dixie Co.	SS	29.542	-83.027
0	0	0	6.06	0.25	U	A	30.146	-83.991
0	0	0	6.48	0.275	Gilchrist Co.	SS	29.757	-82.96
0	0	0	6.2	0.4	Layfayette Co.	U	30.049	-83.0433
0	0	0	6.525	0.338	U	SJ	29.209	-82.054
0	0	0	7.6	0.8	Central Florida	SJ	29.26	-82.031
0	0	0	5.767	0.775	Suwannee Co.	SS	30.096	-82.957
0	0	0	8.58	0.85	Hernando Co.	H	28.607	-82.269
4	0	0	5.52	0.125	Lafayette Co.	SS	30.0496	-83.0433
0	0	0	4.533	0.5	Marion Co.	SJ	28.917	-82.288
0	0	0	6.58	0.3	Gilchrist Co.	SS	29.757	-82.96
0	0	0	6.333	0.463	Dixie Co.	SS	29.542	-83.027
0	0	0	5.58	0.3	Gilchrist Co.	SS	29.757	-82.96
0	0	0	7.56	0.825	Btwn Rum Is. And Poe Springs	SS	29.836	-82.6681
0	0	0	5.9	0.288	Rum Is.	SS	29.84	-82.68
0	0	0	6.15	0.375	Below Poe Springs	SS	29.832	-82.662
0	0	0	6.2	3.1	Tatum Property	SS	29.849	-82.706
0	0	0	6.65	1.025	Clovis Shoals	C	30.71	-85.216
0	0	0	7.3	1.1	1 mi. Below Peacock Bridge	C	30.617	-85.184
0	0	0	6.06	0.7	2 bends above Johnny Boy Landing	C	30.5632	-85.1832
0	0	0	4.867	0.625	Above Peacock Bridge	C	30.64	-85.188
0	0	0	6.8	3.4	Below Peacock Bridge	C	30.64	-85.188
0	0	0	7.025	1.125	Above Johnny Boy Landing	C	30.5632	-85.183
0	0	0	4.9	0.413	Below Peacock Bridge	C	30.64	-85.188
0	0	0	4.825	0.225	Above Peacock Bridge	C	30.64	-85.188
0	0	0	4.833	0.7	5 bends Below Johnny Boy Landing	C	30.541	-85.173
7.8	7.5	4.2	7.811	0.45	Below Peacock Bridge	C	30.64	-85.188
0	0	0	6.157	0.225	Above Johnny Boy Landing	C	30.5633	-85.1832
0	0	0	6.9	0.45	Peacock Bridge	C	30.64	-85.188
0	0	0	5.675	0.375	Peacock Bridge	C	30.64	-85.188
0	0	0	5.3	0.3	Johnny Boy Landing	C	30.563	-85.183
0	0	0	5.14	0.075	Near Johnny Boy Landing	C	30.563	-85.183
0	0	0	4.85	0.375	1.5 mi. so.of Flander's home	C	30.522	-85.175
0	0	0	5.025	0.325	Betwn Peacock Bridge and Marianna	C	30.753	-85.2241
0	0	0	4.233	1.588	Betwn Peacock Bridge and Marianna	C	30.752	-85.2243
0	0	0	4.767	0.588	Peacock Bridge	C	30.64	-85.188
0	0	0	4.267	1.6	Betwn Peacock Bridge and Marianna	C	30.75	-85.224

0	0	0	5.225	0.225	Peacock Bridge	C	30.64	-85.188
0	0	0	4.86	0.4	Above Peacock Bridge	C	30.64	-85.188
0	0	0	8.1	0.75	Peacock Bridge	C	30.64	-85.188
0	0	0	5.7	1.025	Magnolia	C	30.75	-85.224
0	0	0	4.6	0.4	Johnny Boy Landing	C	30.563	-85.183
0	0	0	4.625	0.188	Johnny Boy Landing	C	30.563	-85.183
0	0	0	6.133	0.65	Johnny Boy Landing	C	30.563	-85.183
0	0	0	5	0.25	Johnny Boy Landing	C	30.563	-85.183
0	0	0	4.175	0.675	U	C	30.751	-85.223
0	0	0	3.467	1.3	Chatahootchee	C	31	-85.0151
0	0	0	4.367	1.638	Peacock Bridge	C	30.64	-85.188
0	0	0	7.967	2.988	U	C	30.542	-85.18
0	0	0	5.85	0.588	Above Clovis Shoal	C	30.71	-85.216
0	0	0	5.3	0.6	2 shoals up from Ring Jaw	C	30.519	-85.189
0	0	0	6.125	0.913	Below Willis Bridge	C	30.535	-85.179
0	0	0	6	0.475	Just below Clovis Shoals	C	30.71	-85.216
0	0	0	6.3	0.45	Btwn Willis & Look 'n Tremble	C	30.542	-85.18
0	0	0	5.8	0.75	North of Clovis Shoal	C	30.71	-85.216
0	0	0	5.583	0.5	U	C	30.541	-85.1735
0	0	0	7.7	0.6	Clovis Shoal	C	30.71	-85.216
6	6.9	6.2	7.486	0.725	1 mi. north of Peacock Bridge	C	30.678	-85.208
0	0	0	5.314	0.725	Clovis Shoal	C	30.71	-85.216
5	0	0	7.033	0.975	Btwn Magnolia and Clovis Shoal	C	30.734	-85.221
5.9	5.6	4.1	7	0.7	1 mi. north of Peacock Bridge	C	30.678	-85.208
0	0	0	5.533	2.075	.5 mi below Look 'n Tremble	C	30.505	-85.181
5.6	4.7	3.2	6.733	0.5	3 or 4 bends above Clovis Shoal	C	30.71	-85.216
6.3	5.1	0	7.114	1.525	Btwn Flat Shoals and Peacock	C	30.621	-85.17
0	0	0	7.18	0.9	near Flander's house	C	30.559	-85.195
7.2	7.5	7.8	6.456	0.663	near Flander's house	C	30.559	-85.195
7.3	9.1	8	7.367	0.9	near Flander's house	C	30.559	-85.195
0	0	0	6.125	0.525	1 bend below Clovis Shoals	C	30.71	-85.216
0	0	0	4.375	0.725	U	C	30.71	-85.216
0	0	0	3.675	0.513	1 bend below Clovis Shoals	C	30.71	-85.216
0	0	0	5.6	0.175	Flat shoal btwn Peacock bridge and Johnny Boy	C	30.588	-85.178
0	0	0	5.58	0.775	U	C	30.653	-85.184
0	0	0	7.4	0.6	U	C	30.6531	-85.1841
0	0	0	5.667	0.813	U	C	30.6532	-85.1842
0	0	0	5.733	0.613	3 bends north of Clovis Shoal	C	30.71	-85.216
0	0	0	5.675	0.625	Below Magnolia	C	30.732	-85.216
0	0	0	6.067	2.275	U	C	30.71	-85.216
0	0	0	6.433	0.875	Near Clovis Shoal	C	30.71	-85.216
0	0	0	5.833	0.925	Near Clovis Shoal	C	30.71	-85.216
0	0	0	7.533	0.763	Below Magnolia	C	30.75	-85.224
0	0	0	6.525	0.488	U	C	30.678	-85.208
0	0	0	5.967	0.6	Flat Shoal	C	30.591	-85.189
0	0	0	6.16	0.75	1 mi up from Peacock landing	C	30.678	-85.208
0	0	0	4.8	1.8	1 mi up from Peacock landing	C	30.678	-85.208
0	0	0	6.967	2.613	North Jackson Co.	C	30.999	-85.288
7.7	0	0	10.73	0.7	2 mi down from Peacock	C	30.519	-85.189
0	0	0	6.167	0.438	U	C	30.746	-85.221
0	0	0	6.325	0.825	Yancey Bridge	C	30.779	-85.219
0	0	0	6.6	0.05	Up from Peacock	C	30.64	-85.188
0	0	0	5.367	2.013	No. Jackson Co.	C	30.999	-85.288
0	0	0	4.667	1.75	2 mi. down from Hwy 90	C	30.738	-85.22
0	0	0	6.55	0.4	No. of Spring Creek	C	30.757	-85.21
0	0	0	6.38	0.6	No. of Cristoff's Ferry	C	30.833	-85.253
0	0	0	4.6	1.55	2 mi. no. of Peacock	C	30.684	-85.212
0	0	0	5.75	0.75	2 mi. down from Peacock, Ring Jaw Is.	C	30.519	-85.189
0	0	0	7.08	0.45	2 mi. so of Hwy 90	C	30.738	-85.22
0	0	0	5.62	0.125	1 mi so of Hwy 90	C	30.746	-85.221
0	0	0	5.767	2.163	Ring Jaw Is.	C	30.519	-85.189
0	0	0	5.85	2.925	Cowart's Creek, headwaters of the Chipola	C	30.971	-85.273

0	0	0	6.4	2.4	No. Jackson Co.	C	30.999	-85.288
0	0	0	4.1	1.538	Compass	C	30.966	-85.2829
0	0	0	6.72	0.175	Dry Creek, w. of Hwy 73 Bridge	C	30.776	-85.22
0	0	0	6.75	0.575	Johnny Boy Landing	C	30.563	-85.183
0	0	0	6.28	0.15	So of Peacock Bridge	C	30.64	-85.188
0	0	0	5.967	0.975	Johnny Boy Landing	C	30.563	-85.183
0	0	0	4.55	2.275	Mccomb Landing	SS	30.043	-83.028
0	0	0	5.933	0.35	Peacock Landing	C	30.64	-85.188
0	0	0	4.725	0.238	Peacock Landing	C	30.64	-85.188
0	0	0	5.7	0.15	Peacock Landing	C	30.64	-85.188
0	0	0	6.757	0.75	8 GI 1	SS	29.88797	-82.87835
0	0	0	7.675	0.525	Hillsborough Co.	H	28.01	-85.35
5.6	0	0	5.525	0.388	8 Co 4, Little Spring Run	SS	29.98314	-82.75912
0	0	0	7.514	0.563	8 GI 1	SS	29.88797	-82.87835
0	0	0	7.333	0.375	Confluence of Sfe and Ichnetuckee	SS	29.943	-82.811
0	0	0	6.625	0.525	Alachua Co.	SS	29.513	-82.227
0	0	0	5.1	1.913	Leon Co.	A	30.504	-84.228
6.2	4.9	0	6.943	0.925	U	SJ	29.37	-81.62
0	0	0	5.733	0.475	8 GI 1	SS	29.88797	-82.87835
0	0	0	7.35	1.175	Domino Hammock	SJ	29.67	-82.29
0	0	0	4.3	1.85	Keystone Heights	H	29.77	-82.05
0	0	0	4.45	2.225	8 PA	H	28.258	-82.362
0	0	0	6.1	2.125	Alachua Field	SS	29.80215	-82.50996
0	0	0	6.267	2.35	8 GI 25	SS	29.88953	-82.87682
0	0	0	6.3	0.45	Cox Bridge, Alachua Co.	SS	29.945	-82.506
0	0	0	7.6	0.35	8 Ja 105, J.C. Simpson house	A	30.15	-83.981
0	0	0	7.3	2.475	8 AL 36a, Finks landing, Levy Lake	SS	29.5315	-82.346
0	0	0	6.05	2.138	8 AL 418, Pecan Branch Field	SS	29.83741	-82.51868
0	0	0	5.6	2.1	Gainesville	SS	29.698	-82.2833
0	0	0	7.7	0.55	Terra Ciea	H	27.57	-82.62
0	0	0	6.233	2.338	Gainesville	SS	29.698	-82.2832
0	0	0	6.55	2.313	Thonotosassa	H	28.06	-82.288
0	0	0	5	0.625	8Di 53	SS	29.42835	-83.20978
0	0	0	4.667	1.75	Keystone Heights	H	29.77	-82.05
0	0	0	6.333	2.375	Terra Ciea	H	27.57	-82.62
0	0	0	5.533	2.075	Terra Ciea	H	27.57	-82.62
0	0	0	6.333	0.65	Alachua Co.	SS	29.813	-82.568
0	0	0	8.233	3.088	8 GI 1	SS	29.88797	-82.87835
0	0	0	5.8	2.9	Nalcrest	H	27.844	-81.448
0	0	0	5.217	0.225	8 Gi 24	SS	29.88953	-82.87682
0	0	0	7.3	0.25	8 Se 27, Wekiva Spring	SJ	28.71	-81.461
0	0	0	7.633	0.6	Lafayette Co.	SS	30.0925	-83.1128
0	0	0	8.3	0.525	8 AL 301, Darby	SS	29.86	-82.61
6.5	3.8	0	8.55	0.625	8 Gi 36, Dorsett Landing	SS	29.91318	-82.83453
0	0	0	9.4	0.65	Lafayette Co.	SS	30.092	-83.112
0	0	0	8.48	0.325	Caldesi Causeway Fill, Pinellas Co.	H	27.87	-82.61
0	0	0	6.35	0.5	Lane Bros. Dairy	H	27.974	-82.372
0	0	0	5.725	0.825	8 Gi 1	SS	29.88797	-82.87835
0	0	0	7.95	3.975	Burton Shell Yard on US 19, Pinellas Co.	H	27.96	-82.79
0	0	0	4.6	0.4	8 Al 100	SS	29.49613	-82.23145
0	0	0	5.5	0.5	8 Su 2, River's edge	SS	29.88976	-82.879
0	0	0	7.6	0.85	8 AL 36	SS	29.55461	-82.3414
0	0	0	7.7	2.888	8 AL 36	SS	29.55461	-82.3414
0	0	0	6.2	2.325	8 AL 36	SS	29.55461	-82.3414
0	0	0	5.1	0.3	Nuttal Rise	A	30.133	-83.993
0	0	0	6	2.25	Nuttal Rise	A	30.16	-83.998
0	0	0	6.5	0.5	Nuttal Rise	A	30.16	-83.998
4.3	0	0	6.8	0.75	Nuttal Rise	A	30.16	-83.998
0	0	0	5.133	0.313	Nuttal Rise	A	30.16	-83.998
0	0	0	5.767	2.163	Nuttal Rise	A	30.13	-83.998
0	0	0	5.95	2.975	Nuttal Rise	A	30.16	-83.998
0	0	0	6.2	0.4	Nuttal Rise	A	30.16	-83.998

0	0	0	5.5	0.7	Nuttal Rise	A	30.16	-83.998
0	0	0	7.28	0.45	Nuttal Rise	A	30.16	-83.998
0	0	0	5.42	0.65	Nuttal Rise	A	30.16	-83.998
0	0	0	5.26	0.3	Nuttal Rise	A	30.16	-83.998
4.9	0	0	6.3	0.375	Nuttal Rise	A	30.16	-83.998
0	0	0	6.05	0.425	Nuttal Rise	A	30.16	-83.998
4.9	0	0	6.443	0.925	Nuttal Rise	A	30.16	-83.998
0	0	0	6.2	0.188	Nuttal Rise	A	30.16	-83.998
0	0	0	5.3	0.6	Nuttal Rise	A	30.16	-83.998
0	0	0	5.15	0.325	8 Je 1998, Ladybug site	A	30.168	-83.978
0	0	0	5.875	0.538	8 Je 1998, Latvis Simpson	A	30.168	-83.978
0	0	0	6.233	0.45	Harney Flats	H	28.016	-82.376
0	0	0	6.16	0.425	Harney Flats	H	28.016	-82.376
0	0	0	5.5	0.4	Harney Flats	H	28.016	-82.376
0	0	0	5.24	0.475	Harney Flats	H	28.016	-82.376
0	0	0	7.583	0.375	Harney Flats	H	28.016	-82.376
0	0	0	6.983	0.463	301 pit, 1 mi down 301 from Harney Flats	H	28.011	-82.383
5.3	0	0	8.617	0.45	St. Pete, 54th and Interstate, NE HS site	H	27.758	-82.67
7.1	6.6	3	8.371	0.575	Lake Tarpon, west side	H	28.115	-82.748
0	0	0	5.6	0.6	Cross Creek	H	29.469	-84.28
0	0	0	5.8	0.638	9th & 5th ave, downtown St. Pete	H	27.76	-82.67
0	0	0	4.5	0.1	Fowler Bridge	H	28.06	-82.386
0	0	0	7.1	1.025	Hwy 52 & US 19	H	28.383	-82.705
0	0	0	6.2	0.6	N. Tampa near Zephyrhills	H	28.354	-82.2
0	0	0	5.417	0.45	Btwn Perry and plant	A	30.108	-83.654
0	0	0	6.05	0.275	Tooke Lake, Brooksville	H	28.57	-82.55
0	0	0	6.333	0.925	Brooksville	H	28.561	-82.392
0	0	0	6.567	0.575	Gainesville	SS	29.698	-82.283
0	0	0	6.6	0.45	Buddy Lake	A	28.3123	-82.2333
0	0	0	7.8	0.45	Downtown Tampa	H	27.956	-82.467
0	0	0	7.02	0.15	441 n of Gainesville, near Alachua	SS	29.82	-82.51
0	0	0	6.16	0.763	Near Lake Tsala	H	28.917	-82.288
0	0	0	6.35	0.2	Rattlesnake Is., Land o Lakes, Pasco Co.	H	28.18	-82.49
0	0	0	4.825	0.425	Johnson's Lake, Williston	H	29.45	-82.4
0	0	0	6.85	0.8	Lake Panasofkee, Lady Lake	H	28.797	-82.112
0	0	0	5.28	0.85	301, Harris Grove	H	28.001	-82.378
3.3	0	0	6.46	0.15	Brian Everson Propertyu	SS	29.856	-82.636
6.7	6.2	3.4	6.911	0.625	Duck Pond, Williston	H	29.398	-82.478
9.1	8.6	7.5	8.967	1.038	Newnan Site, Gainesville	SS	29.66	-82.35
8.1	6.7	5.8	8.225	0.337	Newnan Site, Gainesville	SS	29.66	-82.35
0	0	0	5.367	1.263	N of High Springs	SS	29.92	-82.58
0	0	0	5.8	0.725	Brian Everson Propertyu	SS	29.856	-82.636
0	0	0	7.325	0.325	Brian Everson Propertyu	SS	29.856	-82.636
7.5	7.1	0	7.6	0.638	Near Suwannee confl	SS	29.9	-82.88
5.8	3.7	0	7.438	0.338	Near Suwannee confl	SS	29.9	-82.88
0	0	0	5.72	0.425	Brian Everson Propertyu	SS	29.8563	-82.636
0	0	0	6.72	0.4	near Ginnie Spring	SS	29.835483	-82.69914
0	0	0	5.733	0.9	Suck Hole	SS	29.864	-82.627
0	0	0	6.4	0.313	Down from fort	A	30.19	-84.18
0	0	0	6.583	0.275	Up from Poe Springs	SS	29.834	-82.647
0	0	0	5.283	0.5	Near Gulf	A	30.111	-84.01
5.1	4.2	3	6.057	0.8	Near 27 boatramp	SS	29.857	-82.61
4.7	0	0	6.457	0.575	Brian Everson Propertyu	SS	29.856	-82.636
5.9	0	0	8.786	0.862	Down from Brian Everson Propertyu	SS	30.346	-82.75
8.8	7.8	5.5	9.05	0.7	Down from 47 bridge	SS	29.38939	-82.63456
0	0	0	6.033	0.613	Ginnie Springs	SS	29.835483	-82.69914
0	0	0	5.28	0.925	Brian Everson Propertyu	SS	29.8561	-82.636
0	0	0	3.643	0.225	Brian Everson Propertyu	SS	29.8562	-82.636
0	0	0	6.1	0.6	Near boat ramp, hwy 27	SS	29.857	-82.61
0	0	0	7.08	0.275	Area Brian Everson Propertyu	SS	29.853	-82.639
0	0	0	6.183	0.575	Area Brian Everson Propertyu	SS	29.853	-82.639
0	0	0	5.617	0.375	Area Brian Everson Propertyu	SS	29.853	-82.639

6.4	0	0	7.567	0.3	near Belle	SS	29.758	-82.957
0	0	0	7.517	0.875	Near Poe Springs	SS	29.83	-82.65
0	0	0	6.54	0.525	South of 27 Bridge	SS	29.85	-82.64
0	0	0	6.917	0.488	Luraville	SS	30.126	-83.181
4.9	2.5	0	8.017	0.275	Near 441	SS	29.858	-82.612
0	0	0	6.567	0.15	U	A	30.281	-83.87
3.2	0	0	7.5	0.475	Towards Belle	SS	29.758	-82.957
0	0	0	5.8	0.2	Near Ichnetuckee	SS	29.948	-82.8161
0	0	0	5.567	0.438	Upper section	SS	30.386	-83.182
6.7	4.2	0	8.057	0.738	1 mi. up from Brian Everson Property	SS	29.8526	-82.6297
0	0	0	6.35	0.525	towards Rum Is.	SS	29.838	-82.676
0	0	0	7.675	0.575	n of Ginnie Springs	SS	29.835483	-82.69914
0	0	0	7.3	3.65	Harney Flats	H	28.016	-82.376
0	0	0	7.75	3.875	Morris Bridge	H	28.083	-82.387
0	0	0	8.3	0.65	SR 52 & US19, Pasco Co.	H	28.386	-82.702
0	0	0	6.633	2.488	Harris Site	H	28.0012	-82.378
0	0	0	6.333	2.375	Harney Flats	H	28.016	-82.376
0	0	0	6.1	3.05	Harris Site	H	28.0011	-82.378
0	0	0	5	1.875	Near Goose Pasture, Burnt Bridge	A	30.197	-83.941
0	0	0	7.333	0.95	Gainesville, Wacahoota Rd.	SS	29.698	-82.2831
0	0	0	5.2	1.538	Goose Pasture	A	30.226	-83.981
0	0	0	6.867	2.575	Goose Pasture	A	30.226	-83.981
0	0	0	5.1	2.55	Goose Pasture	A	30.226	-83.981
0	0	0	5.6	2.8	Goose Pasture	A	30.226	-83.981
0	0	0	5.533	2.075	Goose Pasture	A	30.226	-83.981
0	0	0	6	3	Goose Pasture	A	30.226	-83.981
0	0	0	7.35	0.45	Goose Pasture	A	30.226	-83.981
0	0	0	7	3.225	Goose Pasture	A	30.226	-83.981
0	0	0	7.733	2.9	Goose Pasture	A	30.226	-83.981
0	0	0	6.2	3.1	Goose Pasture	A	30.226	-83.981
0	0	0	7.7	2.888	Goose Pasture	A	30.226	-83.981
0	0	0	6.933	1	Goose Pasture	A	30.226	-83.981
0	0	0	23.8	21.075	Goose Pasture	A	30.226	-83.981
0	0	0	6.52	0.263	Goose Pasture	A	30.226	-83.981
0	0	0	5.75	2.875	Kitty Litter Site, Ocala	SJ	29.206	-82.0818
0	0	0	7.45	3.725	Morris Bridge?	H	28.083	-82.387
0	0	0	7.533	2.825	U	SS	29.931	-82.787
0	0	0	7.2	2.7	Belle	SS	29.758	-82.957
0	0	0	5.167	1.938	U	SS	29.8639	-82.74
0	0	0	7.92	0.55	Near Micanopy	SS	29.48	-82.23
0	0	0	9.16	0.35	U	SS	29.921	-82.865
0	0	0	7	0.55	U	SS	29.847	-82.715
0	0	0	8.12	0.925	Mouth	SS	29.948	-82.8161
0	0	0	9.157	0.425	U	SS	30.39145	-83.20163
0	0	0	6.45	2.238	U	SS	30.39143	-83.2016
0	0	0	8.25	0.35	Obrien	SS	30.021	-82.99
0	0	0	7.425	0.125	near Blue Springs	SS	30.144	-83.241
0	0	0	7	1.163	near Blue Springs	SS	30.144	-83.241
0	0	0	6.35	2.175	Down from Blue Spring	SS	30.479	-83.24
0	0	0	5.1	0.875	Blue Spring	SS	30.144	-83.241
0	0	0	6.9	1.5	Ft. McComb	SS	30.0532	-83.0422
0	0	0	6.8	0.425	confl with N. With	SS	30.397	-83.184
0	0	0	7.7	0.725	Blue Spring	SS	30.144	-83.241
0	0	0	6.175	0.175	Up from Blue Spring	SS	30.144	-83.241
0	0	0	4.925	0.175	Btwn Blue and confluence	SS	30.443	-83.225
0	0	0	5.725	0.525	Dowling Park	SS	30.261	-83.262
0	0	0	5.34	0.55	up from Ft. McComb at the island	SS	30.113	-83.163
0	0	0	8	3	West Run	A	30.16	-83.97501
0	0	0	7.867	2.95	up from Burnt Bridge	A	30.239	-83.924
0	0	0	7.25	3.625	Piney Z	A	30.51	-84.32
0	0	0	8.067	3.025	Piney Z	A	30.51	-84.32
6	4.7	4.1	6.163	0.475	1/4 mi down from Mandalay	A	30.146	-83.991

0	0	0	5.733	0.525	Page-Ladson	A	30.169	-83.966
0	0	0	5.3	0.275	West Run	A	30.135447	-83.97501
0	0	0	5.7	0.15	Jones Mill Creek	A	30.1515	-83.535
0	0	0	5.6	0.2	Eridu, Taylor Co.	A	30.309	-83.7988
0	0	0	5.375	0.275	1 mi up from Jones Mill Creek	A	30.2732	-83.8812
0	0	0	6.167	0.55	1 mi up from Jones Mill Creek	A	30.273	-83.881
0	0	0	6.1	0.7	Btwn Goose Pasture and .5 mi rise	A	30.203	-83.986
0	0	0	5.4	0.5	Btwn Jones Mill Creek and SR 14	A	30.242	-83.924
0	0	0	5.9	0.425	Ft McComb	SS	30.053	-83.042
0	0	0	6.1	2.288	Ft McComb	SS	30.0531	-83.0421
0	0	0	4.767	1.788	Ft McComb	SS	30.0531	-83.0422
0	0	0	4.925	0.225	Up from Jones Mill Creek	A	30.271	-83.894
0	0	0	5.5	0.5	East Run, 2/3 down Ward Is.	A	30.16	-83.97501
0	0	0	0	0	West Run	A	30.16	-83.97501
3.1	0	0	5.017	0.188	1 mi above natural bridge	A	30.291	-84.159
5.6	4.7	0	7.188	0.4	Boat landing at the state park	SS	30.417	-83.174
7.6	6.6	0	7.088	0.8	Boat landing at the state park	SS	30.417	-83.174
5.3	0	0	6.214	0.4	next to 1st island up from Yeager Camp	SS	30.26	-83.988
0	0	0	7.083	0.413	1 mi up from confluence	SS	30.416	-83.194
0	0	0	7.12	0.475	down from With	SS	30.39	-83.202
0	0	0	6.167	0.85	btwn Mandalay and Williams Fish Camp	A	30.136	-83.993
0	0	0	6.725	0.338	Page Ladson	A	30.169	-83.966
0	0	0	6.667	0.6	up from Ft. McCOmb	SS	30.112	-83.162
0	0	0	7	1.025	Williams Fish Camp	A	30.125	-83.999
5.1	4.3	0	6.743	0.825	up from Jones Mill Creek	A	30.27	-83.895
0	0	0	5.38	0.513	confl with Ichne	SS	29.94	-82.807
0	0	0	6.367	0.813	Dowling Park	SS	30.261	-83.262
0	0	0	6.567	0.4	Btwn Jones Mill Creek and SR 14	A	30.242	-83.9241
0	0	0	4.76	0.075	up from Blue Springs	SS	30.144	-83.241
0	0	0	6.5	0.85	near Obrien	SS	30.021	-82.99
0	0	0	5.733	0.45	down from Blue Springs	SS	30.144	-83.241
0	0	0	6.45	0.4	Close to I-10	SS	30.376	-83.204
0	0	0	7.575	0.275	.5 mi down from N With	SS	30.418	-83.173
0	0	0	6.74	0.45	up from US 98	A	30.167	-83.984
0	0	0	6.433	0.463	.5 mi up from Suwannee	SS	29.341	-82.123
0	0	0	6.944	0.428	Dowling Park	SS	30.261	-83.262
0	0	0	4.925	0.225	Page Ladson	A	30.169	-83.966
0	0	0	7.34	0.65	above Blue Springs	SS	30.144	-83.241
0	0	0	6.98	0.638	above Blue Springs	SS	30.144	-83.241
0	0	0	6.867	1.425	Page Ladson	A	30.169	-83.966
0	0	0	6.85	0.475	up from Blue Springs	SS	30.144	-83.241
0	0	0	7.1	0.45	below Mandalay	A	30.146	-83.991
0	0	0	6.267	2.35	Obrien	SS	30.021	-82.99
0	0	0	4.9	1.838	.5 mi up from I-10	C	30.773	-85.232
0	0	0	6	0.4	Near Johnson Lake, Marion Co.	SJ	29.45	-82.4

River
Santa Fe
Santa Fe
Lake Lochloosa
Wacassassa
Wacassassa
Santa Fe
Steinhatchee
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Wacassassa
Santa Fe
Santa Fe
Santa Fe
Oklawaha
Santa Fe
Oklawaha
Wacissa
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Wacassassa
Santa Fe
Santa Fe
Santa Fe
Wacissa
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Chipola
Chipola
St. Johns
Santa Fe
St. Johns
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe

Santa Fe
Suwannee
Santa Fe
Santa Fe
Suwannee
Santa Fe
Chipola
Suwannee
Santa Fe
Silver
Oklawaha
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Wacassassa
Santa Fe
Silver
Santa Fe
Santa Fe
Chipola
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Hillsborough
Hillsborough
Hillsborough
Hillsborough
Santa Fe
Suwannee
Suwannee
Santa Fe
Wacissa
Wacissa
Wacissa
Wakulla
Wacissa
Aucilla

Wacissa
Apalachicola
Aucilla
Wacissa
Apalachicola
Wacissa
Apalachicola
Wacissa
Apalachicola
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
Alapaha
Suwannee
Santa Fe
Wakulla
Suwannee
Suwannee
Santa Fe
Aucilla
Santa Fe
Suwannee
Suwannee
Suwannee
Suwannee
St. Johns
Suwannee
Suwannee
Suwannee
Chipola
N. Withlachoochee
Santa Fe
Suwannee
Santa Fe
Chipola
Suwannee
Silver
Santa Fe
Suwannee
St. Johns
St. Johns
Suwannee
Suwannee
Santa Fe
Suwannee
Chipola
Suwannee
N. Withlachoochee
Suwannee
Santa Fe

Suwannee
Homossassa
Santa Fe
Suwannee
Hillsborough
N. Withlacoochee
Silver
N. Withlacoochee
Suwannee
Santa Fe
Santa Fe
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Suwannee
Suwannee
Crescent Lake
St. Johns
St. Johns
Lake George
Lake George
St. Johns
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Lake George
Crescent Lake
Crescent Lake
Crescent Lake
Crescent Lake
Crescent Lake
Suwannee
Crescent Lake
Lake Lochloosa
Crescent Lake
Crescent Lake

Crescent Lake
Crescent Lake
Crescent Lake
Crescent Lake
Crescent Lake
Crescent Lake
Crescent Lake
Crescent Lake
Crescent Lake
Crescent Lake
Crescent Lake
Crescent Lake
Crescent Lake
Crescent Lake
St. Johns
St. Johns
St. Johns
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Suwannee
Santa Fe
Suwannee
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Suwannee
Santa Fe
Suwannee
Wekiva
Santa Fe
Santa Fe
Santa Fe
Suwannee
Santa Fe
Suwannee
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe

Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Chassahowitzka
Lower With
Aucilla
Aucilla
Aucilla
Aucilla
Aucilla
Santa Fe
Aucilla
Aucilla
Aucilla
Aucilla
Lake Jackson
Lake Jackson
Lake Jackson
Aucilla
Suwannee
Suwannee
Suwannee
Steinhatchee
Suwannee
Suwannee
Suwannee
Wacissa
St. Marks
Aucilla
Aucilla
Aucilla
Aucilla
Aucilla
Santa Fe
Suwannee
Santa Fe
Santa Fe
Santa Fe
Steinhatchee
Santa Fe
Aucilla
Santa Fe
Wacassassa
Santa Fe
Suwannee
Santa Fe
Santa Fe

Silver Springs
Suwannee
Santa Fe
Oklawaha
Chipola
Chipola
Santa Fe
Lake Monroe
Suwannee
Santa Fe
Santa Fe
Suwannee
Suwannee
Suwannee
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Suwannee
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Aucilla
Wakulla Springs Run
Santa Fe
Santa Fe
Santa Fe
Lake Bird
Steinhatchee
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Lake Bird
Santa Fe
Santa Fe
Aucilla
Wacassassa
Santa Fe
Santa Fe
Suwannee
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Aucilla

Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Suwannee
Santa Fe
Santa Fe
Santa Fe
Santa Fe
N Withlacoochee
Lower With
Wacassassa
Lower With
Tomoko
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
St. Johns
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Chipola
Oklawaha
Santa Fe
Santa Fe
Santa Fe
St. Johns
Suwannee
Santa Fe
Suwannee
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Wacassassa

Suwannee
Santa Fe
Santa Fe
Santa Fe
Suwannee
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Suwannee
Santa Fe
Suwannee
Lower With
Suwannee
Suwannee
Suwannee
N. Withlacoochee
N. Withlacoochee
Santa Fe
Santa Fe
Aucilla
Aucilla
Aucilla
Wakulla
Aucilla
Wakulla
Aucilla
Oklawaha
St. Johns
Chipola
Chipola
Chipola
Aucilla
Aucilla

Santa Fe
Aucilla
Silver
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Suwannee
Santa Fe
Alafia
Lower With
Santa Fe
Suwannee
Santa Fe
St. Johns
St. Johns
St. Johns
St. Johns
St. Johns
St. Johns
St. Johns
St. Johns
St. Johns
St. Johns
St. Johns
St. Johns
St. Johns
St. Johns
St. Johns
St. Johns
Rainbow
Suwannee
Santa Fe
Santa Fe
Rainbow
Santa Fe
Santa Fe
Suwannee
Rainbow
Santa Fe
Santa Fe
Santa Fe

Santa Fe
Santa Fe
Santa Fe
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
Santa Fe
Santa Fe
Aucilla
Silver
Santa Fe
Santa Fe
Santa Fe
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola

Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola
Chipola

Chipola
Chipola
Chipola
Suwannee
Chipola
Chipola
Chipola
Santa Fe
Prairie Creek
St. Johns
Santa Fe
Aucilla
Aucilla
Aucilla
Aucilla
Aucilla
Aucilla
Aucilla
Aucilla

Aucilla
Aucilla
Aucilla
Aucilla
Aucilla
Aucilla
Aucilla
Aucilla
Aucilla
Aucilla
Aucilla
Hillsborough
Econfina
Lower With
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
St. Marks
Santa Fe
Aucilla
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe

Suwannee
Santa Fe
Santa Fe
Suwannee
Santa Fe
Aucilla
Suwannee
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Santa Fe
Hillsborough
Aucilla
Santa Fe
Suwannee
Santa Fe
Santa Fe
Santa Fe
Ichnetuckee
Santa Fe
Santa Fe
Suwannee
Suwannee
Suwannee
N Withlacoochee
Suwannee
Suwannee
Suwannee
Suwannee
Suwannee
N Withlacoochee
Suwannee
Suwannee
Aucilla
Aucilla
Lake Jackson
Lake Jackson
Aucilla

Aucilla
Aucilla
Aucilla
Aucilla
Aucilla
Wacissa
Aucilla
Suwannee
Suwannee
Suwannee
Aucilla
Aucilla
Aucilla
St. Marks
Suwannee
Suwannee
Wacissa
N Withlacoochee
Suwannee
Aucilla
Aucilla
Suwannee
Aucilla
Aucilla
Santa Fe
Suwannee
Aucilla
N Withlacoochee
Suwannee
Suwannee
Suwannee
Suwannee
Wakulla
Suwannee
Suwannee
Aucilla
Suwannee
Suwannee
Aucilla
Suwannee
Aucilla
Suwannee
Chipola

APPENDIX B

CHAPTER 6 STATISTICAL TABLES AND FIGURES

Table B.6.1: PC analysis for Analysis #1 of the Early Paleoindian data.

	PC 1	PC 2	PC 3				
Eigenvalue	2.0639	1.4343	1.0109	0.8595	0.7950	0.5874	0.2489
Percent	29.4848	20.4905	14.4417	12.2787	11.3570	8.3920	3.5553
Cum Percent	29.4848	49.9753	64.4169	76.6957	88.0527	96.4447	100.0000
Eigenvectors							
Std MinBW/BEW	0.11963	-0.60574	0.39636	-0.36230	0.07341	0.50799	0.25878
Std earsize	0.42485	0.30127	0.27401	0.09757	-0.68048	-0.00344	0.42553
Std Hypo	0.63675	-0.05378	0.07940	-0.00103	-0.06607	0.11651	-0.75327
Std Angle	-0.30935	0.26009	0.56880	0.55415	0.12260	0.40292	-0.16930
Std BCV	0.40463	-0.11776	-0.46421	0.56004	0.29493	0.31820	0.32410
Std Avthick	0.37453	0.27406	0.40331	-0.13208	0.64129	-0.37762	0.22507
Std STDthick	0.00674	0.61871	-0.24459	-0.47015	0.11801	0.56760	0.01383

Table B.6.2: PC analysis for Analysis #1 of the Early Paleoindian points with robust flutes.

	PC 1	PC 2	PC 3	PC 4			
Eigenvalue	2.0738	1.2594	1.0125	0.9612	0.8238	0.6459	0.2233
Percent	29.6263	17.9915	14.4647	13.7313	11.7685	9.2273	3.1903
Cum Percent	29.6263	47.6179	62.0826	75.8139	87.5824	96.8097	100.0000
Eigenvectors							
Std MinBW/BEW	0.15601	-0.55746	0.02250	0.45525	0.62256	0.23633	0.11707
Std earsize	0.44735	0.02565	0.27825	0.48389	-0.53486	-0.00683	0.44892
Std Hypo	0.63924	-0.04541	-0.03622	-0.00265	-0.11457	0.14948	-0.74332
Std Angle	-0.19171	0.25904	0.85847	0.01188	0.15283	0.32040	-0.18170
Std BCV	0.43899	-0.05781	0.06375	-0.69128	0.12887	0.34678	0.43029
Std Avthick	0.36934	0.42883	0.12144	0.02938	0.49452	-0.64276	0.07993
Std STDthick	0.03222	0.65740	-0.40617	0.28234	0.16940	0.53452	0.08771

Table B.6.3: Principal components analysis on robust Early Paleoindian points with curved sides in Analysis #2.

	PC 1	PC 2	PC 3	PC 4			
Eigenvalue	1.8734	1.3839	1.0530	1.0039	0.8242	0.5937	0.2678
Percent	26.7633	19.7699	15.0432	14.3414	11.7744	8.4816	3.8262
Cum Percent	26.7633	46.5332	61.5764	75.9178	87.6922	96.1738	100.0000
Eigenvectors							
Std MinBW/BEW	0.25605	-0.50619	-0.03638	0.03502	0.75829	0.24193	0.20525
Std earsize	0.56095	0.05665	-0.40089	-0.13826	-0.36990	0.14633	0.58657
Std Hypo	0.64145	-0.17920	0.09052	-0.08885	-0.17955	0.13000	-0.70086
Std Angle	0.04487	0.39880	-0.38853	0.72279	0.13766	0.34068	-0.17478
Std BCV	0.09155	-0.33741	0.57651	0.60242	-0.33707	0.03212	0.26046
Std Avthick	0.43195	0.39173	0.18842	0.15026	0.31773	-0.70218	0.08882
Std STDthick	0.10651	0.53113	0.55763	-0.25268	0.14972	0.54131	0.12778

Table B.6.4: Principal components analysis on robust Early Paleoindian points with curved sides in Analysis #2.

	PC 1	PC 2	PC 3	PC 4			
Eigenvalue	2.0103	1.3209	1.1132	1.0353	0.7058	0.5820	0.2325
Percent	28.7183	18.8703	15.9024	14.7897	10.0825	8.3150	3.3218
Cum Percent	28.7183	47.5886	63.4910	78.2807	88.3633	96.6782	100.0000
Eigenvectors							
Std MinBW/BEW	0.43213	-0.27572	-0.20951	-0.33375	0.43694	0.61996	0.08177
Std earsize	0.47574	-0.25041	0.38241	0.43848	-0.16743	-0.03694	0.58572
Std Hypo	0.61224	-0.03062	-0.11528	0.15822	-0.37834	-0.03989	-0.66421
Std Angle	-0.02028	0.43603	0.74557	-0.00774	0.06264	0.44233	-0.23229
Std BCV	0.25876	0.53299	-0.15239	-0.52267	-0.45853	-0.00279	0.37723
Std Avthick	0.36240	0.47940	-0.05487	0.12538	0.64752	-0.44804	0.00940
Std STDthick	-0.11579	0.39537	-0.46312	0.61834	-0.06673	0.46507	0.11279

Table B.6.5: PC analysis for large Early Paleoindian points in Analysis #3.

	PC 1	PC 2	PC 3				
Eigenvalue	2.0162	1.3251	1.0335	0.9186	0.8162	0.5981	0.2922
Percent	28.8034	18.9303	14.7646	13.1230	11.6600	8.5442	4.1747
Cum Percent	28.8034	47.7337	62.4982	75.6212	87.2812	95.8253	100.0000
Eigenvectors							
Std MinBW/BEW	0.10130	-0.51941	0.43670	0.61916	-0.03508	0.30940	0.22120
Std earsize	0.36218	0.25721	0.57102	-0.49325	0.11079	0.20415	0.42349
Std Hypo	0.62895	-0.09354	0.12413	-0.05286	-0.02667	0.10259	-0.75249
Std Angle	-0.40687	0.22898	0.30399	0.12170	0.73382	0.16451	-0.33052
Std BCV	0.33572	-0.24864	-0.58111	-0.07933	0.55350	0.33737	0.24760
Std Avthick	0.42087	0.32667	0.01552	0.45797	0.27399	-0.62969	0.18600
Std STDthick	0.08715	0.65904	-0.19362	0.37377	-0.25662	0.56097	0.01830

Table B.6.6: PC analysis for robust, large Early Paleoindian points in Analysis #3.

	PC 1	PC 2	PC 3				
Eigenvalue	2.1973	1.2532	1.0293	0.9249	0.7883	0.5649	0.2422
Percent	31.3897	17.9022	14.7036	13.2135	11.2612	8.0695	3.4603
Cum Percent	31.3897	49.2918	63.9955	77.2090	88.4702	96.5397	100.0000
Eigenvectors							
Std MinBW/BEW	0.28036	-0.53226	0.45846	-0.25964	0.23903	0.48232	-0.26595
Std earsize	0.41435	0.19917	0.27434	-0.02837	-0.76371	-0.10779	-0.34309
Std Hypo	0.61604	-0.06457	-0.07901	-0.06372	-0.06555	0.06992	0.77255
Std Angle	-0.31110	-0.02674	0.60985	0.61080	-0.15059	0.15788	0.33152
Std BCV	0.33201	-0.11257	-0.45170	0.70244	0.04746	0.30886	-0.28634
Std Avthick	0.40073	0.23920	0.35403	0.21644	0.54288	-0.54098	-0.15047
Std STDthick	0.05113	0.77605	0.08383	-0.11987	0.18885	0.58127	-0.01380

Table B.6.7: PC analysis for large, curve-sided Early Paleoindian points in Analysis #4.

	PC 1	PC 2	PC 3	PC 4			
Eigenvalue	1.8959	1.3720	1.0509	0.9841	0.7875	0.6061	0.3035
Percent	27.0841	19.6000	15.0135	14.0585	11.2505	8.6580	4.3353
Cum Percent	27.0841	46.6841	61.6977	75.7562	87.0067	95.6647	100.0000
Eigenvectors							
Std MinBW/BEW	0.21603	-0.29224	0.73464	0.26096	-0.36427	0.23678	-0.26717
Std earsize	0.42254	0.30879	0.10098	-0.57702	0.31307	0.30771	-0.43619
Std Hypo	0.65406	-0.07340	0.01855	-0.08295	-0.04656	0.10839	0.73870
Std Angle	-0.35299	0.33645	0.52287	0.14806	0.54931	0.19761	0.35510
Std BCV	0.27218	-0.37782	-0.27404	0.53248	0.58121	0.21035	-0.20610
Std Avthick	0.38205	0.45415	0.15479	0.33728	0.07717	-0.69343	-0.15255
Std STDthick	0.04850	0.59301	-0.27805	0.41575	-0.34875	0.52283	-0.02905

Table B.6.8: PC analysis for large, straight-sided Early Paleoindian points in Analysis #4.

	PC 1	PC 2	PC 3				
Eigenvalue	2.2810	1.4232	1.2368	0.8085	0.6071	0.4455	0.1979
Percent	32.5857	20.3314	17.6680	11.5495	8.6734	6.3649	2.8271
Cum Percent	32.5857	52.9171	70.5851	82.1346	90.8080	97.1729	100.0000
Eigenvectors							
Std MinBW/BEW	-0.04062	0.56222	0.49906	0.00334	0.54518	0.35373	0.10416
Std earsize	0.39040	-0.02129	-0.56245	0.16569	0.57691	0.09951	-0.40076
Std Hypo	0.59680	0.12969	-0.14633	0.15504	-0.04620	-0.08419	0.75653
Std Angle	-0.41445	0.16622	-0.42736	0.42975	-0.23069	0.58985	0.17928
Std BCV	0.49389	0.21330	0.04622	-0.36335	-0.48242	0.49291	-0.31738
Std Avthick	0.27108	-0.23942	0.45673	0.76034	-0.14339	0.05272	-0.24318
Std STDthick	0.02431	-0.73225	0.14073	-0.23168	0.24761	0.51403	0.25338

Table B.6.9: PC analysis for large, curve-sided, robust Early Paleoindian points in Analysis #4.

	PC 1	PC 2	PC 3				
Eigenvalue	2.3738	1.2610	1.1153	0.8863	0.6377	0.5057	0.2203
Percent	33.9108	18.0144	15.9325	12.6618	9.1098	7.2241	3.1466
Cum Percent	33.9108	51.9252	67.8577	80.5195	89.6293	96.8534	100.0000
Eigenvectors							
Std MinBW/BEW	0.51007	-0.03123	-0.12206	-0.05614	-0.01385	-0.84321	0.09801
Std earsize	0.43694	-0.52207	0.20681	0.11259	0.15637	0.31324	0.59875
Std Hypo	0.55869	-0.03913	0.21937	-0.12481	0.29912	0.23052	-0.69284
Std Angle	0.13590	0.03757	-0.69828	0.63767	0.25297	0.12630	-0.07726
Std BCV	0.22971	0.63306	-0.23921	-0.46790	0.30317	0.21833	0.36157
Std Avthick	0.40452	0.33484	0.06152	0.23122	-0.78533	0.22326	0.02033
Std STDthick	-0.04373	0.45895	0.58789	0.53813	0.33651	-0.15579	0.12146

Table B.6.10: PC analysis on the Middle Paleoindian points in Analysis #1.

	PC 1	PC 2	PC 3				
Eigenvalue	2.3631	1.2538	0.9878	0.9111	0.6608	0.5516	0.2718
Percent	33.7582	17.9115	14.1118	13.0163	9.4397	7.8800	3.8825
Cum Percent	33.7582	51.6697	65.7815	78.7977	88.2374	96.1175	100.0000
Eigenvectors							
Std MinBW/BEW	0.23793	-0.33039	0.76541	0.07323	0.41347	-0.21723	-0.15768
Std earsize	0.43389	0.38633	0.14972	-0.40667	-0.08313	0.47622	-0.49091
Std Hypo	0.58305	-0.00840	0.06133	-0.07278	-0.04321	0.19293	0.78220
Std Angle	-0.33516	0.48872	0.03513	-0.36106	0.66948	-0.02393	0.26161
Std BCV	0.34128	-0.27059	-0.56351	0.22843	0.60657	0.17816	-0.20229
Std Avthick	0.43128	0.37478	-0.19071	-0.03010	-0.04769	-0.78810	-0.11355
Std STDthick	0.01933	0.53759	0.18114	0.80032	0.04311	0.18812	0.00761

Table B.6.11: PC analysis for flared-eared Middle Paleoindian points in Analysis #2.

	PC 1	PC 2	PC 3				
Eigenvalue	2.4715	1.5975	0.9996	0.8661	0.4694	0.3999	0.1959
Percent	35.3073	22.8219	14.2800	12.3734	6.7054	5.7129	2.7991
Cum Percent	35.3073	58.1292	72.4092	84.7827	91.4880	97.2009	100.0000
Eigenvectors							
Std MinBW/BEW	0.03417	-0.50623	0.61083	0.35548	0.37575	0.30567	0.09196
Std earsize	0.46587	0.23531	0.38839	-0.34352	0.13164	-0.36736	0.55359
Std Hypo	0.55258	-0.22708	0.09421	-0.02306	-0.00716	-0.38008	-0.69941
Std Angle	-0.01861	0.68864	0.07082	0.20043	0.62261	0.09006	-0.29066
Std BCV	0.31102	-0.31663	-0.67254	0.03234	0.53813	0.01206	0.24480
Std Avthick	0.51284	0.14788	-0.01996	-0.23833	-0.21023	0.78111	-0.05999
Std STDthick	0.34113	0.20111	-0.09715	0.81060	-0.34642	-0.09363	0.21884

Table B.6.12: PC analysis on the straighter eared group of Middle Paleoindian points in Analysis #2.

	PC 1	PC 2	PC 3				
Eigenvalue	2.2653	1.1805	1.0354	0.8979	0.7299	0.6377	0.2532
Percent	32.3621	16.8643	14.7912	12.8273	10.4275	9.1099	3.6176
Cum Percent	32.3621	49.2264	64.0177	76.8449	87.2724	96.3824	100.0000
Eigenvectors							
Std MinBW/BEW	0.24454	-0.20860	0.79458	-0.18492	0.38109	-0.05091	0.28863
Std earsize	0.43579	0.34803	-0.20503	-0.46518	-0.19902	0.39854	0.48176
Std Hypo	0.59825	0.00182	0.06221	-0.16956	0.00528	0.11446	-0.77223
Std Angle	-0.37092	0.31921	-0.15901	-0.38093	0.72302	0.18344	-0.18364
Std BCV	0.31611	-0.39595	-0.34610	0.47747	0.45559	0.39743	0.17327
Std Avthick	0.39296	0.39611	-0.21375	0.17602	0.29009	-0.71172	0.14598
Std STDthick	-0.02135	0.64791	0.36329	0.56266	-0.02556	0.35683	-0.05658

Table B.6.13: PC analysis on the wider Middle Paleoindian points in Analysis #3.

	PC 1	PC 2	PC 3				
Eigenvalue	2.3668	1.2731	0.9843	0.8777	0.6742	0.5474	0.2764
Percent	33.8114	18.1876	14.0611	12.5380	9.6321	7.8206	3.9492
Cum Percent	33.8114	51.9990	66.0601	78.5981	88.2302	96.0508	100.0000
Eigenvectors							
Std MinBW/BEW	0.24809	-0.27544	0.76749	0.22704	0.38775	-0.20639	-0.17045
Std earsize	0.42413	0.35424	0.17850	-0.50009	-0.06879	0.41937	-0.48174
Std Hypo	0.57954	-0.02907	0.08437	-0.08111	-0.06627	0.19113	0.78018
Std Angle	-0.34989	0.46794	0.09090	-0.30543	0.68647	0.00474	0.29290
Std BCV	0.33202	-0.31871	-0.55262	0.15376	0.60697	0.23477	-0.18872
Std Avthick	0.42789	0.36343	-0.23934	-0.04261	0.02613	-0.78567	-0.08816
Std STDthick	0.08336	0.58752	0.03223	0.75699	-0.01367	0.26943	-0.03198

Table B.6.14: PC analysis for the larger wide Middle Paleoindian points in Analysis #3.

	PC 1	PC 2	PC 3				
Eigenvalue	1.9054	1.4565	1.1581	0.8463	0.8015	0.5101	0.3222
Percent	27.2197	20.8072	16.5440	12.0898	11.4494	7.2865	4.6034
Cum Percent	27.2197	48.0269	64.5709	76.6607	88.1101	95.3966	100.0000
Eigenvectors							
Std MinBW/BEW	0.11925	-0.01931	0.81966	0.03308	0.43365	-0.11727	0.33267
Std earsize	0.45762	-0.28487	-0.13628	0.63028	-0.17542	0.28938	0.42319
Std Hypo	0.39844	0.51225	0.27114	0.33061	-0.13333	0.09057	-0.60831
Std Angle	0.24524	-0.63849	-0.11327	0.07475	0.45413	-0.20192	-0.51649
Std BCV	0.01639	0.46835	-0.43394	0.16398	0.73018	0.09062	0.15429
Std Avthick	0.55342	0.16766	-0.18663	-0.22541	-0.13835	-0.71529	0.22181
Std STDthick	0.50092	-0.03058	-0.01046	-0.63958	0.06969	0.57765	0.02082

Table B.6.15: PC analysis for smaller, wide Middle Paleoindian points in Analysis #3.

	PC 1	PC 2	PC 3				
Eigenvalue	1.7487	1.4558	1.0455	0.9311	0.7689	0.5705	0.4796
Percent	24.9808	20.7973	14.9354	13.3011	10.9842	8.1495	6.8517
Cum Percent	24.9808	45.7782	60.7136	74.0146	84.9988	93.1483	100.0000
Eigenvectors							
Std MinBW/BEW	0.43678	-0.14982	-0.37437	0.59349	0.08245	0.42068	0.33260
Std earsize	0.18615	0.67469	-0.10325	0.06176	0.02314	-0.51534	0.47912
Std Hypo	0.59839	0.22816	-0.01821	0.08601	0.18474	-0.13890	-0.72713
Std Angle	-0.32427	0.49981	-0.15672	-0.13599	0.57941	0.51088	-0.07257
Std BCV	0.36151	-0.37565	0.19889	-0.40765	0.63826	-0.12989	0.31340
Std Avthick	0.37177	0.28124	0.56764	-0.24110	-0.35600	0.49810	0.16587
Std STDthick	-0.20603	0.01636	0.68008	0.62750	0.29785	-0.11041	-0.01047

Table B.6.16: PC analysis for large curve-sided Middle Paleoindian points in Analysis #4.

	PC 1	PC 2	PC 3				
Eigenvalue	2.2987	1.3258	0.9704	0.8840	0.6949	0.5492	0.2770
Percent	32.8380	18.9405	13.8626	12.6293	9.9275	7.8456	3.9565
Cum Percent	32.8380	51.7785	65.6411	78.2704	88.1979	96.0435	100.0000
Eigenvectors							
Std MinBW/BEW	0.26085	-0.27163	0.76615	0.26800	0.30012	0.26979	-0.19108
Std earsize	0.41951	0.35909	0.18866	-0.51693	0.00320	-0.40702	-0.47602
Std Hypo	0.58819	-0.05777	0.07991	-0.10194	-0.01796	-0.18407	0.77441
Std Angle	-0.32411	0.50226	0.12504	-0.22974	0.68946	0.12851	0.28704
Std BCV	0.30789	-0.38505	-0.53289	0.05880	0.64586	-0.09605	-0.20770
Std Avthick	0.42992	0.35697	-0.26091	-0.01934	-0.12140	0.77172	-0.09491
Std STDthick	0.15915	0.51573	-0.05793	0.77069	0.04861	-0.32616	-0.05138

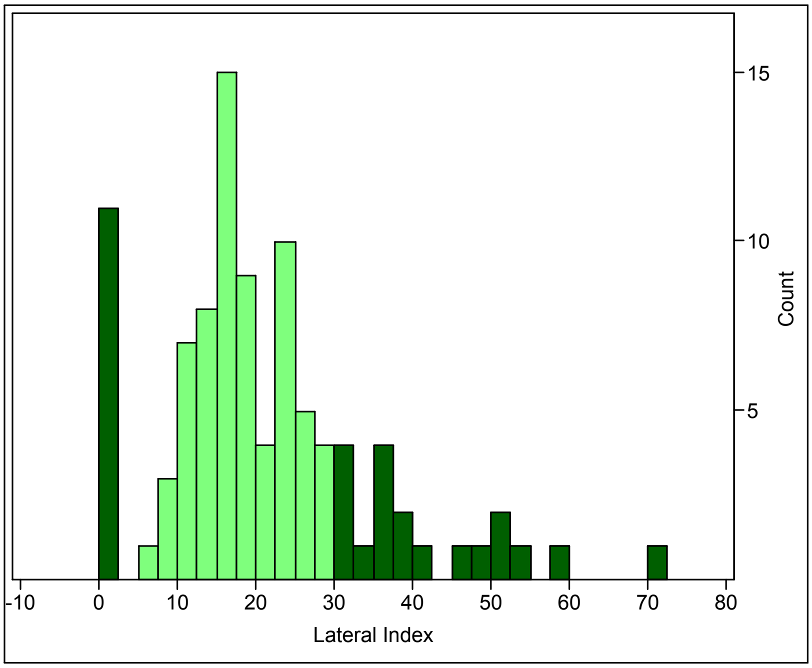

Figure B.6.1: Histogram of the laterial index attribute for the Early Paleoindian points in Analysis #1. The darker bars represent straight-sided points.

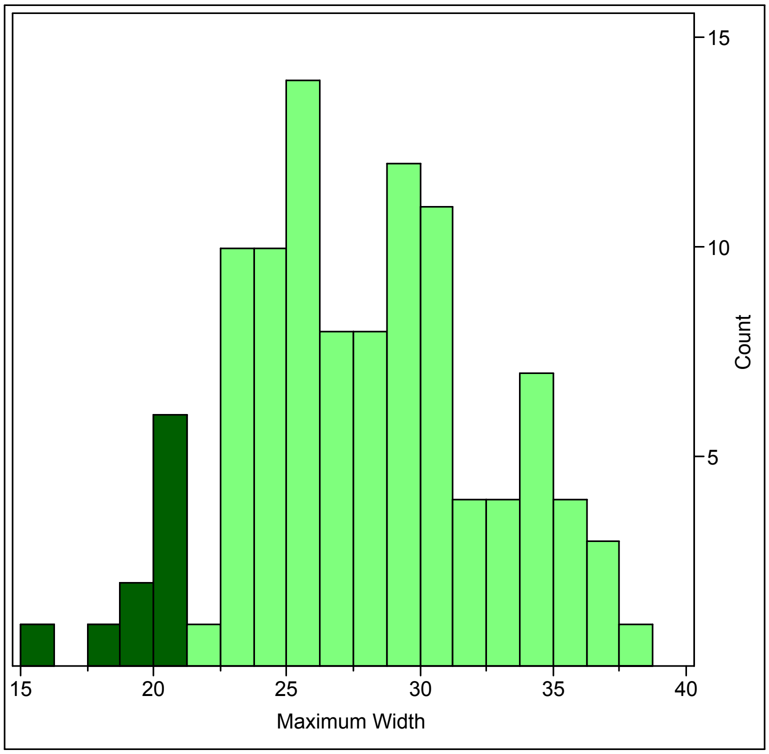

Figure B.6.2: Histogram of maximum width showing the partition between large and small Early Paleoindian points in Analysis #3.

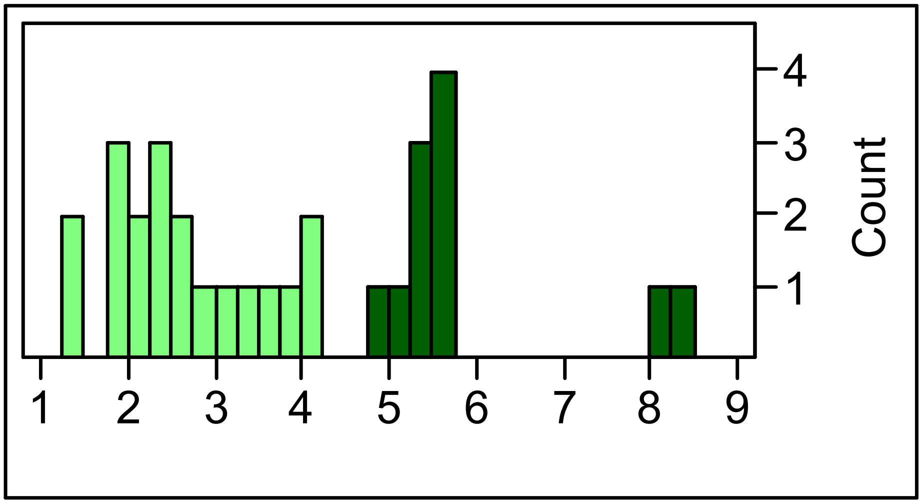

Figure B.6.3: Histogram of basal concavity for large straight-sided Early Paleoindian points in Analysis #4.

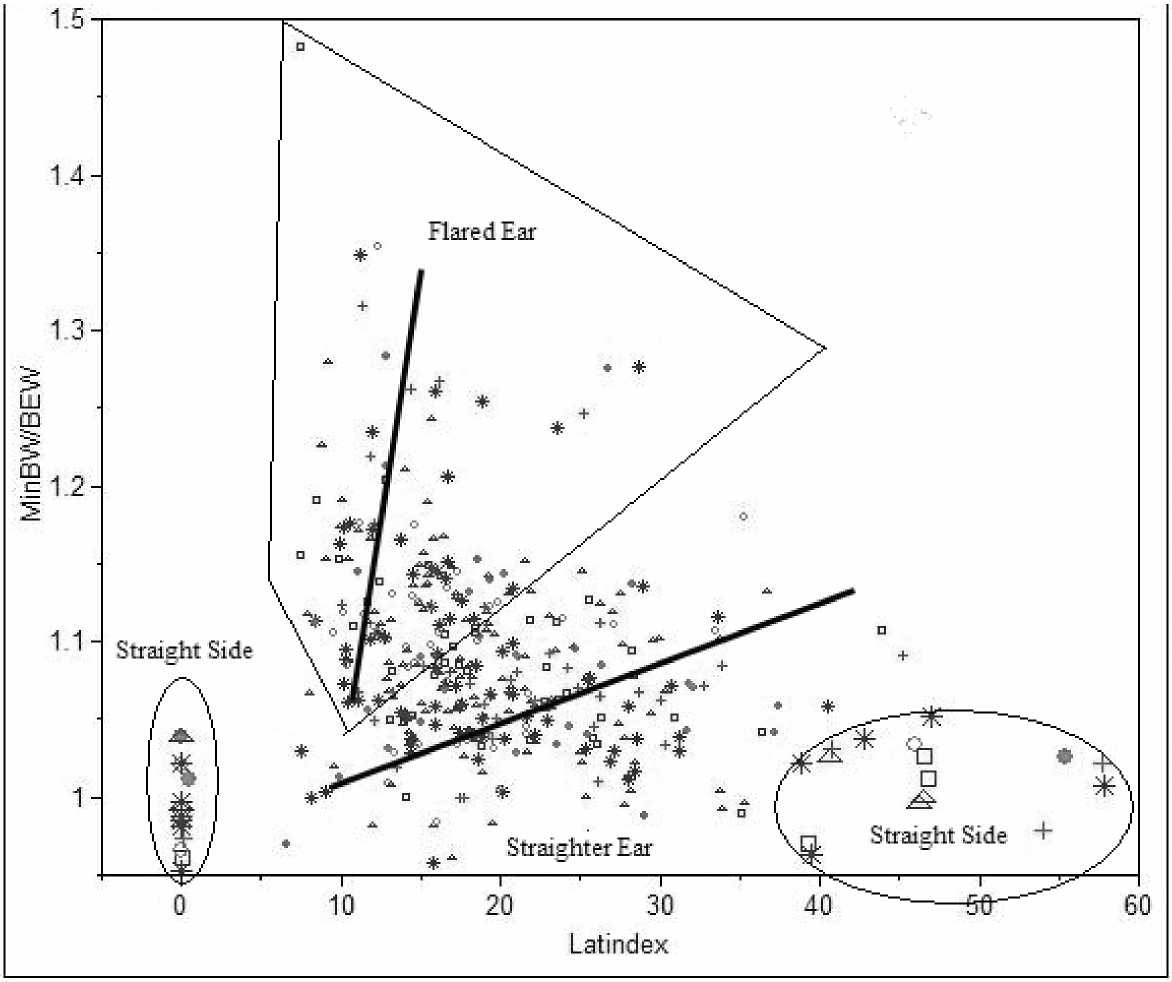

Figure B.6.4: Bivariate plot of minimum basal width/basal ear width and lateral index for Analysis #2 of the Middle Paleoindian points. The data can be divided into three general groups of points. The straight sided points are represented by a lateral index of 0 and > 38. The rest of the data trends in two directions, which are indicated by the black lines. The upper polygon includes the flared-ear partition, and the unenclosed data include the straighter ear partition. The unenclosed area includes the other partition.

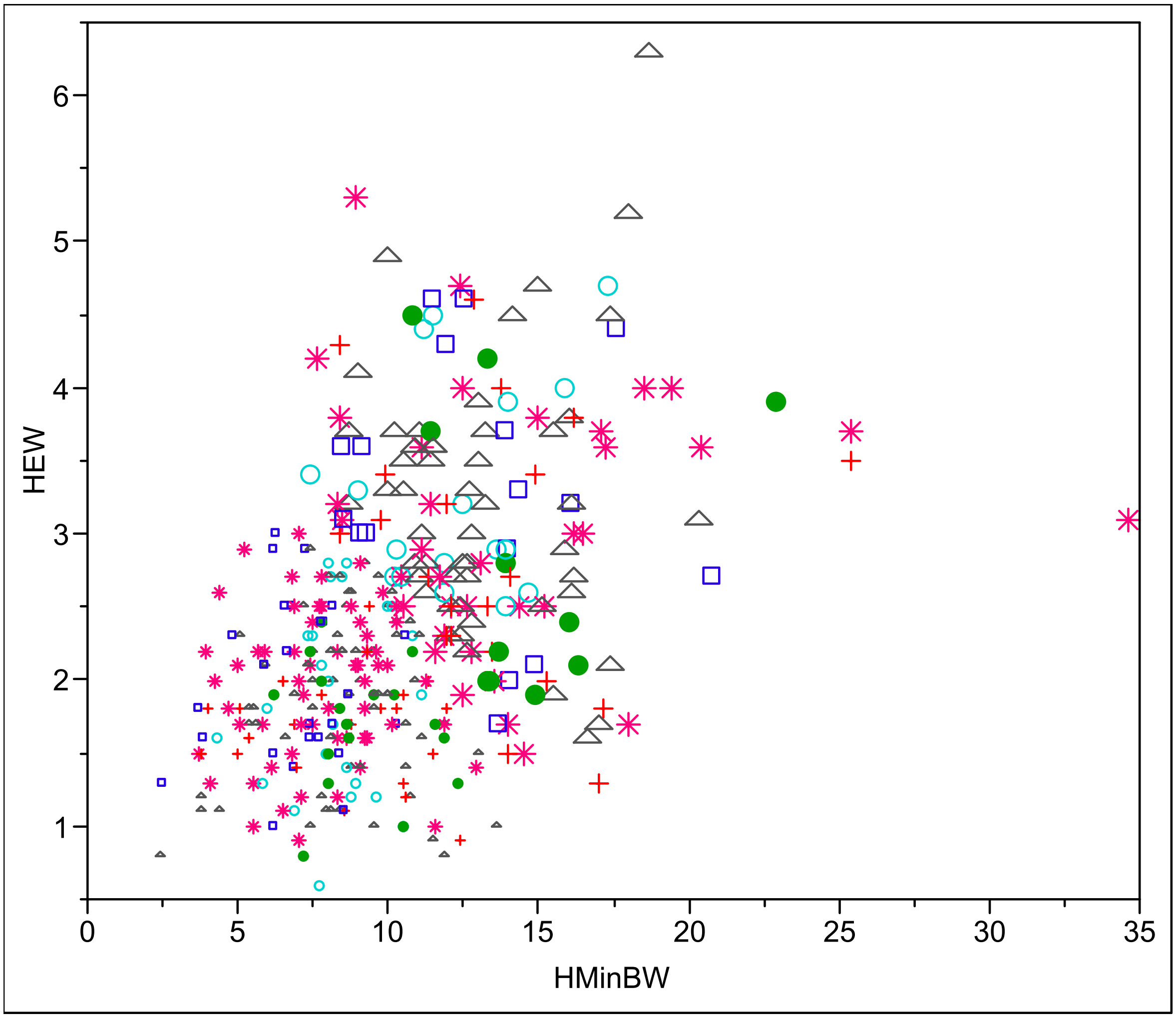

Figure B.6.5: Bivariate plot of height of ear width (HEW) and height of minimum basal width (HMinBW) in Analysis #3 of the Middle Paleoindian points. The large symbols are included in the larger point subset.

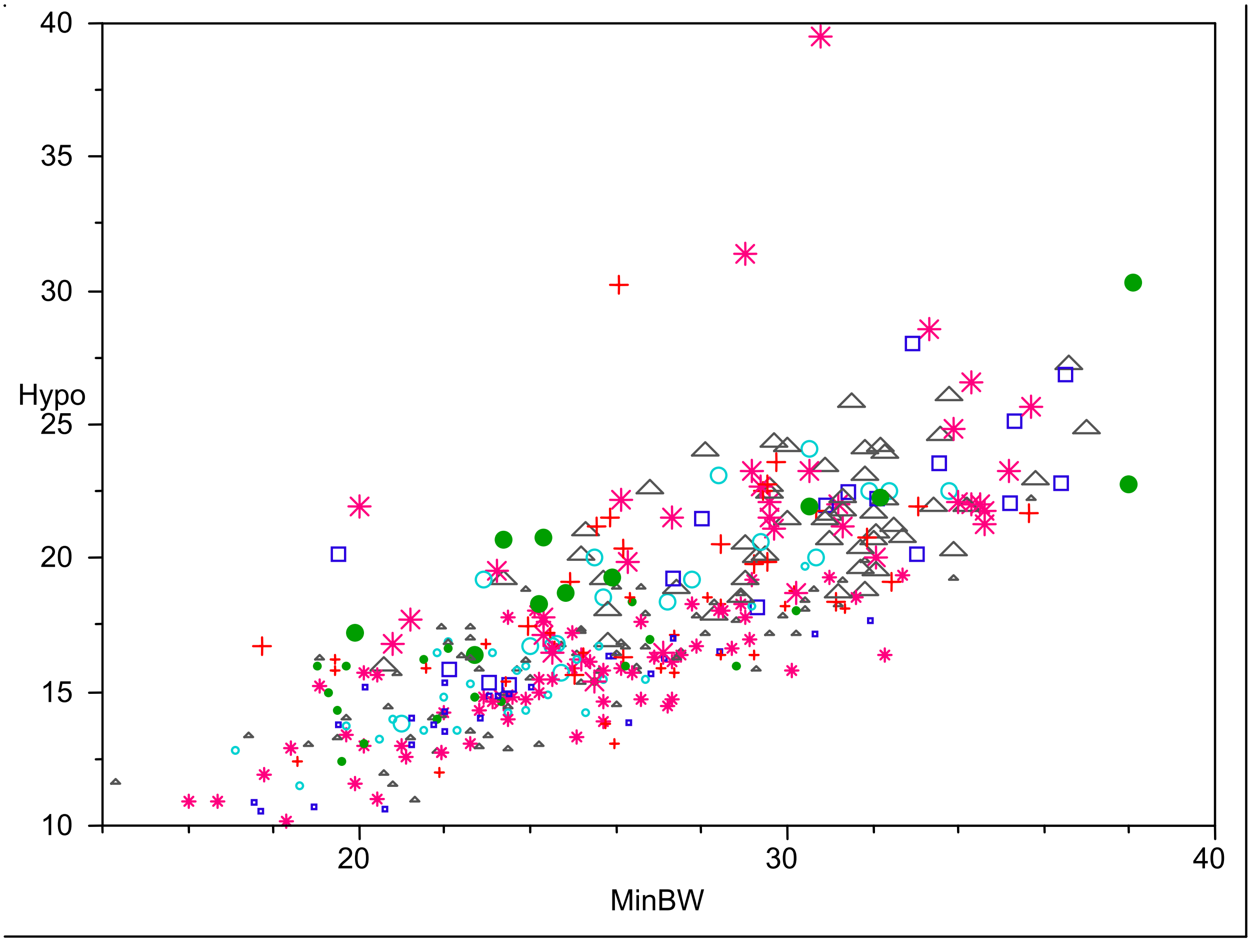

Figure B.6.6: Bivariate plot of hypotenuse (Hypo) and minimum basal width (MinBW) in Analysis #3 of the Middle Paleoindian points. The larger symbols are included in the larger point subset.

APPENDIX C

CHAPTER 6 DESCRIPTIONS OF THE SIGNIFICANT ANOVA RESULTS

Table C.6.1: A description of the results of Analysis #1 for the Early Paleoindian points.

Attribute / Description
PC 3 Only PC 3, which was normally distributed and had equal variances, produced significant ANOVA results. The Tukey-Kramer HSD test showed a significant difference between the St. Johns (-0.62) group and Santa Fe (0.51) group.

Table C.6.2: A description of the results of Analysis #2 for the robustly fluted Early Paleoindian points.

Attribute / Description
Average Thickness The average thickness attribute violated the condition of normality so the data was transformed by taking the reciprocal of the square (1/avt^2). Because the Levene's test showed the variances were unequal ($F = 3.0532$, $p = .0275$), I relied on the Welch ANOVA. The Tukey-Kramer HSD test of means comparisons for average thickness showed significant differences between the Aucilla (6.6 mm) group and Chipola (6.2 mm) group.

Table C.6.3: A description of the results of Analysis #4 for all the Early Paleoindian points.

Attribute / Description
Average Thickness The average thickness, which was normally distributed and had equal variances, produced significant ANOVA results. The Tukey-Kramer HSD test showed a significant difference between the St. Johns (7.0 mm) group and Santa Fe (6.0 mm) group.

Table C.6.4: A description of the results of Analysis #4 for the robustly fluted Early Paleoindian points.

Attribute / Description
Average Thickness The average thickness attribute, which was normally distributed and had equal variances, produced significant ANOVA results. The Tukey-Kramer HSD confirmed the differences between the St. Johns (7.0 mm) group and Santa Fe (6.0 mm) group.
PC 3 PC 3, which was normally distributed and had equal variances showed a significant ANOVA difference. The Tukey-Kramer HSD confirmed the differences between the Santa Fe (-0.99) group and Suwannee (0.42) group.

Table C.6.5: A description of the results of Analysis #1 for 6 region configuration for the Middle Paleoindian points.

Attribute / Description
Earsize The earsize attribute was not normally distributed so the variable had to be transformed by taking the 4th root ($^{4}\surd$ ear). The variances were not equal under Levene's test (*F* = 3.9344, *p* = .0017). The Tukey-Kramer HSD test showed significant differences between the Hillsborough (8 mm^2) and Santa Fe (8 mm^2) regions and the Chipola (5 mm^2) region.
Hypotenuse The hypotenuse variable was not normally distributed so the variable had to be transformed by taking its square root ($^{2}\surd$ hypo). The variances were equal. The Tukey-Kramer HSD test showed a significant difference between the Chipola (16 mm) and Santa Fe (18 mm) regions.
Angle The angle attribute was normally distributed and had equal variances. The Tukey-Kramer HSD test showed significant differences between Chipola (50°) region and the Hillsborough (58°), Suwannee (57°), and Santa Fe (55°) regions.
Minimum Basal Width The minimum basal width attribute was normally distributed but had unequal variances (Levene's test, *F* = 2.4793, *p* = .0121). The Tukey-Kramer HSD test showed significant differences between the Chipola (23 mm) region and the Aucilla (27 mm), Hillsborough (26 mm), Santa Fe (27 mm), and Suwannee (26 mm) regions.

Table C.6.5 continued

Average Thickness The average thickness attribute was normally distributed and had equal variances. The Tukey-Kramer HSD test showed three regional variations. The St. Johns (6.8 mm) region was different from the Suwannee (6.4 mm) and Aucilla (5.9 mm) regions, while the Aucilla region was also different from the Santa Fe (6.5 mm) region.
Standard Thickness The standard thickness attribute was not normally distributed so the variable had to be transformed by taking the 4th root ($\sqrt[4]{\text{stdt}}$), but the variances were equal. The Tukey-Kramer HSD test showed significant differences between the Hillsborough (0.6 mm) region and the Aucilla (0.5 mm), St. Johns (0.5 mm), and Suwannee (0.5 mm) regions.
PC 2 PC 2 was normally distributed and had equal variances. The Tukey-Kramer HSD test showed significant differences between the Hillsborough (0.5) region and the Chipola (-.04) and Aucilla (-.04) regions.
Hypotenuse/basal ear width The ratio of hypotenuse/basal ear width was not normally distributed but had equal variances. The variable was transformed by cubing the reciprocal of the variable ($(1/\text{hyp.bew})^3$). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.67) region and the Hillsborough (0.60), Santa Fe (0.62), and Suwannee (0.62) regions.
Height of minimum basal width/basal ear width The ratio of height of minimum basal width/basal ear width was not normally distributed and had unequal variances (Levene's test, $F = 2.3492$, $p = .0405$). The variable was transformed by taking the square root of the variable ($\sqrt[3]{\text{hbw.bew}}$). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.47) region and the Hillsborough (0.32), Santa Fe (0.35), and Suwannee (0.36) regions.
Angle/basal ear width The ratio of height of angle/basal ear width was not normally distributed but had equal variances. The variable was transformed by taking the eighth root of the variable ($\sqrt[8]{\text{ang.bew}}$). The Tukey-Kramer HSD test did not show significant differences, although the Aucilla (1.91) region and the Hillsborough (2.18) region had the greatest differences in means.
Minimum basal width.basal ear width/hypotenuse The ratio of minimum basal width.basal ear width/hypotenuse was not normally distributed but had equal variances. The variable was transformed by taking the fourth root of the variable ($\sqrt[4]{\text{mbw.bew/hyp}}$). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.07) region and the Santa Fe (0.06) region.

Table C.6.6: A description of the results of Analysis #1 for 5 region configuration for the Middle Paleoindian points.

Attribute / Description
Hypotenuse The hypotenuse variable was not normally distributed so the variable had to be transformed by taking its square root. The Tukey-Kramer HSD test did not show a significant difference between the regions, although the Chipola (16 mm) region and Aucilla (18 mm) region showed the greatest difference.
Angle The angle attribute was normally distributed and had equal variances, and the Tukey-Kramer HSD test showed significant differences between Chipola (50°) region and the Hillsborough (58°) and Santa Fe (55°) regions.
Minimum Basal Width The minimum basal width attribute was not normally distributed and had unequal variances (Levene's test, $F = 3.5231$, $p = .0077$). The attribute was transformed by taking the 1.3 root of the variable (${}^{1..3}\surd$minbw). The Tukey-Kramer HSD test showed significant differences between the Chipola (23 mm) region and the Aucilla (27 mm), Hillsborough (26 mm), Santa Fe (27 mm) regions.
Average Thickness The average thickness attribute was not normally distributed but had equal variances. The attribute was transformed by taking the 1.7 root of the variable (${}^{1.7}\surd$avt). The Tukey-Kramer HSD test showed three regional variations. The Aucilla (6 mm) region was different from the Santa Fe (6.5 mm) and St. Johns (6.8 mm) regions.
PC 2 PC 2 was not normally distributed but had equal variances. The attribute was transformed by adding 3 to the variable and taking its 1.4 root (${}^{1.4}\surd$(PC2 +4)). The Tukey-Kramer HSD test showed significant differences between the Hillsborough (0.38) region and the Aucilla (-.33) region.
Hypotenuse/basal ear width The ratio of hypotenuse/basal ear width was not normally distributed but had equal variances. The variable was transformed by cubing the reciprocal of the variable ($(1/\text{hyp.bew})^3$). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.67) region and the Hillsborough (0.60) and Santa Fe (0.62) regions.
Height of minimum basal width/basal ear width The ratio of height of minimum basal width/basal ear width attribute, which was not normally distributed but had equal variances, produced significant ANOVA results. The variable was transformed by taking the square root of the variable (${}^{2}\surd$hbw.bew). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.44) region and the Hillsborough (0.32) and Santa Fe (0.36) regions.
Minimum basal width.basal ear width/hypotenuse The ratio of minimum basal width.basal ear width/hypotenuse was not normally distributed but had equal variances. The variable was transformed by taking the fourth root of the variable (${}^{4}\surd$mbw.bew/hyp). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.07) region and the Santa Fe (0.06) and Aucilla (0.06) regions.

Table C.6.7: A description of the results of Analysis #1 for 3 region configuration for the Middle Paleoindian points.

Attribute / Description
Angle The angle attribute was normally distributed and had equal variances, and the Tukey-Kramer HSD test showed significant differences between Chipola (52°) region and the Hillsborough (56°) and Santa Fe (55°) regions.
Minimum Basal Width The minimum basal width attribute was not normally distributed but had equal variances. The attribute was transformed by taking the 1.3 root of the variable ($^{1.3}\sqrt{\text{minbw}}$). The Tukey-Kramer HSD test showed significant differences between the Chipola (25 mm) region and the Santa Fe (27 mm) region.
Height of basal ear width The height of basal ear width was not normally distributed but had equal variances. The attribute was transformed by taking the cube root of the variable ($^{3}\sqrt{\text{hew}}$). The Tukey-Kramer HSD test showed significant differences between the Chipola (2.1 mm) region and the Hillsborough (2.4 mm) and Santa Fe (2.4 mm) regions.
PC 3 PC 3 was normally distributed and had equal variances. However, the Tukey-Kramer HSD test showed no significant differences between the regions, although Hillsborough (0.28) region and the Santa Fe (-.01) region showed the greatest mean differences.
Hypotenuse/basal ear width The ratio of hypotenuse/basal ear width was not normally distributed but had equal variances. The attribute was transformed by cubing the reciprocal of the variable ($(1/\text{hyp.bew})^3$). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.65) region and the Hillsborough (0.61) and Santa Fe (0.62) regions.
Height of minimum basal width/basal ear width The ratio of height of minimum basal width/basal ear width was not normally distributed and had unequal variances (Levene's test, $F = 3.1538$, $p = .0438$). The attribute was transformed by taking the square root of the variable ($^{3}\sqrt{\text{hbw.bew}}$). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.40) region and the Hillsborough (0.34) and Santa Fe (0.36) regions.
Minimum basal width.basal ear width/hypotenuse The ratio of minimum basal width.basal ear width/hypotenuse was not normally distributed but had equal variances, produced significant ANOVA results. The variable was transformed by taking the fourth root of the variable ($^{4}\sqrt{\text{hyp.mbw.bew}}$). The Tukey-Kramer HSD test showed significant differences between the Santa Fe (0.06) region and the Hillsborough (0.07) region.

Table C.6.7 continued

Hypotenuse/height of basal ear width The ratio of hypotenuse/height of basal ear width was not normally distributed and had unequal variances (Levene's test, $F = 3.4190$, $p = .0338$). The variable was transformed by taking the 2.5 root of the reciprocal of the variable ($^{2.5}\surd$1/hyp.hew). The Tukey-Kramer HSD test showed significant differences between the Chipola (14.51) region and the Santa Fe (13.38) and Hillsborough (12.78) regions.

Table C.6.8: A description of the results of Analysis #2 for the flared ear Middle Paleoindian points for the 6 region configuration.

Attribute / Description
Minimum basal width/basal ear width The ratio minimum basal width/basal ear width was not normally distributed but had equal variances. The attribute was transformed by raising the reciprocal to the 10th power ((1/mbw.bew)^{10}). The Tukey-Kramer HSD test shows significant differences between the Aucilla (1.2) and St. Johns (1.1) regions.
Height of ear width The height of ear width was not normally distributed and had to be transformed by taking the square root of the attribute ($^{2}\surd$hew). The variances were equal. The Tukey Kramer HSD test showed significant differences between the Chipola (1.6 mm) group and Santa Fe (2.6 mm) and Hillsborough (2.9 mm) groups.
Basal ear width The basal ear width attribute was normally distributed and had equal variances. The Tukey-Kramer HSD test showed significant regional differences between the Chipola (24 mm) group and the Suwannee (30 mm) and Santa Fe (31 mm) groups.
Earsize The earsize attribute had equal variances but was not normally distributed and had to be transformed by taking the 10th root of the reciprocal ($^{10}\surd$1/ear). The variances were equal. The Tukey-Kramer HSD test showed differences between the Chipola (4 mm^2) group and the Suwannee (8 mm^2), Santa Fe (10 mm^2), and Hillsborough (11 mm^2) groups.
Hypotenuse The hypotenuse attribute had equal variances but was not normally distributed and had to be transformed by taking the 6th root of the reciprocal ($^{6}\surd$hypo). The Tukey-Kramer HSD test showed differences between the St. Johns (16 mm) group and the Suwannee (20 mm) and Santa Fe (19 mm) groups.

Table C.6.8 continued

Minimum basal width The minimum basal width attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Chipola (21 mm) group and the Santa Fe (27 mm) group.
Height of minimum basal width The height of minimum basal width attribute had equal variances but was not normally distributed and had to be transformed by taking the 5th root of the reciprocal ($^{5}\sqrt{1/hbw}$). The Tukey-Kramer HSD test showed differences between the St. Johns (9 mm) group and the Suwannee (13 mm), Santa Fe (12 mm), and Aucilla (14 mm) groups.
PC 2 The PC 2 attribute had equal variances and was normally distributed. The ANOVA Tukey-Kramer HSD test showed differences between the Aucilla (-1.38) group and the St. Johns (0.54) and Hillsborough (1.00) groups.
Angle/basal ear width The ratio of height of minimum basal width/basal ear width was normally distributed and had equal variances. The Tukey-Kramer HSD test showed significant differences between the St. Johns (2.24) region and the Suwannee (1.78), Santa Fe (1.76), and Aucilla (1.66) regions.
Minimum basal width.basal ear width/hypotenuse The ratio of minimum basal width/basal ear width/hypotenuse was not normally distributed but had equal variances. The variable was transformed by taking the fourth root of the reciprocal of the variable ($^{4}\sqrt{1/mbw.bew/hyp}$). The Tukey-Kramer HSD test showed significant differences between the St. Johns (0.18) region and the Santa Fe (.12) region and Suwannee (.13) regions.
Minimum basal width/height of minimum basal width The ratio of minimum basal width/height of minimum basal width was not normally distributed but had equal variances. The variable was transformed by taking the reciprocal of the square root of the variable ($^{2}\sqrt{mbw/hbw}$). The Tukey-Kramer HSD test did not show significant differences between the regions, although the Hillsborough (2.88) region and Aucilla (1.92) region had the largest difference in means.

Table C.6.9: A description of the results of Analysis #2 for the flared ear Middle Paleoindian points for the 5 region configuration.

Attribute / Description
Height of ear width The height of ear width was not normally distributed and had to be transformed by taking the square root of the attribute ($^2\sqrt{}$hew). The variances were equal. The Tukey-Kramer HSD test showed significant differences between the Chipola (1.6 mm) group and Santa Fe (2.6 mm) and Hillsborough (2.9 mm) groups.
Basal ear width The basal ear width attribute was normally distributed and had equal variances. The Tukey-Kramer HSD test showed significant regional differences between the Santa Fe (31 mm) group and the Chipola (24 mm) and St. Johns (26 mm) groups.
Hypotenuse The hypotenuse attribute had equal variances but was not normally distributed and had to be transformed by taking the 6th root of the reciprocal ($^6\sqrt{}$hyp). The Tukey-Kramer HSD test showed differences between the St. Johns (16 mm) group and Santa Fe (20 mm) group.
Minimum basal width The minimum basal width attribute had equal variances and was normally distributed. The ANOVA Tukey-Kramer HSD test showed differences between the Chipola (21 mm) group and the Santa Fe (26 mm) group.
Height of minimum basal width The height of minimum basal width attribute had equal variances but was not normally distributed and had to be transformed by taking the 5th root of the reciprocal ($^5\sqrt{}$1/hbw). The Tukey-Kramer HSD test showed differences between the St. Johns (9 mm) group and the Santa Fe (12 mm) and Aucilla (14 mm) groups.
Angle The angle attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test did not show significant differences between the regions, although the Aucilla (48°) group and the Hillsborough (58°) group had the greatest difference in means.
Angle/basal ear width The ratio of height of minimum basal width/basal ear width was normally distributed and had equal variances. The Tukey-Kramer HSD test showed significant differences between the St. Johns (2.24) region and the Santa Fe (1.77), and Aucilla (1.66) regions.

Table C.6.9 continued

<u>Minimum basal width.basal ear width/hypotenuse</u> The ratio of minimum basal width.basal ear width/hypotenuse was not normally distributed but had equal variances. The variable was transformed by taking the reciprocal of the fourth root of the variable ($^4\sqrt{\text{mbw.bew/hyp}}$). The Tukey-Kramer HSD test showed significant differences between the Santa Fe (0.06) region and the Chipola (0.08) and St. Johns (0.08) regions.
<u>Minimum basal width/height of minimum basal width</u> The ratio of minimum basal width/height of minimum basal width was not normally distributed but had equal variances. The variable was transformed by taking the fourth root of the variable ($^4\sqrt{\text{mbw/hbw}}$). The Tukey-Kramer HSD test did not show significant differences between the regions, although the Hillsborough (2.88) region and Aucilla (1.92) region had the largest difference in means.

Table C.6.10: A description of the results of Analysis #2 for the flared ear Middle Paleoindian points for the 3 region configuration.

Attribute / Description
<u>Height of basal ear width</u> The height of basal ear width was not normally distributed and had to be transformed by taking the square root of the attribute ($^2\sqrt{\text{hew}}$). The variances were equal. The Tukey Kramer HSD test showed significant differences between the Chipola (1.8 mm) group and Santa Fe (2.6 mm) group.
<u>Basal ear width</u> The basal ear width attribute was normally distributed and had equal variances. The ANOVA Tukey-Kramer HSD test showed significant regional differences between the Chipola (27 mm) group and Santa Fe (31 mm) group.
<u>Earsize</u> The earsize attribute had unequal variances (Levene's test, $F = 3.1699$, $p = .0464$) and was not normally distributed and had to be transformed by taking the 10th root of the reciprocal ($^{10}\sqrt{1/\text{ear}}$). The Tukey-Kramer HSD test did not show significant differences between the regions, although the Chipola (5 mm^2) group and the Santa Fe (9 mm^2) groups had the greatest differences.
<u>Hypotenuse</u> The hypotenuse attribute had equal variances but was not normally distributed and had to be transformed by taking the 6th root of the reciprocal ($^6\sqrt{\text{hyp}}$). The Tukey-Kramer HSD test showed differences between the Hillsborough (17 mm) group and the Santa Fe (20 mm) group.

Table C.6.10 continued

Minimum basal width The minimum basal width attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Chipola (22 mm) group and the Santa Fe (26 mm) group.
Height of minimum basal width The height of minimum basal width attribute had equal variances but was not normally distributed and had to be transformed by taking the 5th root of the reciprocal ($\sqrt[5]{1/hbw}$). The Tukey-Kramer HSD test showed differences between the Hillsborough (9 mm) group and the Santa Fe (12 mm) and Chipola (12 mm) groups.
Angle The angle attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Hillsborough (57°) group and the Santa Fe (52°) and Chipola (49°) groups.
Angle/basal ear width The ratio of height of minimum basal width/basal ear width was normally distributed and had equal variances. The Tukey-Kramer HSD test showed significant differences between the Santa Fe (1.77) and Hillsborough (2.13) region.
Minimum basal width.basal ear width/hypotenuse The ratio of minimum basal width/basal ear width/hypotenuse attribute was not normally distributed but had equal variances. The variable was transformed by taking the reciprocal of the fifth root of the variable ($\sqrt[5]{mbw.bew/hyp}$). The Tukey-Kramer HSD test showed significant differences between the Santa Fe (0.06) region and the Hillsborough (0.07) region.
Minimum basal width/height of minimum basal width The ratio of height of minimum basal width/minimum basal width attribute was not normally distributed but had equal variances. The variable was transformed by taking the fourth root of the variable ($\sqrt[4]{hmbw/mbw}$). The Tukey-Kramer HSD test showed significant differences between the Hillsborough (2.80) region and Santa Fe (2.37) and Chipola (2.02) regions.
Height of minimum basal width/basal ear width The ratio of height of height of minimum basal width/basal ear width was not normally distributed but had equal variances. The variable was transformed by taking the square root of the variable ($\sqrt[8]{hbw.bew}$). The Tukey-Kramer HSD test showed significant differences between the Hillsborough (0.33) region and the Chipola (0.44) and Santa Fe (0.40) regions.
Basal ear width/ height of basal ear width The ratio of basal ear width/ height of basal ear width was not normally distributed and had equal variances. The variable was transformed by taking the eighth root of the reciprocal of the variable ($\sqrt[8]{1/bew.hew}$). The Tukey-Kramer HSD test showed significant differences between the Chipola (16.02) region and the Hillsborough (12.12) region.

Table C.6.11: A description of the results of Analysis #2 for the straighter ear Middle Paleoindian points for the 6 region configuration.

Attribute / Description
Basal ear width The basal ear width attribute had unequal variances (Levene's test, $F = 2.7074$, $p = .0309$) and was not normally distributed and had to be transformed by taking its 1.5 square root ($^{1.5}\sqrt{\text{bew}}$). The Tukey-Kramer HSD test showed differences between the Chipola (24 mm) group and the Aucilla (28 mm) and Santa Fe (29 mm) groups.
Angle The angle attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Chipola (50°) group and the Hillsborough (58°), Suwannee (57°), and Santa Fe (56°) groups.
Minimum Basal Width The minimum basal width attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Chipola (23 mm) group and the Aucilla (27 mm), and Santa Fe (28 mm) groups.
Average Thickness After removing 17 outliers, the average thickness attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Aucilla (5.9 mm) and Suwannee (6.2 mm) groups and the St. Johns (7.1 mm) group, and the Santa Fe (6.5 mm) group and Aucilla group.
Standard Thickness After removing 17 outliers, the standard thickness attribute had equal variances but was not normally distributed and had to be transformed by taking the fourth root ($^{4}\sqrt{\text{stdt}}$). The Tukey-Kramer HSD test showed differences between the Aucilla (0.4 mm) and Suwannee (0.5 mm) groups and the Chipola (0.8 mm) and Hillsborough (0.7 mm) groups.
PC 2 The PC 2 attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Aucilla (-0.58) group and the Santa Fe (0.13) and Hillsborough (0.46) groups.
Height of minimum basal width/basal ear width The ratio of height of minimum basal width/basal ear width was not normally distributed but had equal variances. The variable was transformed by taking the square root of the variable ($^{2}\sqrt{\text{hbw.bew}}$). The Tukey-Kramer HSD test showed significant differences between the Chipola (.04) region and the Hillsborough (.03), Suwannee (0.3), and Santa Fe (0.3) regions.
Hypotenuse/basal ear width The ratio of hypotenuse/basal ear width was not normally distributed but had equal variances. The variable was transformed by cubing the reciprocal of the variable ($(1/\text{hyp.bew})^3$). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.66) region and the Hillsborough (0.60), Suwannee (0.61), and Santa Fe (0.61) regions.

Table C.6.12: A description of the results of Analysis #2 for the straighter ear Middle Paleoindian points for the 5 region configuration.

Attribute / Description
Basal ear width The basal ear width attribute had unequal variances (Levene's test $F = 2.7074$, $p = 0.0309$) and was not normally distributed and had to be transformed by taking its 1.5 root ($^{1.5}\sqrt{\text{bew}}$). The Tukey-Kramer HSD test showed differences between the Chipola (24 mm) group and the Aucilla (28 mm) and Santa Fe (30 mm) groups.
Angle The angle attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Chipola (50°) group and the Hillsborough (58°) and Santa Fe (56°) groups.
Minimum Basal Width The minimum basal width attribute had unequal variances (Levene's test $F = 2.5858$, $p = 0.0376$) and was not normally distributed. The attribute was normalized by taking the 1.3 root ($^{1.3}\sqrt{\text{minbw}}$). The Tukey-Kramer HSD test showed differences between the Chipola (23 mm) group and the Aucilla (27 mm) and Santa Fe (27 mm) groups.
Height of minimum basal width/basal ear width The ratio of height of minimum basal width/basal ear width was not normally distributed but had equal variances. The variable was transformed by taking the square root of the variable ($^{2}\sqrt{\text{hbw.bew}}$). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.44) region and the Hillsborough (0.32) and Santa Fe (0.34) regions.
Hypotenuse/basal ear width The ratio of hypotenuse/basal ear width was not normally distributed but had equal variances. The variable was transformed by cubing the reciprocal of the variable ($((1/\text{hyp.bew})^{3})$). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.67) region and the Hillsborough (0.60) and Santa Fe (0.61) regions.

Table C.6.13: A description of the results of Analysis #2 for the straighter ear Middle Paleoindian points for the 3 region configuration.

Attribute / Description
Angle The angle attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Chipola (53°) group and Santa Fe (56°) group.
Minimum Basal Width The minimum basal width attribute had equal variances and was normally distributed. The attribute was normalized by taking the 1.3 root ($^{1..3}$√minbw). The Tukey-Kramer HSD test showed differences between the Chipola (25 mm) group and the Santa Fe (27 mm) group.
Average Thickness After removing 17 outliers, the average thickness attribute had equal variances and was normally distributed. Tukey-Kramer HSD test showed differences between the Chipola (6.1 mm) and Hillsborough (6.7 mm) group.
PC 3 The PC 3 attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed no differences between the groups, although the Santa Fe (-0.10) group and Hillsborough (0.28) group had the greatest difference.
Height of minimum basal width/basal ear width The ratio of height of height of minimum basal width/basal ear width was not normally distributed but had equal variances. The variable was transformed by taking the square root of the variable (^{2}√hbw.bew). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.40) region and the Santa Fe (0.34) region.
Hypotenuse/basal ear width The ratio of hypotenuse/basal ear width was not normally distributed and had unequal variances (Levene's test, $F = 3.2991$, $p = .0367$). The variable was transformed by cubing the reciprocal of the variable ((1/hyp.bew)^{3}). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.65) region and the Santa Fe (0.61) region.
Hypotenuse/height of basal ear width The ratio of hypotenuse/height of basal ear width was not normally distributed but had equal variances. The variable was transformed by taking the fourth root of the reciprocal of the variable (^{4}√1/hyp.hew). The Tukey-Kramer HSD test showed significant differences between the Chipola (9.3) region and the Hillsborough (8.05) region.

Table C.6.14: A description of the results of Analysis #3 for the wider Middle Paleoindian points for the 6 region configuration.

Attribute / Description
Angle The angle attribute had equal variances and was normally distributed. The ANOVA Tukey-Kramer HSD test showed differences between the Chipola (50°) group and the Suwannee (56°), Santa Fe (55°), and Hillsborough (58°) groups.
Average Thickness The average thickness attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Aucilla (6.0 mm) group and the St. Johns (6.8 mm) and Santa Fe (6.5 mm) groups.
PC 2 The PC 2 attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Hillsborough (0.54) group and the Aucilla (-0.44) and Chipola (-0.48) groups.
Height of minimum basal width/basal ear width The ratio of height of height of minimum basal width/basal ear width was not normally distributed but had equal variances. The variable was transformed by taking the square root of the variable ($^2\sqrt{}$hbw.bew). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.43) region and the Hillsborough (0.32), Suwannee (0.36), and Santa Fe (0.36) regions.

Table C.6.15: A description of the results of Analysis #3 for the wider Middle Paleoindian points for the 5 region configuration.

Attribute / Description
Angle The angle attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Chipola (50°) group and the Santa Fe (55°) and Hillsborough (58°) groups.
Height of minimum basal width/basal ear width The ratio of height of height of minimum basal width/basal ear width was not normally distributed but had equal variances. The variable was transformed by taking the square root of the variable ($^2\sqrt{}$hbw.bew). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.43) region and the Hillsborough (0.32) and Santa Fe (0.36) regions.

Table C.6.16: A description of the results of Analysis #3 for the wider Middle Paleoindian points for the 3 region configuration.

Attribute / Description
Angle The angle attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Chipola (53°) group and the Santa Fe (55°) and Hillsborough (56°) groups.
Height of minimum basal width/basal ear width The ratio of height of height of minimum basal width/basal ear width was not normally distributed and had unequal variances (Levene's Test $F = 3.0470$, $p = .0487$). The variable was transformed by taking the square root of the variable ($^2\sqrt{\text{hmbw.bew}}$). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.40) region and the Hillsborough (0.34) and Santa Fe (0.36) regions.

Table C.6.17: A description of the results of Analysis #3 for the larger wide Middle Paleoindian points for the 6 region configuration.

Attribute / Description
Basal Ear Width The basal ear width attribute had unequal variances (Levene's test $F = 3.0627$, $p = 0.0199$) and was not normally distributed and had to be normalized by squaring the variable (bew^2). The Tukey-Kramer HSD test showed differences between the Hillsborough (33 mm) group and the Santa Fe (34 mm) and Chipola (29 mm) groups.
Earsize The earsize attribute had equal variances but was not normally distributed and had to be normalized by taking the cube root of the squared variable ($^3\sqrt{\text{ear}^2}$). Although, the Tukey-Kramer HSD test did not show differences between any of the groups, the greatest difference in means was between the Chipola (9 mm^2) and Hillsborough (11 mm^2) groups.
PC 1 The PC 1 attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Santa Fe (0.39) group and the Aucilla (-0.9) group.

Table C.6.17 continued

Average Thickness The average thickness attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Aucilla (6.1 mm) group and the Suwannee (7.0 mm), St. Johns (7.2 mm), Chipola (7.2 mm), and Santa Fe (7.1 mm) groups.
Height of minimum basal width/basal ear width The ratio of height of height of minimum basal width/basal ear width was not normally distributed but had equal variances. The variable was transformed by taking the square root of the variable ($^{2}\sqrt{\text{hbw.bew}}$). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.51) region and the Hillsborough (0.39) and Santa Fe (0.40) regions.

Table C.6.18: A description of the results of Analysis #3 for the larger wide Middle Paleoindian points for the 5 region configuration.

Attribute / Description
Basal Ear Width The basal ear width attribute had unequal variances (Levene's test $F = 3.6162$, $p = 0.0076$) and was not normally distributed and had to be normalized by squaring the variable (bew^{2}). Although the Tukey-Kramer HSD test did not show any significant differences between the regions, the Hillsborough (33 mm) group and Chipola (29 mm) group showed the greatest mean differences.
Angle The angle attribute had equal variances but was not normally distributed and had to be normalized by raising the variable to the 1.4 power ($\text{angle}^{1.4}$). The Tukey-Kramer HSD test showed differences between the Hillsborough (53°) group and the Chipola (45°) group.
Average Thickness The basal ear width attribute had equal variances but was not normally distributed and had to be normalized by taking the square root of the variable ($^{2}\sqrt{\text{avt}}$). The Tukey-Kramer HSD test showed differences between the Aucilla (6.1 mm) and the Chipola (7.2 mm), St. Johns (7.2 mm), and Santa Fe (7 mm) groups.

Table C.6.18 continued

Height of minimum basal width/basal ear width The ratio of height of height of minimum basal width/basal ear width was not normally distributed and had equal variances. The variable was transformed by taking the square root of the variable ($^{2}\sqrt{}$hbw.bew). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.51) region and the Hillsborough (0.39) and Santa Fe (0.41) regions.

Table C.6.19: A description of the results of Analysis #3 for the larger wide Middle Paleoindian points for the 3 region configuration.

Attribute / Description
Basal Ear Width The basal ear width attribute had equal variances but was not normally distributed and had to be normalized by squaring the variable (bew^{2}). The Tukey-Kramer HSD test showed differences between the Santa Fe (33 mm) group and Chipola (30 mm) group.
Height of minimum basal width/basal ear width The ratio of height of height of minimum basal width/basal ear width was not normally distributed and had equal variances. The variable was transformed by taking the square root of the variable ($^{2}\sqrt{}$hbw.bew). The Tukey-Kramer HSD test did not show significant differences between any of the regions, although the Chipola (0.46) region and the Hillsborough (0.40) regions had the greatest difference in means.

Table C.6.20: A description of the results of Analysis #3 for the smaller wide Middle Paleoindian points for the 6 region configuration.

Attribute / Description
Hypotenuse The hypotenuse attribute had equal variances and was normally distributed. The ANOVA showed significant differences, and the Tukey-Kramer HSD test showed differences between the Hillsborough (14 mm) group and the Santa Fe (16 mm) and Aucilla (16 mm) groups.
Height of minimum basal width The height of minimum basal width attribute had unequal variances (Levene's test F = 2.3573, p = 0.0418) but was normally distributed. Welch's ANOVA showed significant differences, and the Tukey-Kramer HSD test showed differences between the Hillsborough (6.9 mm) group and the Santa Fe (9 mm) and Chipola (9 mm) groups.

Table C.6.20 continued

Angle The angle attribute had equal variances and was normally distributed. The ANOVA showed significant differences, and the Tukey-Kramer HSD test showed no significant differences between the groups. However, the Chipola (54°) and Hillsborough (60°) groups had the greatest spread between means.
Angle/basal ear width The ratio of height of angle/basal ear width attribute, which was not normally distributed and had equal variances, produced significant ANOVA results. The attribute was transformed by squaring the reciprocal of the variable $((1/ang.bew)^2)$. The Tukey-Kramer HSD test showed significant differences between the Hillsborough (2.49) region and the Aucilla (2.17), Santa Fe (2.19), and Chipola (2.17) regions.
Minimum basal width/height of minimum basal width The ratio of minimum basal width/height of minimum basal width was not normally distributed but had equal variances. The variable was transformed by taking the square root of the reciprocal of the variable $(^2\sqrt{}\ 1/mbw/hbw)$. The Tukey-Kramer HSD test showed significant differences between the Hillsborough (3.76) region and Chipola (2.66) region.
Height of minimum basal width/basal ear width The ratio of height of height of minimum basal width/basal ear width was not normally distributed and had equal variances. The variable was transformed by taking the square root of the variable $(^2\sqrt{}hmbw.bew)$. The Tukey-Kramer HSD test did not show significant differences between any of the regions, although the Chipola (0.38) region and the Hillsborough (0.28) regions had the greatest difference in means.

Table C.6.21: A description of the results of Analysis #3 for the smaller wide Middle Paleoindian points for the 5 region configuration.

Attribute / Description
Hypotenuse The hypotenuse attribute had equal variances but was not normally distributed. The attribute was transformed by squaring the variable $(hypo^2)$. The Tukey-Kramer HSD test showed differences between the Hillsborough (14 mm) group and the Aucilla (16 mm) group.

Table C.6.21 continued

Height of minimum basal width The height of minimum basal width attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Hillsborough (6.9 mm) group and the Santa Fe (8.2 mm) and Chipola (9.1 mm) groups.
Angle The angle attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Chipola (54°) and Hillsborough (61°) groups.

Table C.6.22: A description of the results of Analysis #3 for the smaller wide Middle Paleoindian points for the 3 region configuration.

Attribute / Description
Hypotenuse The hypotenuse attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Hillsborough (15 mm) group and the Santa Fe (16 mm) and Chipola (16 mm) groups.
Height of minimum basal width The height of minimum basal width attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Hillsborough (7.6 mm) group and Chipola (8.7 mm) groups.
Angle/basal ear width The ratio of height of angle/basal ear width was not normally distributed and had unequal variances (Levene's test $F = 3.9295$, $p = .0211$). The attribute was transformed by squaring the reciprocal of the variable ($(1/\text{ang.bew})^2$). The Tukey-Kramer HSD test showed significant differences between the Hillsborough (2.39) region and the Santa Fe (2.25) and Chipola (2.17) regions.

Table C.6.23: A description of the results of Analysis #4 for the wider curve-sided Middle Paleoindian points for the 6 region configuration.

Attribute / Description
Angle The angle attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Chipola (51°) group and the Hillsborough (58°) group.
Minimum Basal Width The minimum basal width attribute had unequal variances (Levene's test $F = 2.6725$, $p = .0221$) but was normally distributed. The Tukey-Kramer HSD test showed differences between the Chipola (24 mm) group and the Santa Fe (27 mm) group.
Basal Concavity The basal concavity attribute had equal variances but was not normally distributed, and had to be transformed by taking the square root of the attribute ($^{2}\sqrt{\text{bcv}}$). The Tukey-Kramer HSD test showed differences between the Hillsborough (3.0 mm) group and the Santa Fe (3.8 mm) and Chipola (4.1 mm) groups.
Average Thickness The average thickness attribute had equal variances but was not normally distributed, and the variable had to be transformed by taking the cube root of the variable ($^{3}\sqrt{\text{avt}}$). The Tukey-Kramer HSD test showed differences between the Aucilla (5.9 mm) group and the Santa Fe (6.6 mm) and St. Johns (6.9 mm) groups.
PC 2 PC 2 had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Hillsborough (0.64) group and the Chipola (-0.51), Suwannee (-0.09) and Aucilla (-0.47) groups.

Table C.6.24: A description of the results of Analysis #4 for the wider curve-sided Middle Paleoindian points for the 5 region configuration.

Attribute / Description
Angle The angle attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Chipola (51°) group and the Santa Fe (55°) Hillsborough (58°) groups.

Table C.6.24 continued

Basal Concavity The basal concavity attribute had equal variances but was not normally distributed, and had to be transformed by taking the square root of the attribute ($^{2}\sqrt{}$b bcv). The Tukey-Kramer HSD test showed differences between the Hillsborough (3.0 mm) group and the Santa Fe (3.7 mm) and Chipola (4.1 mm) groups.
Average Thickness The average thickness attribute had equal variances but was not normally distributed, and the variable had to be transformed by taking the cube root of the variable ($^{3}\sqrt{}$avt). The Tukey-Kramer HSD test showed differences between the Aucilla (5.9 mm) group and the Santa Fe (6.5 mm), Chipola (6.6 mm) and St. Johns (6.9 mm) groups.
Height of minimum basal width/basal ear width The ratio of height of height of minimum basal width/basal ear width was not normally distributed and had equal variances. The attribute was transformed by taking the fourth root of the variable ($^{4}\sqrt{}$hbw.bew). The Tukey-Kramer HSD test showed significant differences between the Chipola (0.43) region and Santa Fe (0.36) and Hillsborough (0.32) regions.
Basal ear width/basal concavity The ratio of height of height of basal ear width/basal concavity was not normally distributed but had equal variances. The attribute was transformed by taking the cube root of the reciprocal ($^{3}\sqrt{}$ 1/bew.bcv). The Tukey-Kramer HSD test showed significant differences between the Hillsborough (10.63) regions and Chipola (7.34) and St. Johns (8.27) regions and the Santa Fe (9.15) region and Chipola (7.34) region.

Table C.6.25: A description of the results of Analysis #4 for the wider curve-sided Middle Paleoindian points for the 3 region configuration.

Attribute / Description
Angle The angle attribute had equal variances and was normally distributed. The Tukey-Kramer HSD test showed differences between the Chipola (53°) group and the Hillsborough (56°) group.
PC 2 PC 2 had equal variances but was not normally distributed and was transformed as follows: Log(PC2 +5)$^{1.4}$. The Tukey-Kramer HSD test showed differences between the Hillsborough (-0.42) group and the Chipola (-0.94) group.

Table C.6.25 continued

<u>Height of minimum basal width/basal ear width</u> The ratio of height of height of minimum basal width/basal ear width was not normally distributed but had equal variances. The attribute was transformed by taking the fourth root of the variable (4√hbw.bew). The Tukey-Kramer HSD test showed significant differences between the Chipola (.040) region and Hillsborough (0.34) region.

APPENDIX D

CHAPTER 7 TABLES

Table D.7.1: Summary of the ANOVA results of Analysis #1 for all Middle Paleoindian points. The total number of significant ANOVAs is listed in parentheses.

6 Regions (11 possible)	**Chipola**	**Aucilla**	**Hillsborough**	**St. Johns**	**Santa Fe**	**Suwannee**
Chipola	-	1	6	0	7	4
Aucilla	1	-	3*	1	1	0
Hillsborough	6	3*	-	1	0	1
St. Johns	0	1	1	-	0	1
Santa Fe	7	1	0	0	-	0
Suwannee	4	0	1	1	0	-

5 Regions (8 possible)	**Chipola**	**Aucilla**	**Hillsborough**	**St. Johns**	**Santa Fe**
Chipola	-	3*	3	0	3
Aucilla	3*	-	2	1	2
Hillsborough	3	2	-	0	1
St. Johns	0	1	0	-	0
Santa Fe	3	2	1	0	-

3 Regions (8 possible)	**Chipola**	**Hillsborough**	**Santa Fe**
Chipola	-	5	6
Hillsborough	5	-	2*
Santa Fe	6	2*	-

Table D.7.2: Summary of the ANOVA results of Analysis #2 for the flared ear Middle Paleoindian points. The total number of significant ANOVAs is listed in parentheses.

6 Regions (11 possible)	**Chipola**	**Aucilla**	**Hillsborough**	**St. Johns**	**Santa Fe**	**Suwannee**
Chipola	-	0	2	0	4	2
Aucilla	0	-	2*	4	0	0
Hillsborough	2	2*	-	0	0	1
St. Johns	0	4	0	-	5	3
Santa Fe	4	0	0	5	-	0
Suwannee	2	0	1	3	0	-

5 Regions (9 possible)	**Chipola**	**Aucilla**	**Hillsborough**	**St. Johns**	**Santa Fe**
Chipola	-	0	1	0	4
Aucilla	0	-	2**	2	0
Hillsborough	1	2**	-	0	0
St. Johns	0	2	0	-	5
Santa Fe	4	2	0	5	-

3 Regions (12 possible)	**Chipola**	**Hillsborough**	**Santa Fe**
Chipola	-	5	5*
Hillsborough	5	-	6
Santa Fe	5*	6	-

Table D.7.3: Summary of the ANOVA results of Analysis #2 for the straighter eared Middle Paleoindian points. The total number of significant ANOVAs is listed in parentheses.

6 Regions (8 possible)	**Chipola**	**Aucilla**	**Hillsborough**	**St. Johns**	**Santa Fe**	**Suwannee**
Chipola	-	3	3	0	5	4
Aucilla	3	-	2	1	2	0
Hillsborough	3	2	-	0	0	1
St. Johns	0	1	0	-	0	1
Santa Fe	5	2	0	0	-	0
Suwannee	4	0	1	1	0	-

5 Regions (5 possible)	**Chipola**	**Aucilla**	**Hillsborough**	**St. Johns**	**Santa Fe**
Chipola	-	2	3	0	5
Aucilla	2	-	0	0	0
Hillsborough	3	0	-	0	0
St. Johns	0	0	0	-	0
Santa Fe	5	0	0	0	-

3 Regions (8 possible)	**Chipola**	**Hillsborough**	**Santa Fe**
Chipola	-	2	4
Hillsborough	2	-	1*
Santa Fe	4	1*	-

Table D.7.4: Summary of the ANOVA results of Analysis #3 for all the large Middle Paleoindian points. The total number of significant ANOVAs is listed in parentheses.

6 Regions (4 possible)	**Chipola**	**Aucilla**	**Hillsborough**	**St. Johns**	**Santa Fe**	**Suwannee**
Chipola	-	0	3	0	2	2
Aucilla	0	-	1	1	1	0
Hillsborough	3	1	-	0	0	0
St. Johns	0	1	0	-	0	0
Santa Fe	2	1	0	0	-	0
Suwannee	2	0	0	0	0	-

5 Regions (2 possible)	**Chipola**	**Aucilla**	**Hillsborough**	**St. Johns**	**Santa Fe**
Chipola	-	0	2	0	2
Aucilla	0	-	0	0	0
Hillsborough	2	0	-	0	0
St. Johns	0	0	0	-	0
Santa Fe	2	0	0	0	-

3 Regions (2 possible)	**Chipola**	**Hillsborough**	**Santa Fe**
Chipola	-	2	2
Hillsborough	2	-	0
Santa Fe	2	0	-

Table D.7.5: Summary of the ANOVA results of Analysis #3 for the larger, wider Middle Paleoindian points. The total number of significant ANOVAs is listed in parentheses.

6 Regions (5 possible)	**Chipola**	**Aucilla**	**Hillsborough**	**St. Johns**	**Santa Fe**	**Suwannee**
Chipola	-	1	3*	0	2	0
Aucilla	1	-	0	1	2	1
Hillsborough	3*	0	-	0	0	0
St. Johns	0	1	0	-	0	0
Santa Fe	2	2	0	0	-	0
Suwannee	0	1	0	0	0	-

5 Regions (4 possible)	**Chipola**	**Aucilla**	**Hillsborough**	**St. Johns**	**Santa Fe**
Chipola	-	1	3*	0	1
Aucilla	1	-	0	1	1
Hillsborough	3*	0	-	0	0
St. Johns	0	1	0	-	0
Santa Fe	1	1	0	0	-

3 Regions (2 possible)	**Chipola**	**Hillsborough**	**Santa Fe**
Chipola	-	1*	1
Hillsborough	1*	-	0
Santa Fe	1	1*	-

Table D.7.6: Summary of the ANOVA results of Analysis #3 for the larger, narrower Middle Paleoindian points. The total number of significant ANOVAs is listed in parentheses.

6 Regions (6 possible)	**Chipola**	**Aucilla**	**Hillsborough**	**St. Johns**	**Santa Fe**	**Suwannee**
Chipola	-	0	5*	0	0	0
Aucilla	0	-	2	0	0	0
Hillsborough	5*	2	-	0	3	0
St. Johns	0	0	0	-	0	0
Santa Fe	0	0	3	0	-	0
Suwannee	0	0	0	0	0	-

5 Regions (3 possible)	**Chipola**	**Aucilla**	**Hillsborough**	**St. Johns**	**Santa Fe**
Chipola	-	0	2	0	0
Aucilla	0	-	1	0	0
Hillsborough	2	1	-	0	1
St. Johns	0	0	0	-	0
Santa Fe	0	0	1	0	-

3 Regions (3 possible)	**Chipola**	**Hillsborough**	**Santa Fe**
Chipola	-	3	0
Hillsborough	3	-	2
Santa Fe	0	2	-

Table D.7.7: Summary of the ANOVA results of Analysis #4 for the larger, curve-sided points. The total number of significant ANOVAs is listed in parentheses.

6 Regions (5 possible)	Chipola	Aucilla	Hillsborough	St. Johns	Santa Fe	Suwannee
Chipola	-	0	3	0	2	0
Aucilla	0	-	1	1	1	0
Hillsborough	3	1	-	0	1	1
St. Johns	0	1	0	-	0	0
Santa Fe	2	1	1	0	-	0
Suwannee	0	0	1	0	0	-

5 Regions (5 possible)	Chipola	Aucilla	Hillsborough	St. Johns	Santa Fe
Chipola	-	1	4	0	3
Aucilla	1	-	0	1	1
Hillsborough	4	0	-	1	0
St. Johns	0	1	1	-	0
Santa Fe	3	1	0	0	-

3 Region (3 possible)	Chipola	Hillsborough	Santa Fe
Chipola	-	3	0
Hillsborough	3	-	0
Santa Fe	0	0	-

Table D.7.8: Summary of significant differences in Analysis #1, all Middle Paleoindian points. All differences are listed in relation to the region listed first. The third analysis combines the Hillsborough and Santa Fe regions because they are similar.

Analysis #1 all points									
	Chipola:Santa Fe (6 regions)			**Chipola:Hillsborough (6 regions)**			**Chipola:Suwannee (6 regions)**		
	Attribute	*Diff*	*Effect*	*Attribute*	*Diff*	*Effect*	*Attribute*	*Diff*	*Effect*
Size	Ear	-3 mm^2	Smaller ear	Ear	-3mm^2	Smaller ear	Mbw	-.3 mm	Narrower waist
	Mbw	-4 mm	Narrower waist	mbw	-3 mm	Narrower waist			
	Hypo	-2 mm	Shorter ear						
Shape	Angle	- 6°	Ears less flared	Angle	- 8°	Ears less flared	Angle	-7°	Ears less flared
	Mbbw.hyp	+ .01	A relatively squatter base, perhaps with flaring ears	Hmbw.bew	+ .12	Relatively longer base	Hmbw.bew	+.08	Relatively longer base
				Hyp.bew	+ .07	A relatively straighter and longer base	Hyp.bew	+.05	A relatively straighter and longer base
	Hmbw.bew	+ .09	Relatively longer base						
	Hyp.bew	+ .05	A relatively straighter and longer base						
PC				PC 2	- .59	Likely smaller angle and more uniform thickness			

Table D.7.9: Summary of significant differences in Analysis #1, all Middle Paleoindian points in the three region configuration. All differences are listed in relation to the region listed first.

	Chipola:Hillsborough (3 regions)			**Chipola:Santa Fe (3 regions)**		
	Attribute	*Diff*	*Effect*	*Attribute*	*Diff*	*Effect*
Size	hew	-.3 mm	thinner ear	Mbw	-3 mm	Narrower waist
				hew	-.3 mm	thinner ear
Shape	Angle	- 4°	Ears less flared	Angle	- 3°	Ears less flared
	Hmbw.bew	+ .06	Relatively longer base	Hmbw.bew	+ .12	Relatively longer base
	Hyp.bew	+ .07	A relatively straighter and longer base	Hyp.bew	+ .07	A relatively straighter and longer base
	Hyp.hew	+ 1.73	Relatively thinner ear or longer hypotenuse	Hyp.hew	+ 1.13	Relatively thinner ear or longer hypotenuse
PC						

Table D.7.10: Summary of significant differences in Analysis #2, all Middle Paleoindian points. All differences are listed in relation to the region listed first. The third analysis combines the Hillsborough and Santa Fe regions because they are similar.

Analysis #2 flared ear									
	Chipola:Santa Fe (6 regions)			**Aucilla:St. Johns (6 regions)**			**St. Johns:Santa Fe (6 regions)**		
	Attribute	*Diff*	*Effect*	*Attribute*	*Diff*	*Effect*	*Attribute*	*Diff*	*Effect*
Size	Ear	-6 mm^2	Smaller ear	hmbw	+ 5 mm	longer waist	Hypo	-.3 mm	Narrower waist
	Mbw	-6 mm	Narrower waist				hmbw	- 3 mm	
	Hew	-1 mm	Shorter ear						
	Bew	-7 mm	Narrower base						
Shape				Mbw.bew	+ .1	Relatively more flared basal ears	ang.bew	+.48	Relatively narrower or longer, and possibly a flared base
				Ang.bew	- .58	Relatively wider or squatter, more flared base	mbbw.hyp	+.01	A relatively squatter base, perhaps with flaring ears
PC				PC 2	- 1.92	Relatively squatter base and more flaring ears			

Table D.7.11: Summary of significant differences in Analysis #2, points with flared ears in the five-region configuration. All differences are made in relation to the region listed first.

	St. Johns:Santa Fe (5 regions)			**Chipola:Santa Fe (5 regions)**		
	Attribute	*Diff*	*Effect*	*Attribute*	*Diff*	*Effect*
Size	hypo hmbw bew	- 4 mm - 3 mm - 5 mm	Shorter ear Squatter waist Narrower base	Hew Bew Mbw	- 1 mm - 7 mm - 5 mm	Thinner ear Narrower base Narrower waist
Shape	Ang.bew Mbbw.hyp	+ .47 + .02	Relatively narrower or longer, and possibly a flared base A relatively squatter base, perhaps with flaring ears	Mbbw.hyp	+ .02	A relatively squatter base, perhaps with flaring ears
PC						

Table D.7.12: Summary of significant differences in Analysis #2, flared ear Middle Paleoindian points in the three region configuration. All comparisons are made to the region listed first. The third analysis combines the Hillsborough and Santa Fe regions because they are similar.

	Chipola:Hillsborough (3 regions)			**Chipola:Santa Fe (3 regions)**			**Hillsborough: Santa Fe (3 regions)**		
	Attribute	Diff	Effect	Attribute	Diff	Effect	Attribute	Diff	Effect
Size	hmbw	+3 mm	Longer waist	Ear	-4mm^2	Smaller ear	Hypo	- 3 mm	Shorter ear
				Hew	-1 mm	Smaller ear	Hmbw	- 3 mm	Squatter base
				Bew	-7 mm	Narrower base			
				mbw	-4 mm	Narrower waist			
Shape	Angle	- 8°	Ears less flared	Mbw.hmbw	-.35	Relatively longer base	Angle	+ 5°	Ears more flared
	mbw.hmbw	-.78	Relatively longer base				Ang.bew	+ .36	Relatively narrower or longer, and possibly a flared base
	Hmbw.bew	+ .11	Relatively longer base				mbbw.hyp	+ .01	Relatively squatter base, perhaps with flaring ears
	Bew.hew	+ 3.9	Relatively smaller ear				mbw.hmbw	+ .43	Relatively squatter and more flaring base
							hmbw.bew	- .07	Relatively squatter base
PC									

Table D.7.13: Summary of significant differences in Analysis #2, straighter eared Middle Paleoindian points. All differences are listed in relation to the region listed first.

Analysis #2 straighter ear									
	Chipola:Santa Fe (6 regions)			**Chipola:Suwannee (6 regions)**			**Chipola: Santa Fe (3 regions)**		
	Attribute	*Diff*	*Effect*	*Attribute*	*Diff*	*Effect*	*Attribute*	*Diff*	*Effect*
Size	bew Mbw	-5 mm -5 mm	Narrower base Narrower waist	Stdt	+.3 mm	The thickness is less uniform	Mbw	-.2 mm	Narrower waist
Shape	Angle Hmbw.bew hyp.bew	- 6° + .01 + .05	Ears less flared Relatively longer base A relatively straighter and longer base	Angle Hmbw.bew Hyp.bew	- 7° + .01 + .05	Ears less flared Relatively longer base A relatively straighter and longer base	Angle Hmbw.bew Hyp.bew	-3° +.01 +.04	Ears less flared Relatively longer base A relatively straighter and longer base
PC									

Table D.7.14: Summary of significant differences in Analysis #3, large, narrower Middle Paleoindian points. All differences are listed in relation to the region listed first.

	Chipola:Hillsborough (6 regions)		
	Attribute	*Diff*	*Effect*
Size	hmbw	+2.1 mm	Longer base
Shape	Angle *	- 7°	Ears less flared
	mbw.hmbw	- 1.7	Relatively longer base
	hmbw.bew	+ .01	Relatively longer base
	ang.bew	-.32	Relatively narrower or longer, less flared base
PC			

Table D.7.15: Summary of significant differences in Analysis #4, straighter ear Middle Paleoindian points. All differences are listed in relation to the region listed first.

	Chipola:Santa Fe (5 regions)		
	Attribute	*Diff*	*Effect*
Size	Bew mbw	- 6 mm - 4 mm	Narrower base Narrower waist
Shape	Angle Hmbw.bew Hyp.bew	- 6° + .1 + .05	Ears less flared Relatively longer base Relatively straighter and longer base
PC			

Table D.7.16 Summary of significant differences in Analysis #4, large, curved sided Middle Paleoindian points. All differences are listed in relation to the region listed first.

	Chipola:Hillsborough (5 regions)		
	Attribute	*Diff*	*Effect*
Size	Bcv	+ 1.1 mm	Deeper base
Shape	Angle Hmbw.bew Bew.bcv	- 7° + .11 - 3.29	Ears less flared Relatively longer base Relatively deeper concavity
PC			

Table D.7.17: Summary of significant differences between the Chipola and Santa Fe regions in Analysis #1, all Middle Paleoindian points. All differences are listed in relation to the region listed first. The third analysis combines the Hillsborough and Santa Fe regions because they are similar.

	Chipola:Santa Fe (6 regions)			**Chipola:Santa Fe (3 regions)**		
	Attribute	*Diff*	*Effect*	*Attribute*	*Diff*	*Effect*
Size	Ear	-3 mm^2	Smaller ear	Mbw	-3 mm	Narrower waist
	Mbw	-4 mm	Narrower waist	hew	-.03 mm	Smaller ear
	Hypo	-2 mm	Shorter ear			
Shape	Angle	- 6°	Ears less flared	Angle	- 3°	Ears less flared
	Mbbw.hyp	+ .01	A relatively squatter base, perhaps with flaring ears	Hmbw.bew	+ .12	Relatively longer base
				Hyp.bew	+ .07	A relatively straighter and longer base
	Hmbw.bew	+ .09	Relatively longer base	Hyp.hew	+ 1.13	Relatively thinner ear or longer hypotenuse
	Hyp.bew	+ .05	A relatively straighter and longer base			
PC				PC 2	- .59	Likely smaller angle and more uniform thickness

Table D.7.18: Summary of significant differences between the Chipola and Santa Fe regions in Analysis #2, flared ear Middle Paleoindian points in the three region configuration. All comparisons are made to the region listed first.

	Chipola:Santa Fe (6 regions)			**Chipola:Santa Fe (5 regions)**			**Chipola:Santa Fe (3 regions)**		
	Attribute	Diff	Effect	Attribute	Diff	Effect	Attribute	Diff	Effect
Size	Ear	-6 mm^2	Smaller ear	Hew	- 1 mm	Thinner ear	Ear	-4mm^2	Smaller ear
	Mbw	-6 mm	Narrower waist	Bew	- 7 mm	Narrower base	Hew	-1 mm	Smaller ear
	Hew	-1 mm	Shorter ear	Mbw	- 5 mm	Narrower waist	Bew	-7 mm	Narrower base
	Bew	-7 mm	Narrower base				mbw	-4 mm	Narrower waist
Shape				Mbbw.hyp	+ .02	A relatively squatter base, perhaps with flaring ears	Mbw.hmbw	- .35	Relatively longer base
PC									

Table D.7.19: Summary of significant differences between the Chipola and Santa Fe regions in Analysis #2, straighter ear Middle Paleoindian points in the three region configuration. All comparisons are made to the region listed first.

	Chipola:Santa Fe (6 regions)			**Chipola:Santa Fe (5 regions)**			**Chipola:Santa Fe (3 regions)**		
	Attribute	Diff	Effect	Attribute	Diff	Effect	Attribute	Diff	Effect
Size	bew	-5 mm	Narrower base	bew	- 6 mm	Narrower base	Mbw	-.2 mm	Narrower waist
	Mbw	-5 mm	Narrower waist	mbw	- 4 mm	Narrower waist			
Shape	Angle	- 6°	Ears less flared	Angle	- 6°	Ears less flared	Angle	-3°	Ears less flared
	Hmbw.bew	+ .11	Relatively longer base	Hmbw.bew	+ .11	Relatively longer base	Hmbw.bew	+.6	Relatively longer base
	hyp.bew	+ .05	A relatively straighter and longer base	Hyp.bew	+ .05	Relatively straighter and longer base	Hyp.bew	+.04	A relatively straighter and longer base
PC									

REFERENCES

Abrahamson, W. G., and Hartnett, D. C.
1990 Pine flatwoods and dry prairies. In *Ecosystems of Florida*, edited by R. L. Myers and J. J. Ewel, pp. 103-149. University of Central Florida Press, Gainesville.

Aldenderfer, M. S. and R. K. Blashfield
1978 Cluster Analysis and Archaeological Classification. *American Antiquity* 43(3):502-505.

Amick, Daniel S.
1995 Patterns of Technological Variation among Folsom and Midland Projectile Points in the American Southwest. *Plains Anthropologist* 40: 23-38.

Anderson, David G.
1990 The Paleoindian Colonization of Eastern North America: a View from the Southeastern United States. In *Research in Economic Anthropology, Supplement 5*, edited by Kenneth B. Tankersley and Barry Isaac, pp. 163-217. JAI Press, Greenwich, CT.

1995 Paleoindian interaction networks in the eastern woodlands. In *Native American Interactions*, edited by Kenneth Sassaman, pp. 3-26. University of Tennessee Press, Knoxville.

1996 Models of Paleoindian and Early Archaic Settlement in the Southeastern United States. In *The Paleoindian and Early Archaic Southeast*, edited by D. Anderson and K. Sassaman, pp. 29-57. University of Alabama Press, Tuscaloosa.

2004 Paleoindian Occupations in the Southeastern United States. In *New Prespectives on the First Americans*, edited by B. Lepper and R. Bonnichsen, pp. 119-128. Center for the Study of the First Americans, State College, Texas.

Anderson, David G. and Christopher Gillam
2000 Paleoindian Colonization of the Americas: Implications from an Examination of Physiography, Demography, and Artifact Distribution. *American Antiquity* 65:43-66.

Anderson, David G. and Glen T. Hanson
1988 Early Archaic Settlement in the Southeastern United States: A Case Study from the Savannah River Valley. *American Antiquity* 53: 262-286.

Anderson, David G. and Kenneth E. Sassaman
1996 Modeling Paleoindian and Early Archaic Settlement in the Southeast: A Historical Perspective. In *The Paleoindian and Early Archaic Southeast*, edited by D. Anderson and K. Sassaman, pp. 16-28. University of Alabama Press, Tuscaloosa.

Andrefsky, William, Jr.
1998 *Lithics: Macroscopic Approaches to Analysis.* Cambridge University Press, Cambridge.

Bahuchet, Serge
1992 Spatial Mobility and Access to Resources among the African Pygmies. In *Mobility and Territoriality: Social and Spatial Boundaries among Foragers, Fishers, Pastoralists, and Peripatetics*, edited by M. J. Casimir and A. Rao, pp. 205-258. Berg, New York.

Ballo, George R.
1985 *Experiments in Use-Wear Formation on Stone Tools Made from Florida Cherts: A Study Supporting a Microwear Analysis of PaleoIndian Lithic Artifacts from the Harney Flats Site, Tampa, Florida.* Unpublished Master's Thesis, Department of Anthropology, University of South Florida, Tampa.

Balsillie, James H., and Joseph F. Donoghue
2004 *High Resolution Sea-Level History for the Gulf of Mexico since the Last Glacial Maximum*. Report of Investigations No. 113. Florida Geological Survey, Tallahassee.

Bamforth, Douglas B.
2002 Evidence and Metaphor in Evolutionary Archaeology. *American Antiquity* 67:231-242.

Bandura, Albert
1977 *Social Learning Theory*. Prentice-Hall, Englewood Cliffs, NJ.

Barnard, Alan
1992 Social and Spatial Boundary Maintenance among Southern African Hunter-Gatherers. In *Mobility and Territoriality: Social and Spatial Boundaries among Foragers, Fishers, Pastoralists, and Peripatetics*, edited by Michael J. Casimir and Aparna Rao, pp. 55-90. Berg, New York.

Barth, F.
1969 *Ethnic groups and boundaries. The social organization of culture difference*. Little Brown, Boston,

Basalla, George
1988 *The Evolution of Technology*. Cambridge University Press, Cambridge.

Basso, Ronald J., Jr.
2003 Predicted Change in Hydrologic Conditions along the Upper Peace River due to a Reduction in Ground-Water Withdrawals. Southwest Florida River Water Management District, Brooksville.

Benedict, Ruth
1934 *Patterns of Culture*. Houghton Mifflin, Boston.

Bentley, R. Alexander, and Stephen J. Shennan
2003 Cultural Transmission and Stochastic Network Growth. *American Antiquity* 68: 459-486.

Benton, J. M.
1991 Colonizing Continents: Some Problems from Australia and the Americas. In *The First Americans: Search and Research*, edited by Tom Dillehay and David Meltzer, pp. 209-230. CRC Press, Boca Raton, FL.

Berger, A., and M. F. Loutre
1991 Insolation values for the climate of the last 10 million years. *Quaternary Science Reviews* 10: 297-317.

Bermes, B. J., G. W. Leve, and G. R. Tarver
1963 *Geology and Ground-Water Resources of Flagler, Putnam, and St. Johns Counties, Florida*. Report of Investigation No. 32. Florida Geological Survey, Tallahassee.

Binford, Lewis R.
1962 Archaeology as Anthropology. *American Antiquity* 28:217-225.

1983 Long Term Land Use Patterns: Some Implications for Archaeology. In *Lulu Linear Punctated: Essays in Honor of George Irving Quimby*, edited by Robert C. Dunnell and Donald K. Grayson, pp. 27-53. Anthropological Papers, Museum of Anthropology No. 72. University of Michigan, Ann Arbor.

2001 *Constructing Frames of Reference: An Analytical Method for Archaeological Theory Building using Ethnographic and Environmental Data Sets*. University of California Press, Berkley.

Bleed, Peter
1986 The Optimal Design of Hunting Weapons: Maintainability or Reliability. *American Antiquity* 51:737-747.

Bond, Paulette, Kenneth M. Campbell, and Thomas M. Scott
1986 *An Overview of Peat in Florida and Related Issues*. Special Publication No. 27. Florida Geological Survey, Tallahassee.

Bourdieu, Pierre
1977 *An Outline of a Theory of Practice*. Cambridge University Press, Cambridge.

Boyd, Robert, and Peter J. Richerson
1985 *Culture and the Evolutionary Process*. University of Chicago Press, Chicago.

1992 How Microevolutionary Processes give rise to History. In *History and Evolution*, edited by Matthew H. Nitecki and Doris V. Nitecki, pp. 179-209. State University of New York Press, Albany.

Bradley, R. S.
1999 Paleoclimatology: reconstructing climates of the Quaternary, 2nd ed. Academic Press, San Diego.

Bradley, Bruce, and Dennis Stanford
2004 The North Atlantic Ice-edge Corridor: A Possible Palaeolithic route to the New World. *World Archaeology* 36:459-478.

Brenner, Mark, Michael W. Binford, and Edward S. Deevey
1990 Lakes. In *Ecosystems of Florida*, edited by Ronald L. Myers and John J. Ewel, pp. 364-391. University of Central Florida Press, Orlando.

Brown, J. G., and A. D. Cohen
1985 Palynologic and petrographic analyses of peat deposits, Little Salt Spring. *National Geographic Reports*, p. 21-31.

Bullen, Ripley P.
1958 The Bolen Bluff Site on Paynes Prairie, Florida. *Contributions of the Florida State Museum Social Sciences* 4:1-51.

1969 A Clovis Fluted Point from the Santa Fe River, Florida. *The Florida Anthropologist* 33:36-37.

1975 *A Guide to the Identification of Florida Projectile Points*. Kendall Books, Gainesville, FL.

Bullen, Ripley P., and Laurence E. Beilman
1973 The Nalcrest Site, Lake Weohyakapka, Florida. *The Florida Anthropologist* 26:1-22.

Bush, Peter W., and Richard H. Johnston
1988 *Ground-Water Hydraulics, Regional Flow, and Ground-Water Development of the Floridan Aquifer System in Florida and in Parts of Georgia, South Carolina, and Alabama*. U.S. Geological Survey Professional Paper 1403-C. Washington, D.C.

Callahan, Errett
1979 The Basics of Biface Knapping in the Eastern Fluted Point Tradition: A Manual for Flintknappers and Lithic Analysts. *Archaeology of Eastern North America* 7:1-180.

Campbell, Kenneth M.
1989 *Geology of Sumpter County, Florida*. Report of Investigations No. 98. Florida Geological Survey, Tallahassee.

Carr, Christopher
1985 Perspective and Basic Definitions. In *Concordance in Archaeological Analysis,* edited by C. Carr, pp. 1-17. Westport Publishers, Kansas City.

1995 A Unified Middle-Range Theory of Artifact Design. In *Style, Society, and Person: Archaeological and Ethnological Perspectives*, edited by C. Carr and J. E. Neitzel, pp. 172-258. Plenum Press, New York.

Carr, Christopher, and Jill E. Neitzel
1995 Integrating Approaches to Material Style in Theory and Philosophy. In *Style, Society, and Person: Archaeological and Ethnological Perspectives*, edited by C. Carr and J. E. Neitzel, pp. 3-20. Plenum Press, New York.

Cashdan, Elizabeth
1983 Territoriality among Human Foragers: Ecological Models and an Application to Four Bushman Groups. *Current Anthropology* 24: 47-66.

Casimir, Michael J.
1992 The Dimensions of Territoriality: An Introduction. In *Mobility and Territoriality: Social and Spatial Boundaries among Foragers, Fishers, Pastoralists, and Peripatetics*, edited by M. J. Casimir and A. Rao, pp. 1-26. Berg, New York.

Ceryak, Ron
1977 *Alapha River Basin*. Information Circular 5, Suwannee River Water Management District. Cooks Hammock, FL.

Ceryak, Ron, Michael S. Knapp, and Terry Burnson
1983 *The Geology and Water Resources of the Upper Suwannee River Basin, Florida*. Bureau of Geology, Report of Investigation. Tallahassee, FL.

Cherry, R. N., J. W. Stewart, and J. A. Mann
1970 *General Hydrology of the Middle Gulf Area, Florida*. Report of Investigation No. 56. Florida Geological Survey, Tallahassee.

Christenson, A. L. and D. W. Read
1977 Numerical Taxonomy, R-Mode Factor Analysis, and Archaeological Classification. *American Antiquity* 42: 163-179.

Clark, William E., Rufus H. Musgrove, Clarence G. Menke, and Joseph W. Cagle, Jr.
1964 *Water Resources of Alachua, Bradford, Clay, and Union Counties, Florida.* Report of Investigations No. 35. State of Florida, State Board of Conservation, Division of Geology, Tallahassee.

Clarke, David L.
1968 *Analytical Archaeology*. Methuen, London.

1977 Spatial Information in Archaeology. In *Spatial Archaeology*, edited by David L. Clarke, pp. 1-32. Academic Press, London.

Clastres, Pierre
1972 The Guayaki. In *Hunters and Gatherers Today*, edited by M. G. Bicchieri, pp. 138-174. Holt, Rinehart, and Winston, New York.

Clausen, Carl J., H. K. Brooks, and Al B. Wesolowsky
1975 The Early Man Site at Warm Mineral Springs, Florida. *Journal of Field Archaeology* 2:191-212.

Clausen, C. J., A. D. Cohen, C. Emiliani, J. A. Holman, J. J. Stipp
1979 Little Salt Spring, Florida: A unique underwater site. *Science* 203:609-614.

Cockrell, Wilburn A., and Larry Murphy
1978 Pleistocene Man in Florida. *Archaeology of Eastern North America* 6:1-13.

Col, Nolan, Frank Rupert, Meryl Enright, and Glenn Horvath
1997 *Reappraisal of the Geology and Hydrology of Gilchrist County, Florida, with Emphasis on the Waccasassa Flats*. Report of Investigation No. 99. Florida Geological Survey, Tallahassee.

Conkey, Margaret W.
1989 The Use of Diversity in Stylistic Analysis. In *Quantifying Diversity in Archaeology*, edited by R. D. Leonard and G. T. Jones, pp., 118-130. Cambridge University Press, New York.

1990 Experimenting with style in archaeology: some historical and theoretical issues. In *The Uses of Style in Archaeology,* edited by M. Conkey and C. Hastorf, pp. 5-17. Cambridge University Press, Cambridge.

Crane, James J.
1986 *An Investigation of the Geology, Hydrogeology, and Hydrochemistry of the Lower Suwannee River Basin*. Report of Investigation No. 96, Florida Geological Survey, Tallahassee.

Curran, Mary Lou, and John R. Grimes
1989 Ecological Implications for Paleoindian Lithic Procurement Economy in New England. In *Eastern Paleoindian Lithic Resource Use*, edited by C. Ellis and J. Lothrop, pp. 41-74. Westview Press, Boulder, CO.

Custer, Jay F., and R. Michael Stewart
1990 Environment, Analogy, and Early Paleoindian Economies in Northeastern North America. In *Research in Economic Anthropology, Supplement 5*, edited by K. B. Tankersley and B. L. Issac, pp. 303-322. JAI Press, Greenwich, CT.

Damas, David
1968 The Diversity of Eskimo Societies. In *Man the Hunter*, edited by R. B. Lee and I. DeVore, pp. 111-117. Aldine Publishing, Chicago.

1972 The Copper Eskimo. In *Hunters and Gatherers Today*, edited by M. G. Bicchieri, pp. 3-50. Holt, Rinehart, and Winston, New York.

Daniel, R. I.
1985 A Preliminary Model of Hunter-Gatherer Settlement in Central Florida. *The Florida Anthropologist* 38:261-273.

2001 Stone Raw Material Availability and Early Archaic Settlement in the Southeastern United States. *American Antiquity* 66:237-267.

Daniel, R. I., and M. Wisenbaker
1987 *Harney Flats: A Florida Paleo-Indian Site*. Baywood Publishing, Farmingdale, NY.

1989 Paleoindian in the Southeast: The View from Harney Flats. In *Eastern Paleoindian Lithic Resource Use*, edited by C. Ellis and J. Lothrop, pp. 323-344. Westview Press, Boulder, CO.

Deetz, James
1996 *In Small Things Forgotten: an Archaeology of Early American Life, revised edition*. Anchor Books, New York.

Deevey, E. S.
1988 Estimation of Downward Leakage from Florida lakes. *Limnology Oceanography* 3: 1308-1416.

Delcourt, H. R., P. A. Delcourt, and T. Webb III.
1983 Dynamic Plant Ecology: The Spectrum of Vegetational Change in Space and Time: *Quaternary Science Reviews* 1:153-175.

Dietler, Michael, and Ingrid Herbich

1989 *Tich Matek*: The Technology of Luo Pottery Production and the Definition of Ceramic Style. *World Archaeology* 21:148-164.

1998 *Habitus*, Techniques, Style: An Integrated Approach to the Social Understanding of Material Culture and Boundaries. In *The Archaeology of Social Boundaries*, edited by M. T. Stark, pp. 232-263. Smithsonian Institution Press, Washington, D.C.

Dincauze, Dena F.

1993a Fluted Points in the Eastern Forests. In *From Kostenki to Clovis: Upper Paleolithic Paleo-Indian Adaptations*, edited by O. Soffer and N. D. Praslov, pp. 279-292. Plenum Press, New York.

1993b Pioneering in the Pleistocene: Large Paleoindian Sites in the Northeast. In *Archaeology of Eastern North America: Papers in Honor of Stephen Williams*, edited by James B. Stoltman, pp. 43-60. Archaeological Report No. 25. Mississippi Department of Archives and History, Jackson.

Doran, Glen H.

2002 Introduction to Wet Sites and Windover (8BR246) Investigations. In *Windover: Multidisciplinary Investigations of an Early Archaic Florida Cemetery*, edited by G. H. Doran, pp. 1-38. University Presses of Florida, Gainesville.

Doran, J. E., and F. R. Hodson

1975 *Mathematics and Computers in Archaeology*. Harvard University Press, Cambridge, MA.

Drennan, Robert D.

1996 *Statistics for Archaeologists: a Commonsense Approach*. Plenum Press, New York.

Dolan, E. M.

1959 *An investigation of the Darby and Hornsby Springs Sites, Alachua County, Florida*. Unpublished master's thesis, Department of Anthropology, Florida State University, Tallahassee.

Dolan, Edward M., and Glenn T. Allen, Jr.

1961 *An Investigation of the Darby and Hornsby Springs Sites, Alachua County, Florida*. Special Publication No. 7, Florida Geological Survey, Tallahassee.

Dooris, Patricia M., George M. Dooris, Theodore F. Rochow, and Manuel Lopez

1990 The Effects on Wetland Vegetation and Habitat Value Caused by Altered Hydroperiods Resulting from Groundwater Withdrawals in Central Florida. Technical Report 1990-1, Southwest Florida Water Management District, Brooksville.

Dunbar, James S.

1991 Resource Orientation of Clovis and Suwannee Age Paleoindian Sites in Florida. In *Clovis Origins and Adaptations*, edited by R. Bonnichsen and K. L. Turnmire, pp. 185-213. Center for the Study of the First Americans, Oregon State University, Corvallis.

2002 *Chronostratigraphy and Paleoclimate of Late Pleistocene Florida and the Implications of Changing Paleoindian Land Use*. Unpublished Master's thesis on file, Department of Anthropology, Florida State University, Tallahassee.

2005 *The Pre-Clovis Occupation of Florida: The Page-Ladson and Wakulla Springs Lodge Data*. Paper presented at the Clovis in the Southeast Conference, October 26-29, 2005, Columbia, SC.

Dunbar, James S., Michael K. Faught, and S. David Webb
1988 Page/Ladson (8Je591): an Underwater Paleo-Indian Site in Northwestern Florida. *The Florida Anthropologist* 41:442-452.

Dunbar, James S. and Pamela K. Vojnovski
2006 Early Floridians and Late Mega-Mammals: Some Technological and Dietary Evidence from Four North Florida Paleoindian Sites. Manuscript on file at the Florida Bureau of Archaeological Research, Tallahassee.

Dunbar, James S., and Benjamin Waller
1983 A Distribution Analysis of the Clovis/Suwannee Paleo-Indian Sites of Florida—A Geographic Approach. *The Florida Anthropologist* 36:18-30.

Dunbar, James S., and S. David Webb
1996 Bone and Ivory Tools from Submerged Paleoindian Sites in Florida. In *The Paleoindian and Early Archaic Southeast*, edited by D. Anderson and K. Sassaman, pp. 331-353. University of Alabama Press, Tuscaloosa.

Edwards, W. E.
1954 *The Helen Blazes Site of Central Eastern Florida: A Study in Method Utilizing the Disciplines of Archaeology, Geology, and Pedology.* Unpublished dissertation. Department of Geology, Columbia University, New York City.

Evans-Pritchard, E. E.
1940 *The Nuer: A Description of the Modes of Livelihood and Political Institutions of a Nilotic People*. Oxford University Press, New York.

Ewel, Katherine C.
1990 Swamps. In *Ecosystems of Florida*, edited by R. L. Myers and J. J. Ewel, pp. 281-323. University of Central Florida Press, Orlando.

Fairbanks, R. G.
1989 A 17,000-year Glacio-eustatic Sea Level Record: Influence of Glacial Melting Rates on the Younger Dryas Event and Deep-ocean Circulation. *Nature* 342:637-642.

Faught, Michael K.
2004 The Underwater Archaeology of Paleolandscapes, Apalachee Bay, Florida. *American Antiquity* 69:275-290.

Faught, Michael K., and Joseph F. Donoghue
1997 Marine Inundated Archaeological Sites and Paleofluvial Systems: Examples from a Karst-controlled Continental Shelf Setting in Apalachee Bay, Northeastern Gulf of Mexico. *Geoarchaeology* 12:417-458.

Faure, Hugues, Robert C. Walter, and Douglas R. Grant
2002 The Coastal Oasis: Ice Age Springs on Emerged Continental Shelves. *Global and Planetary Change* 33:47-56.

Fernald, Edward A., and Elizabeth D. Purdum, editors
1998 *Water Resources Atlas of Florida*. Institute of Science and Public Affairs, Florida State University, Tallahassee.

Fiedel, Stuart J.
1999 Older than We Thought: Implications of Corrected Dates for Paleoindians. *American Antiquity* 64:95-115.

2004 Clovis Age in Calendar Years: 13,500 – 13,000 CALYBP. In, *New Prespectives on the First Americans*, edited by B. Lepper and R. Bonnichsen, pp. 73-80. Center for the Study of the First Americans, State College, Texas.

Fitting, James Edward.
1977 Social dimensions of the paleoindian adaptation in the Northeast. In *Amerinds and Their Paleoenvironments in Northeastern North America*, edited by W. S. Newman and B. Salwen, pp. 369-374. New York Academy of Sciences, New York.

Flannery, K. V.
1976 *The Early Mesoamerican village*. Academic Press, New York.

Florida Department of Natural Resources
1989 *Florida Rivers Assessment*. Florida Department of Natural Resources, Tallahassee.

Friedrich, Margaret Hardin
1970 Design Structure and Social Interaction. *American Antiquity* 35:332-343.

Foley, Robert
1977 Space and Energy: A Method for Analysing Habitat Value and Utilization in Relation to Archaeological Sites. In *Spatial Archaeology*, edited by D. L. Clarke, pp. 163-188. Academic Press, London.

Foley, William A.
1997 *Anthropological Linguistics: An Introduction*. Blackwell, Malden, MA.

Gardner, William M.
1983 Stop Me if You've Heard This One Before: The Flint Run PaleoIndian Complex Revisited. *Archaeology of Eastern North America* 11:49-59.

Giese, G.L., and M.A. Franklin
1996 Magnitude and Frequency of Low Flows in the Suwannee River Water Management District, Florida. U.S. Geological Survey Water Investigations Report 96-4308. Tallahassee, FL.

Goggin, John M.
1950 An Early Lithic Complex from Central Florida. *American Antiquity* 16:46-49.

Goodyear, Albert C., III
1974 *The Brand Site: A Techno-Functional Study of a Dalton Site in Northeastern Arkansas*. Arkansas Archaeological Survey Research Series No. 7. University of Arkansas, Fayetteville.

Goodyear, Albert C., III, and L. O. Warren
1972 Further Observations on the Submarine Oyster Shell Deposits in Tampa Bay. *The Florida Anthropologist* 25:52-66.

Goodyear, Albert C., Sam B. Upchurch, Mark J. Brooks, and Nancy C. Goodyear
1983 Paleo-Indian Manifestations in the Tampa Bay Region, Florida. *The Florida Anthropologist* 36:40–66.

Gosselain, Oliver P.
1992 Technology and Style: Potters and Pottery Making among Bafia of Cameroon. *Man (n.s.)*:27:559-586.

1998 Social and Technical Identity in a Clay Crystal Ball. In *The Archaeology of Social Boundaries*, edited by M. T. Stark, pp. 78-106. Smithsonian Institution Press, Washington, D.C.

Gramly, Richard M.
1988 Palaeo-Indian Sites South of Lake Ontario, Western and Central New York State. In *Late Pleistocene and Early Holocene Paleoecology and Archaeology of the Eastern Great Lakes Region*, edited by R. S. Laub, N. G. Miller, and D. W. Steadman, pp. 265-280. Bulletin of the Buffalo Society of Natural Sciences, Buffalo, NY.

Griffin, James B.
1952 Culture Periods in Eastern United States Archaeology. In *Archaeology of the Eastern United States*, edited by James B. Griffin, pp. 352-364. University of Chicago Press, Chicago.

Grimm, E.C., G.L. Jacocsen, W.A. Watts, B.C.S. Hansen, and K.A. Maasch.
1993 A 50,000-year Record of Climate Oscillations from Florida and its Temporal Correlation with the Heinrich Events. *Science* 261:198-200.

Haggett, Peter
1966 *Locational Analysis in Human Geography*. St. Martins Press, New York.

Hamilton, Christopher E.
1995 A Cautionary Perspective. In *Ethics in Archaeology: Challenges for the 1990s*, edited by M. J. Lynott and A. Wylie, pp. 17-21. Society for American Archaeology, Allen Press, Lawrence, Kansas.

Hamilton, W. D.
1964 The genetical evolution of social behavior. *Journal of Theoretical Biology* 7:17-52.

Hardin, Margaret Ann
1979 The Cognitive Basis of Productivity in a Decorative Art Style: Implications of an Ethnographic Study for Archaeologists' Taxonomies. In *Ethnoarchaeology: Implications of Ethnography for Archaeology*, edited by C. Kramer, pp. 75-101. Columbia University Press, New York.

Hartwig, Frederick, and Brian E. Dearing
1979 *Exploratory Data Analysis*. Sage Publications, Beverly Hills, CA.

Hayden, Brian
1982 Interaction parameters and the demise of PaleoIndian craftsmanship. *Plains Anthropologist* 27:109-123.

Haynes, C. Vance
1982 Were Clovis Progenitors in Beringia? *Paleoecology of Beringia*, edited by D.M. Hopkins, J. V. Mathews, C. E. Schwenger, and S. B. Young, pp. 383-398. Academic Press, New York.

Haynes, C. Vance, Dennis J. Stanford, Margret Jordy, Joanne Dickenson, John L. Montgomery, Philip H. Shelley, Irwing Rovner, and George A. Agogino
1999 A Clovis Well at the Type Site 11,500 B.C.: The Oldest Prehistoric Well in America. *Geoarchaeology* 14:455-470.

Helm, June
1968 The Nature of Dogrib Socioterritorial Groups. In *Man the Hunter*, edited by R. B. Lee and I. DeVore, pp. 118-125. Aldine Publishing, Chicago.

1972 The Dogrib Indians. In *Hunters and Gatherers Today*, edited by M. G. Bicchieri, pp. 51-89. Holt, Rinehart, and Winston, New York.

Hemmings, C. Andrew
1999 *The Paleoindian and Early Archaic Tools of Sloth Hole (8Je121): An Inundated Site in the Lower Aucilla River, Jefferson County, Florida.* Unpublished Master's Thesis, University of Florida, Gainesville.

2004 *The Organic Clovis: a Single Continent-Wide Cultural Adaptation*. Unpublished Ph.D. dissertation. Department of Anthropology, University of Florida, Gainesville.

Hemmings, E. Thomas
1975 The Silver Springs Site, Prehistory in the Silver Springs Valley, Florida. *The Florida Anthropologist* 28:141-158.

Henrich, Joseph
2001 Cultural Transmission and Diffusion of Innovations: Adoption Dynamics Indicate that Biased Cultural Transmission is the Predominant Force in Behavioral Change. *American Anthropologist* 103:992-1013.

2002 Decision Making, Cultural Transmission, and Adaptation in Economic Anthropology. In *Theory in Economic Anthropology*, edited by J. Ensminger, pp. 251-295. Altamira Press, Walnut Creek, CA.

2004 Demography and Cultural Evolution: How Adaptive Cultural Processes can Produce Maladaptive Losses – the Tasmanian Case. *American Antiquity* 69:197-214.

Henrich, Joe and Robert Boyd
1998 The Evolution of Conformist Transmission and the Emergence of Between-Group Difference. *Evolution and Human Behavior* 19:215-241.

2002 On Modeling Cognition and Culture. *Journal of Cognition and Culture* 2:87-112.

Henrich, Joseph, and Francisco J. Gil-White
2001 The Evolution of Prestige: Freely Conferred Deference as a Mechanism for Enhancing the Benefits of Cultural Transmission. *Evolution and Human Behavior* 22:165-196.

Henrich, Joseph, and Richard McElreath
2003 The Evolution of Cultural Evolution. *Evolutionary Anthropology* 12:123-135.

Hester, James J., and James Grady
1977 Paleoindian Social Patterns on the Llano Estacado. In *Paleoindian Lifeways*, edited by E. Johnson, pp. 78-96. The Museum Journal XVII. West Texas Museum Association, Lubbock.

Hewlett, Barry S., and L. L. Cavilla-Sforza
1986 Cultural Transmission Among Aka Pygmies. *American Anthropologist* 88:922-934.

Hitchcock, Robert K., and Laurence E. Bartram, Jr.
1998 Social Boundaries, Technical Systems, and the Use of Space and Technology in the Kalahari. In *The Archaeology of Social Boundaries*, edited by M. T. Stark, pp. 21-49. Smithsonian Institution Press, Washington, D. C.

Hodder, Ian
1977 The Distribution of Material Culture Items in the Baringo District, West Kenya. *Man* 12:239-269.

1990 Style as Historical Quality. In *Uses of Style in Archaeology*, edited by M. Conkey and C. Hasdorf, pp. 44-51. Cambridge University Press, Cambridge.

1991 Interpretive Archaeology and its Role. *American Antiquity* 56:7-18.

Hodder, Ian, and Clive Orton
1976 *Spatial Analysis in Archaeology*. Cambridge University Press, Cambridge.

Hoffman, C. Marshall
1985 Projectile point maintenance and typology: assessment with factor analysis and canonical correlation. In *For Concordance in Archaeological Analysis*, edited by C. Carr, pp.566-612. Westport Publishers, Kansas City.

Hoffman, Charles A.
1983 A Mammoth Kill Site in the Silver Springs Run. *The Florida Anthropologist* 36(1-2):83-86.

Holloway, R. G.
2002 Pollen Analysis of Holocene Sediments. In *Windover: Multidisciplinary Investigations of an Early Archaic Florida Cemetery*, edited by G. H. Doran, pp. 211-226. University Presses of Florida, Gainesville.

Hornum, Michael B., Donald J. Maher, Clifford Brown, Julian Granberry, Frank Vento, Arlene Fradkin, and Michele Williams
1995 *Phase III Data Recovery at Site 8LE2105 for the proposed Florida Gas Transmission Company Phase III Expansion Project, Leon County, Florida: Draft Report, v. I.* Goodwin and Associates, New Orleans, LA.

Horvath, Elizabeth A.
2000 Archaeological Investigations at the Colorado Site (8HE241): A Lithic Workshop in Hernando County, Florida. *The Florida Anthropologist* 53:82-97.

Howard, Calvin D.
1995 Projectile Point and Hafting Design Review. *North American Archaeologist* 16:291-301.

Hughes, Gilbert H.
1967 Analysis of the Water-level Fluctuations of Lake Jackson near Tallahassee, Florida, Report of Investigation No. 48. Florida Geological Survey, Tallahassee.

Hughen, K.A., J.T Overpeck, L. C. Peterson, and S. Trumbore.
1996 Rapid Climate Changes in the Tropical Atlantic Region During the Last Deglaciation, *Nature* 380:51-54.

Hyatt, J.A., and R. Gilbert
2004 Subbottom Acoustic and Sedimentary Records of Past Surface Water-groundwater Exchange through Sinkhole Lakes in South Georgia, U.S.A. *Environmental Geology* 46: 32-46.

Iverson, Gudmund R., and Helmut Norpoth
1976 *Analysis of Variance*. Sage Publications, Beverly Hills, CA.

Ivester, Andrew, David S. Leigh, and D.I. Godfrey-Smith
2001 Chronology of Inland Eolian Dunes on the Coastal Plain of Georgia, USA. *Quaternary Research* 55: 293-302.

Jacobson, Jr., G. L., T. Webb III, and E. C. Grimm.
1987 Patterns and Rates of Vegetation Change during the Deglaciation of Eastern North America. In *North America and Adjacent Oceans during the Last Deglaciation*, edited by W. F. Ruddiman and H. E. Wright, Jr., pp. 277-288. The Geological Society of America, Boulder, Colorado.

Jarman, M. R., C. Vita-Finzi, and E. S. Higgs
1972 Site Catchment Analysis in Archaeology. In *Man, Settlement, and Urbanism*, edited by R. Ucko, R. Tringham, and B. Dimbleby, pp. 61-66. Shenkman, Cambridge, MA.

Jenks, A. E., and Mrs. H. H. Simpson, Sr.
1941 Beveled Bone Artifacts in Florida of the Same Type as Artifacts Found near Clovis, New Mexico. *American Antiquity* 6:314-319.

Jochim, Michael A.
1976 *Hunter-Gatherer Subsistence and Settlement: A Predictive Model*. Academic Press, New York.

1981 *Strategies for Survival*. Academic Press, New York.

Johnson, Gregory
1977 Aspects of Regional Analysis in Archaeology. *Annual Review of Anthropology* 6: 479-508.

1980 Rank-Size Convexity and System Integration: A View from Archaeology. *Economic Geography* 56:234-247.

Jones, George T., Robert D. Leonard, and Alysia L. Abbot
1995 The Structure of Selectionist Explanations in Archaeology. In *Evolutionary Archaeology: Methodological Issues*, edited by Patrice A. Teltser, pp. 13-32. University of Arizona Press, Tucson.

Jones, Sian
1997 *The Archaeology of Ethnicity: Constructing Identities in the Past and Present.* Routledge, London.

Justice, Noel D.
1987 *Stone Age Spear and Arrow Points of the Midcontinental and Eastern United States: A Modern Survey and Reference*. Indiana University Press, Bloomington.

Katz, Brian G., Rodney S. DeHan, Joshua J. Hirten, and John S. Catches
1997 Interactions between Ground Water and Surface Water in the Suwannee River Basin, Florida. *Journal of the American Water Resources Association* 33: 1237.

Kelly, Robert L.
1995 *The Foraging Specturm: Diversity in Hunter-Gatherer Lifeways*. Smithsonian Institution Press, Washington, D. C.

Kelly, R. L., and L. C. Todd
1988 Coming into the Country: Early Paleoindian Hunting and Mobility. *American Antiquity* 53: 231-244.

Kennedy, Stephen K., and Wei-Hsiung Lin
1988 A Fractal Technique for the Classification of Projectile Point Shapes. *Geoarchaeology* 3:297-201.

Kindinger, J.L., J.B. Davis, and J.G. Flocks
1999 Geology and evolution of lakes in north-central Florida. *Environmental Geology* 38: 301-321.

Kinser, Palmer, and Marc C. Minno
1995 *Estimating the Likelihood of Harm to Native Vegetation from Ground Water Withdrawals, St. Johns River Water Management District*. Technical Publication SJ95-8. St. Johns River Water Management District, Palatka, FL.

Knight, Robert L.
2004 A Comparative Inventory of Prehistoric Lithic and Bone Tools found in Five Shallow Gravel Bars in the Middle Santa Fe River, Florida. *The Amateur Archaeologist* 10:93-120.

Knight, Robert L., and Donald Munroe
2004 The Florida Isolated Finds Policy – Opportunity and Responsibility for River Divers. *The Amateur Archaeologist* 10: 9-26.

Kushlan, James A.
1990 Freshwater Marshes. In *Ecosystems of Florida*, edited by R. L. Myers and J. J. Ewel, pp. 324-363. University of Central Florida Press, Orlando.

Lane, Ed
1986 *Karst in Florida, Special Publication No. 29*. Florida Geological Survey, Tallahassee.

2001 The Spring Creek Submarine Springs Group, Wakulla County, Florida. *Special Publication No. 47*. Florida Geological Survey, Tallahassee.

Laessle, A. M.
1958 The Origin and Successional Relationships of Sandhill Vegetation and Sand-pine Scrub. *Ecological Monographs*. 28:361-387.

Lee, Richard B.
1972 !Kung Spatial Organization: An Ecological and Historical Prespective. *Human Ecology* 1:125-147.

1979 *The !Kung San: Men, Women, and Work in a Foraging Society*. Cambridge University Press, Cambridge.

Lee, T.M.
2002 Factors Affecting Ground-Water Exchange and Catchment Size for Florida Lakes in Mantled Karst Terrain. U.S. Geological Survey, Water-Resources Investigations Report 02-4033. U.S. Geological Survey, Tallahassee, FL.

Lemonnier, Pierre
1986 The Study of Material Culture Today: Towards an Anthropology of Technical Systems. *Journal of Anthropological Archaeology* 5:147-186.

Lenardi, Michael, and Holly Rushmeier
2005 Revisiting Ritchie: Morphometric Analysis of New York State Projectile Points using Bias Free Capture Methods and Invariant Shape Descriptors. Paper presented at the 70th Annual Meeting, Society for American Archeology. Salt Lake City, UT.

Lepper, Bradley T., and David J. Meltzer
1991 Late Pleistocene Human Occupation of the Eastern United States. In *Clovis: Origins and Adaptations,* edited by R. Bonnichsen and K. Turnmire, pp. 175-184. Center for the Study of the First Americans, Corvallis, OR.

Levi-Strauss
1966 *The Savage Mind*. University of Chicago Press, Chicago.

Light, Helen M., Melanie R. Darst, and Lori J. Lewis
2002 Hydrology, Vegetation, and Soils of Riverine and Tidal Floodplain Forests of the Lower Suwannee River, Florida, and Potential Impacts on Flow Reductions. U.S. Geological Survey Professional Paper 1656A.

Loney, Helen L.
2000 Society and Technological Control: a Critical Review of Models of Technological Change in Ceramic Studies. *American Antiquity* 65:646-668.

2001 Pots and Evolution: Response to Neff and Schiffer, et al. *American Antiquity* 66:738-741.

Lynott, Mark J., and Alison Wylie, eds.
1995 *Ethics in Archaeology: Challenges for the 1990s*. Society for American Archaeology, Allen Press, Lawrence, Kansas.

MacDonald, Douglas H.
1997 Hunter-gatherer Mating Distance and Early Paleoindian Social Mobility. *Current Research in the Pleistocene* 14: 119-121.

MacDonald, Douglas H., and Barry S. Hewlett
1999 Reproductive Interests and Forager Mobility. *Current Anthropology* 40:501-523.

Malcolm, R. L., D. M. McKnight, and R. C. Averett
1994 History and Description of the Okefenokee Swamp – Origin of the Suwannee River. In *Humic Substances in the Suwannee River, Georgia: Interactions, Properties, and Proposed Structures*, edited by R. C. Averett, J.A. Leenheer, D.M. McKnight, and K.A. Thorn, pp. 2-12. U.S. Geological Survey Water Supply Paper 2373.

McAvoy, Joseph M.
1992 *Nottoway River Survey, Part I: Clovis Settlement Patterns*. Special Publication No. 28. Archaeological Society of Virginia, Sandston, VA.

McElreath, Richard, Robert Boyd, and Peter J. Richerson
2003 Shared Norms and the Evolution of Ethnic Markers. *Current Anthropology* 44:123-129.

Means, Ryan C., and Harley Means
2004 Discovery of the Middle Paleoindian Ryan-Harley Site, Wacissa River, North Florida. *The Amateur Archaeologist* 10:35-42.

Meltzer, David J.
1989 Was Stone Exchanged Among Eastern North American Paleoindians? In *Eastern Paleoindian Lithic Resource Use*, edited by C. Ellis and J. Lothrop, pp. 11-40. Westview Press, Boulder, CO.

2002 What Do You Do When No One's Been There Before? Thoughts on the Exploration and Colonization of New Lands. In *The First Americans: The Pleistocene Colonization of the New World*, edited by N. G. Jablonski, pp. 27-58. Memoirs of the California Academy of Sciences, No. 27, San Fransico, CA.

Meyer, Fredrick W.
1962 *Reconnaissance of the Geology and Ground-Water Resources of Columbia County, Florida*. Report of Investigations No. 30. State of Florida, State Board of Conservation, Division of Geology, Tallahassee.

Milanich, Jerald T.
1994 *Archaeology of Precolumbian Florida*. University Press of Florida, Gainesville.

Milanich, Jerald T., and Charles H. Fairbanks
1980 *Florida Archaeology*. Academic Press, Orlando.

Miller, James A.
1986 *Hydrogeologic Framework of the Floridan Aquifer System in Florida and in Parts of Georgia, Alabama, and South Carolina*. U.S. Geological Survey Professional Paper 1403-B, Washington, D.C.

1997 Hydrogeology of Florida. In *The Geology of Florida*, edited by A. F. Randazzo and D. S. Jones, pp. 57-68. University Press of Florida, Gainesville.

Moore, Wayne E.
1955 *Geology of Jackson County, Florida*. Geological Bulletin No. 37. State Board of Conservation, Florida Geological Survey, Tallahassee.

Moore, John H., and Michael E. Moseley
2001 How Many Frogs Does It Take to Leap around the Americas? Comments on Anderson and Gillam. *American Antiquity* 66: 526-529.

Musil, Robert R.
1988 Functional Efficiency and Technological Change: A Hafting Tradition Model for Prehistoric North America. In *Early Human Occupation in Far Western North America: The Clovis-Archaic Interface*, edited by J. A. Willig, C. M. Aikens, and J. L. Fagan, pp. 373-387. Nevada State Museum Anthropological Papers No. 21. Nevada State Museum, Carson City.

Murphy, Larry E., Mary C. Beaudry, Richard E. W. Adams, and James Brown
1995 Commercialism: Beyond the Law or Above It? Ethics and the Selling of the Archaeological Record. In *Ethics in Archaeology: Challenges for the 1990s*, edited by M. J. Lynott and A. Wylie, pp. 38-41. Society for American Archaeology, Allen Press, Lawrence, Kansas.

Neill, Wilfred T.
1958 A Stratified Early Site at Silver Springs, Florida. *The Florida Anthropologist* 11:32-52.

1964 The Association of Suwannee Points and Extinct Animals in Florida. *The Florida Anthropologist* 17:17-32.

Niedoroda, Alan W., Lyle Hatchett, and Joseph Donoghue
2004 Reconnaissance Level Regional Sand Search of the Florida Panhandle. URS Corporation. Prepared for the Florida Department of Environmental Protection, Tallahassee.

O'Brien, Michael J., and R. D. Leonard
2001 Style and Function: An Introduction. In *Style and Function: Conceptual Issues in Evolutionary Archaeology*, edited by T. D. Hurt and G. F. M. Rakita, pp. 1-23. Bergina & Garvey, Westport, CT.

O'Brien, Michael J., and R. Lee Lyman (editors)
2003 *Style, Function, Transmission: Evolutionary Archaeological Perspectives*. University of Utah Press, Salt Lake City.

Ortman, Scott G.
2000 Conceptual Metaphor in the Archaeological Record: Methods and an Example from the American Southwest. *American Antiquity* 65:613-645.

2001 On a Fundamental False Dichotomy in Evolutionary Archaeology: Response to Hurt, Rakita, and Leonard. *American Antiquity* 66:744-746.

Otvos, Ervin G.
2004 Prospects for interregional correlations using Wisconsin and Holocene aridity episodes, northern Gulf of Mexico coastal Plain. *Quaternary Research* 61:105-118.

Otvos, Ervin G., and David M. Price
2001 Late Quaternary Inland Dunes of Southern Louisiana and Arid Climate Phases in the Gulf Coastal Region. *Quaternary Research* 55:150-158.

Paciotti, Brian, Peter J. Richerson, and Robert Boyd
2006 Cultural Evolutionary Theory: A Synthetic Theory for Fragmented Disciplines. In *Bridging Social Psychology: Benefits of Transdisciplinary Approaches,* edited by Paul Van Lange. Lawrence Erlbaum Associates, Mahwah, NJ.

Palmer, Jill, James Dunbar, and Danny H. Clayton
1981 *Report on Phase II Underwater Archaeological Testing at the Fowler Bridge Mastodon Site (8Hi393c/uw) Hillsborough County, Florida*. Florida Department of State, Tallahassee.

Parkinson, William A.
2006 Tribal Boundaries: Stylistic Variability and Social Boundary Maintenance during the Transition to the Copper Age on the Great Hungarian Plain. *Journal of Anthropological Archaeology* 25:33-58.

Patton, Bob
2005 *People of the Flute: A Study in Anthropolithic Forensic*. Stone Dagger Publications, Denver, CO.

Pisias, N. G., and J. Imbrie.
1986 Orbital geometry, CO2, and Pleistocene climate. *Oceanus* 29:43-49.

Peek, H. M.
1951 Cessation of Flow of Kissengen Spring in Polk County, Florida. In *Water Resource Studies*, Report of Investigations No. 7, pp. 73-82. Florida Geological Survey, Tallahassee.

Petroski, Henry
1992 *The Evolution of Useful Things*. Knopf, NewYork.

Pitblado, Bonnie L.
2003 *Late Paleoindian Occupation of the Southern Rocky Mountains: Early Holocene Projectile Points and Land Use in the High Country*. University of Colorado Press, CO.

Plog, Stephen
1978 Social Interaction and Stylistic Similarity: A Reanalysis. In *Advances in Archaeological Method and Theory*, v. 1, edited by M. B. Schiffer, pp. 143-182. Academic Press, New York.

1990 Sociopolitical Implications of Stylistic Variation in the American Southwest. In *Uses of Style in Archaeology*, edited by M. Conkey and C. Hasdorf, pp. 61-72. Cambridge University Press, Cambridge.

Pride, R.W, and J.W. Crooks
1962 *The Drought of 1954-1956, its Effect on Florida's Surface-water Resources*. Report of Investigations No. 26. Florida Geological Survey, Tallahassee.

Puri, Harbans S., William Yon, Jr., and Woodson R. Oglesby
1967 *Geology of Dixie and Gilchrist Counties, Florida.* Geological Bulletin No. 49. State of Florida, State Board of Conservation, Division of Geology, Tallahassee.

Pyburn, Anne K., and Richard R. Wilk
1995 Responsible Archaeology is Applied Anthropology. In *Ethics in Archaeology: Challenges for the 1990s*, edited by M. J. Lynott and A. Wylie, pp. 71-76. Society for American Archaeology, Allen Press, Lawrence, Kansas.

Rayl, Sandra L.
1974 *A Paleo-Indian Mammoth Kill Site near Silver Springs, Florida*. Unpublished master's thesis. Department of Anthropology, Northern Arizona University.

Read, Dwight W.
1974 Some Comments on Typologies in Archaeology and an Outline of a Methodology. *American Antiquity* 39: 216-242.

1982 Toward a Theory of Archaeological Classification. In *Essays on Archaeological Typology*, edited by R. Whallon and J. Brown, pp. 56-92. Center for American Archaeology Press, Evanston, IL.

1985 The Substance of Archaeological Analysis and the Mold of Statistical Method: Enlightenment out of Discordance? In *For Concordance in Archaeological Data Analysis*, edited by C. Carr, pp. 45-86. Westport, Kansas City.

1989a Intuitive Typology and Automatic Classification: Divergence or Full Circle? *Journal of Anthropological Archaeology* 8:158-188.

1989b Statistical Methods and Reasoning in Archaeological Research: a Review of Praxis and Promise. *Journal of Quantitative Anthropology* 1: 5-78.

2006 Tasmanian Knowledge and Skill: Maladaptive Imitation or Adequate Technology? *American Antiquity* 71:164-184.

Read, D. W. and A. L. Christenson
1978 Comments on "Cluster Analysis and Archaeological Classification." *American Antiquity* 43(3):505-506.

Read, D. W. and G. Russell
1996 A Method for Taxonomic Typology Construction and an Example: Utilized Flakes. *American Antiquity* 61(4):663-684.

Robb, John E.
1998 The Archaeology of Symbols. *Annual Review of Anthropology* 27:329-346.

Rogers, Everett M.
1995 *Diffusion of Innovations, 5th ed*. Free Press, New York.

Rosenau, J. C., G. L. Faulkner, C. W. Hendry, Jr., and R. W. Hull
1977 *Springs of Florida*. Florida Bureau of Geology Bulletin No. 31 (revised), Tallahassee.

Roux, V., B. Bril, and G. Dietrich
1995 Skills and Learning Difficulties involved in Stone Knapping: The Case of Stone-bead Knapping in Khambhat, India. *World Archaeology* 27:63-87.

Sackett, James
1990 Isochrestism and Style: A Clarification. In *Uses of Style in Archaeology*, edited by M. Conkey and C. Hasdorf, pp. 32-43. Cambridge University Press, Cambridge.

Shiffer, Michael Brian, and James M. Skibo
1997 The Explanation of Artifact Variability. *American Antiquity* 62:27-50.

Schlanger, Nathan
1994 Mindful technology: Unleasing the *Chaîne Opératoire* for an Archaeology of the Mind. In *The Ancient Mind: Elements of Cognitive Archaeology*, edited by Colin Renfrew and E. B. W. Zubrow, pp. 143-151. Cambridge University Press, Cambridge.

Scott, Thomas M., Guy H. Means, Ryan C. Means, and Rebecca P. Meegan
2002 First Magnitude Springs of Florida. Open File Report No. 85, Florida Geological Survey, Tallahassee.

Scott, Thomas M., Guy H. Means, Rebecca P. Meegan, Ryan C. Means, Sam B. Upchurch, R.E. Copeland, James Jones, Tina Roberts, Alan Willet
2004 Springs of Florida, Bulletin No. 66. Florida Geological Survey, Tallahassee.

Sellards, E. H.
1940 Early Man in America: Index to Localities, and Selected Bibliography. *Bulletin of the Geological Society of America* 51:373-432.

Sepúlveda, Nicasio
2002 Simulation of Ground-Water Flow in Intermediate and Floridan Aquifer Systems in Peninsular Florida. U.S. Geological Survey, Water-Resources Investigations Report 02-4009. Tallahassee, FL.

Serbousek, Don
1983 Explorations of a Paleo-Indian Site on the Aucilla River. *The Florida Anthropologist* 36:88-97.

Shennan, Stephan
1989 Introduction: Archaeological Approaches to Cultural Identity. In *Archaeological Approaches to Cultural Identity*, edited by S. J. Shennan, pp. 1-32. Unwin Hyman, London.

1997 *Quantifying Archaeology*, 2nd edition. University of Iowa Press, Iowa City.

2001 Demography and Cultural Innovation: A Model and its Implications for the Emergence of Modern Human Culture. *Cambridge Archaeological Journal* 11: 5-16.

Simpson, J. Clarence
1948 Folsom-like Points from Florida. *The Florida Anthropologist* 1:11-15.

Smith, Edward E., Jr.
1990 Paleoindian Economy and Settlement Patterns in the Wyandotte Chert Source Area, Unglaciated South-Central Indiana. In *Research in Economic Anthropology, Supplement 5*, edited by K. B. Tankersley and B. L. Issac, pp. 217-258. JAI Press, Greenwich, CT.

Smith, Eric A.
1977 Anthropological Applications of Optimal Foraging Theory: A Critical Review. *Current Anthropology* 24:625-651.

1981 The Application of Optimal Foraging Theory to the Analysis of Hunter-Gatherer Group Size. In *Hunter-gatherer Foraging Strategies*, edited by B. Winterhalder and E. A. Smith, pp. 36-65. University of Chicago Press, Chicago.

Snell, L. J., and Warren Anderson
1970 *Water Resources of Northeast Florida (St. Johns River Basin and Adjacent Coastal Areas).* Report of Investigation No. 54. Florida Geological Survey, Tallahassee.

Southeastern Geological Society
1986 *Hydrogeological Units of Florida*. Special Publication NO. 28. Florida Geological Survey, Tallahassee.

Spaulding, A. C.
1953 Statistical Techniques for the Discovery of Artifact Types. *American Antiquity* 18: 305-313.

1954 Reply to Ford. *American Antiquity* 19: 391-393.

Spiess, A., and D. Wilson
1989 Paleoindian Lithic Distribution in the Maine-Maritimes Region. In *Eastern Paleoindian Lithic Resource Use*, edited by C. J. Ellis and J. C. Lothrop, pp. 75–97. Westview Press, Boulder, Colorado

Straus, Lawrence Guy, David J. Meltzer, and Ted Goebel
2005 Ice Age Atlantis? Exploring the Solutrean-Clovis "Connection." *World Archaeology* 37:507-532.

Steward, Julian H.
1970 *Basin-Plateau Aboriginal Sociopolitical Groups*. Bureau of American Ethnology Bulletin, 120. Washington, D.C. (reprinted: University of Utah, Salt Lake City).

Storck, Peter
1991 Imperialists Without A State: The Cultural Dynamics of Early Paleoindian Colonization As Seen From the Great Lakes Region. In *Clovis: Origins and Adaptations*, edited by R. Bonnichsen and K. L. Turnmire, pp. 153–161. Center for the Study of the First Americans, Corvallis.

Tankersley, Kenneth B.
1989 A Close Look at the Big Picture: Eastern Paleoindian Lithic Resource Procurement in the Midwestern United States. In *Eastern Paleoindian Lithic Resource Use*, edited by C. J. Ellis and J. C. Lothrop, pp. 259-292. Westview Press, Boulder, CO.

1990 Late Pleistocene Lithic Exploitation in the Midwest and Midsouth: Indiana, Ohio, and Kentucky. In *Research in Economic Anthropology, Supplement 5*, edited by K. B. Tankersley and B. L. Issac, pp. 259-299. JAI Press, Greenwich, CT.

1994 Clovis Mastic and its Hafting Implications. *Journal of Archaeological Science* 21:117-124.

Teltser, Patrice A. (editor)
1995a *Evolutionary Archaeology: Methodological Issues*. University of Arizona Press, Tucson.

Teltser, Patrice A.
1995b The Methodological Challenge of Evolutionary Theory in Archaeology. In *Evolutionary Archaeology: Methodological Issues*, edited by P. A. Teltser, pp. 1-12. University of Arizona Press, Tucson.

Tesar, Louis D.
1994 *Johnson Sand Pit (8LE73): An Analysis and Comparative Review of a Paleoindian through Early Deptford Base Camp in Leon County, Florida*. Florida Archaeological Reports 32. Florida Bureau of Archaeological Research, Division of Historical Resources, Tallahassee.

Tesar, Louis D., and B. Calvin Jones
2004 *Wakulla Springs Lodge Site (8WA329) in Edward Ball state Park Wakulla County Florida: A Summary of Eleven Projects and Management Recommendations*. Prepared for the Florida Department of Environmental Protection by the Bureau of Archaeological Research, Division of Historical Resources, Florida Department of State.

Thulman, David
2006 A Suwannee/Bolen Artifact Assemblage from the Santa Fe River. *The Florida Anthropologist* 59:21-34.

Tihansky, Ann B., and Lari A. Knochenmus
2001 Karst Features and Hydrology in West-central Florida – A Field Perspective. In *U.S. Geological Survey Karst Interest Group Proceedings*, Water Resources Investigations Report 01-4011, edited by E. L. Kuniansky, pp. 198-211.

Titmus, Gene L., and James C. Woods
1991 A Closer Look at Margin "Grinding" on Folsom and Clovis Points. *Journal of California and Great Basin Anthropology* 13:194-203.

Tompkins, Charles Nichols
1993 *Classifying Clovis Points: a Study in Metric Variability*. Master's Thesis, Department of Anthropology, Arizona State University, Tucson.

Torak, Lynn J., Gary S. Davis, George A. Strain, and Jennifer G. Herndon
1996 Geohydrology and Evaluation of the Stream-Aquifer Relations in the Apalachicola-Chattahoochee-Flint River Basin, Northwestern Florida, and Southwestern Georgia. U.S. Geological Survey Water-Supply Paper 2460, Washington, D. C.

Torrence, Robin (editor)
1989 *Time, Energy, and Stone Tools*. Cambridge University Press, Cambridge.

Turnbull, Colin
1968 The Importance of Flux in Two Hunting Societies. In *Man the Hunter*, edited by R. B. Lee and I. DeVore, pp. 283-312. Clarendon Press, Oxford.

Tyldesley, J. A., J. S. Johnson, and S. R. Snape
1985 "Shape" in Archaeological Artifacts: Two Case Studies Using a New Analytical Method. *Oxford Journal of Archaeology* 4:19-30.

Upchurch, Sam B., and Anthony F. Randazzo
1997 Environmental Geology of Florida. In *The Geology of Florida*, edited by A. F. Randazzo and D. S. Jones, pp. 217-249. University Press of Florida, Gainesville.

Upchurch, Samuel B., Richard N. Strom, and Mark G. Nuckels
1982 *Methods of Provenance Determination of Florida Cherts*. Department of Geology, University of South Florida, Tampa.

United States Geological Survey (USGS)
2002a *Water Resources Data, Florida Water Year 2001: Volume 1A, Northeast Florida Surface Water*. Water-Data Report FL-01-1A. Tallahassee, FL.

2002b *Water Resources Data, Florida Water Year 2001: Volume 1A, Northwest Florida Surface Water*. Water-Data Report FL-01-3A. Tallahassee, FL.

2002c *Water Resources Data, Florida Water Year 2001: Volume 4, Southwest Florida*. Water-Data Report FL-01-4. Tallahassee, FL.

Van der Leuuw, S. E.
1994 Cognitive Aspects of "Technique." In *The Ancient Mind: Elements of Cognitive Archaeology*, edited by C. Renfrew and E. B. W. Zubrow, pp. 135-142. Cambridge University Press, Cambridge

Vierra, R. K. and D. L. Carlson
1981 Factor Analysis, Random Data, and Patterned Results. *American Antiquity* 46(2): 272-283.

Voss, Jerome A., and Robert L. Young
1995 Style and the Self. In *Style, Society, and Person: Archaeological and Ethnological Perspectives*, edited by C. Carr and J. E. Neitzel, pp. 78-100. Plenum Press, New York.

Waller, Benjamin
1969 Paleo-Indian and other artifacts from a Florida Stream Bed. *The Florida Anthropologist* 33: 37-39.

1970 Some Occurances of Paleo-Indian Projectile Points in Florida Waters. *The Florida Anthropologist* 23:129-134.

Watts, W. A.
1971 Postglacial and Interglacial Vegetation History of Southern Georgia and Central Florida. *Ecology* 52: 676-690.

1975 A Late Quaternary Record of Vegetation from Lake Annie, South-central Florida: *Geology* 3: 344-46.

1980 The Late Quaternary Vegetation History of the Southeastern United States. *Annual Review of Ecological Systems* 11: 387-409.

Watts, W. A, and Hansen, B. C. S.
1988, Environments of Florida in the late Wisconsin and Holocene. In *Wet Site Archaeology*, edited by B. Purdy, pp. 307-323. Telford Press, Caldwell, NJ.

1994 Pre-Holocene and Holocene Pollen Records of Vegetation History from the Florida Peninsula and their Climatic Implications: *Palaeogeography, Palaeoclimatology, Palaeoecology* 109: 163-176.

Watts, W. A., B. C. S. Hansen, and E. C. Grimm.
1992 Camel Lake: A 40,000-yr Record of Vegetational and Forest History from Northwest Florida. *Ecology* 73: 1056-1066.

Watts, W. A., and M. Stuiver
1980 Late Wisconsin Climate of Northern Florida and the Origin of Species-rich Deciduous Forest. *Science* 210: 325-327.

Webb, S. David, Jerald T. Milanich, Roger Alexon, and James Dunbar
1983 An Extinct Bison Kill Site, Jefferson County, Florida. *The Florida Anthropologist* 36:81-82.

Webb, III, T., P. J. Bartlein, S. P. Harrison, and K. H. Anderson.
1993 Vegetation, lake levels, and climate in eastern North America for the past 18,000 years. In *Global Climates since the Last Glacial Maximum*, edited by H. E. Wright, Jr., J. E. Kutzbach, T. Webb III, W. F. Ruddiman, F. A. Street-Perrott, and P. J. Bartlein. University of Minnesota Press, Minneapolis.

Werner, Christopher
2000 Determination of Groundwater Flow Patterns from Cave Exploration in the Woodville Karst Plain, Florida. In *Transactions of the Wakulla Springs Woodville Karst Plain Symposium, October 9, 1998*, compiled and edited by W. Schmidt, J. M. Lloyd, and Ci. Collier, pp. 37-44. Florida Geological Survey Special Publication No. 46. Tallahassee, FL.

Wetterhall, W.S.
1965 *Reconnaissance of Springs and Sinks in West-Central Florida*. Report of Investigation No. 39. Florida Geological Survey, Tallahassee.

Willis, Craig
1988 Controlled Surface Collection of the Little River Rapids Site (8Je603): A Stratigraphically Deflated Site in the Aucilla River, North Florida. *The Florida Anthropologist* 41:453-470.

Whallon, R.
1982 Variables and Dimensions: The Critical Step in Quantitative Typology. In *Essays on Archaeological Typology*, edited by R. Whallon and J. Brown, pp. 127-161. Center for American Archaeology Press, Evanston, IL.

1987 Simple statistics. In *Quantitative Research in Archaeology: Progress and Prospects,* edited by M. S. Aldenderfer, pp. 135-150. Sage Publications, Newberry Park, CA.

White, William A.
1970 *The Geomorphology of the Florida Peninsula*. Geological Bulletin No. 51. Bureau of Geology, Florida Department of Natural Resources, Tallahassee.

Wiessner, Polly
1983 Style and Social Information in Kalahari San Projectile Points. *American Antiquity* 48: 253-276.

1984 Reconsidering the Behavioral Basis for Style: A Case Style among the Kalahari San. *Journal of Anthropological Archaeology* 3:190-234.

1990 Is There Unity to Style? In *Uses of Style in Archaeology*, edited by M. Conkey and C. Hasdorf, pp. 105-112. Cambridge University Press, Cambridge.

Willey, Gordon R., and Phillip Phillips
1958 *Method and Theory in American Archaeology*. University of Chicago Press, Chicago.

Wilmsen, Edwin N.
1973 Interaction, Spacing Behavior, and the Organization of Hunting Bands. *Journal of Anthropological Research* 29: 1-31.

Wilson, W. L., and W. C. Skiles
1988 Aquifer Characterization by Quantitative Dye Tracing at Ginnie Springs, Northern Florida. In *Proceedings of the Second Conference on Environmental Problems in Karst Terranes and Their Solutions*, Nashville Tennessee, Nov. 16-18.

Wobst, H. Martin
1974 Boundary Conditions for Paleolithic Social Systems: A Simulation Approach. *American Antiquity* 39: 147-178.

1977 Stylistic Behavior and Information Exchange. In *For the Director: Research Essays in Honor of James B. Griffin,* edited by C. E. Cleland, pp. 317-342. University of Michigan, Ann Arbor.

1978 The Archaeo-Ethnology of Hunter-Gatherers or the Tyranny of the Ethnographic Record in Archaeology. *American Antiquity* 43:303-309.

Wolansky, Richard M., and T.H. Thompson
1987 *Relations Between Ground Water and Surface Water in the Hillsborough River basin, West-central Florida*. U.S. Geological Survey, Water-Resources Investigations Report 87-4010. Tallahassee, FL.

Wylie, Alison
1995 Archaeology and the Antiquities Market: the Use of "Looted" Data. In *Ethics in Archaeology: Challenges for the 1990s*, edited by M. J. Lynott and A. Wylie, pp. 17-21. Society for American Archaeology, Allen Press, Lawrence, Kansas.

Yellen, John E.
1977 *Archaeological Approaches to the Present: Models for Reconstructing the Past.* Academic Press, New York.

Yellen, John, and Henry Harpending
1972 Hunter-Gatherer Populations and Archaeological Inference. *World Archaeology* 4: 244-253.

Yon, William J., Jr.
1966 *Geology of Jefferson County, Florida*. Geological Bulletin No. 48. Florida Geological Survey, Tallahassee.

Zarky, Alan
1976 Statistical Analysis of Site Catchments at Ocos, Guatemala. In T*he Early Mesoamerican Village*, edited by Kent Flannery, pp. 117-130. Academic Press, New York.

Zimmerman, Larry
1995 Regaining our Nerve: Ethics, Values, and the Transformation of Archaeology. In *Ethics in Archaeology: Challenges for the 1990s*, edited by M. J. Lynott and A. Wylie, pp. 64-67. Society for American Archaeology, Allen Press, Lawrence, Kansas.

BIOGRAPHICAL SKETCH

David Thulman received his B.A. cum laude in Anthropology from the University of Pennsylvania in 1978. He received his J.D. with honors from George Washington University in 1982. He received his M.S. in Anthropology from Florida State University in 2000. He was a two-year reciepient of a University Fellowship from Florida State. From 1983 to the present, he has worked as an environmental enforcement attorney for the Florida Department of Environmental Protection. He presently lives in Alexandria, Virginia.