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THE WALLACE MITIGATION SURVEY: AN OVERVIEW

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Athens

TEH WALLACE MITIGATION SURVEY: AN OVERVIEW

by

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WALLACE RESERVOIR PROJECT CONTRIBUTION NUMBER 26

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THE WALLACE MITIGATION SURVEY: AN OVERVIEW

by

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WALLACE RESERVOIR PROJECT CONTRIBUTION NUMBER 32

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PREFACE

This report represents the final report for the "Ongoing Survey" of the Wallace Reservoir which was provided for in Appendices 1 and 11 of the Archaeological Salvage Agreement between the University of Georgia and the Georgia Power Company.

The report describes the organization of the survey and the methods used in carrying it out. The report also presents some of the results of the survey; specifically, data on component frequency and distribution by period and land form.

Several other Wallace Reservoir Project Contributions utilize data obtained by the Wallace Mitigation Survey (WMS). These include:

Elliott, Daniel Thorton
1981 Soapstone Use in the Wallace Reservoir. Wallace Reservoir Contribution No. 5

Rudolph, James L., and Dennis B. Blanton
1981 A Discussion of Mississippian Settlement in the Georgia Piedmont. Early Georgia 8:14-36. Wallace Reservoir Contribution No 7.

O'Steen, Lisa
1983 Early Archaic Settlement Patterns in the Wallace Reservoir: An Inner Piedmont Perspective. Wallace Reservoir Contribution No. 25.

Rudolph, James L.
1986 Lamar Period Exploitation of Aquatic Resources in the Middle Oconee River Valley. Early Georgia 11:86-103. Wallace Reservoir Contribution No. 31.

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Introduction

In 1976, archeologists were given the unprecedented opportunity to survey about 53 km^2 of contiguous, uniformly cleared land in the predominantly wooded southeastern United States. This opportunity arose during Georgia Power Company's construction of a 77 km^2 pumped storage, hydroelectric reservoir on the Oconee River in northeast Georgia.

The Department of Anthropology, University of Georgia, contracted with the Georgia Power Company to conduct intensive archeological investigation of the reservoir basin, then known as the Wallace Reservoir and now called Lake Oconee, as mitigation for the adverse impact to known and anticipated cultural resources. The Wallace Archeological Project consisted of the standard three-fold approach of survey, testing, and intensive excavation (Fish and Hally 1983). The survey and testing (DePratter 1976, 1983) was conducted well before reservoir construction and consisted of locating and evaluating the range of site types present, but with an emphasis toward intensively occupied, well preserved sites that would contain intact subsurface features, midden, and artifacts. Prior to construction, 292 archeological sites had been discovered in the reservoir area. The testing program had indicated that 22 of these sites warranted large-scale excavation (DePratter 1976) and the bulk of the mitigation was geared to the excavation and analysis of these 22 sites and an additional five sites (Fish and Hally 1983).

Unlike most reservoirs constructed in the Southeast, a large portion of the Wallace Reservoir was cleared of the forest vegetation that covered over 90% of the proposed floodpool. The bulldozing, burning, and burying of trees and smaller vegetation was intensive as well as extensive, resulting in varying degrees of ground disturbance, but generally excellent ground surface exposure. When the effects of the clearing and its potential for archeological site discovery were recognized, the project directors (Paul R. Fish and David J. Hally) decided to re-allocate some of the excavation effort to an intensive, full-coverage survey of the cleared reservoir basin. Known as the Wallace Mitigation Survey (WMS), the effort was actually composed of three components, 100% surface survey of all cleared land in the basin, deep backhoe testing of alluviated areas within four 0.5 mi wide transects in the basin, and surface survey of a sample of exposed ground surface in uplands outside of the reservoir basin.

The WMS remains one of the few large-scale, full-coverage surveys in the Southeast and, as such, provides valuable data for settlement studies over a wide span of time. A focused discussion of the survey goals, methods, and results is warranted not only because of the size and effectiveness of the survey, but also because it can serve as an example for even larger scale, full-coverage surveys in the predominantly wooded Southeast. This paper presents the methodological context of the WMS, survey methods, some summary results that are compared to the previous, pre-clearing survey, and a review of the major analyses of the survey data. We attempt to demonstrate the value of large-scale, full-coverage surveys in the southeastern United States and conclude that such survey is desirable and attainable, but will require a lengthy, centrally organized effort.

Physiography

The Wallace Reservoir is situated on the Oconee River in the Piedmont Physiographic Province of the South Atlantic Slope. The Piedmont is characterized by hills and ridges dissected by a dendritic drainage pattern of streams and rivers. The reservoir is located about 35 km upstream from the Fall Line, where the relatively flat Atlantic Coastal Plain begins (Figure 1). One of the earliest studies conducted as part of the Wallace Reservoir Archaeological Project was a detailed physiographic and geomorphological description. Siegel (n.d.) and Brook (1981) recognized, but never precisely delineated, four physiographic strata within the reservoir basin. The delineation of these strata, shown in Figure 1, is based on Siegel's (n.d.) written description and differs slightly from the delineations presented by Elliott (1980) and O'Steen (1983). As described by Siegel (n.d.), Stratum I, beginning at the dam site and encompassing about 14.3 km^2 (20% of the reservoir), is characterized by a narrow, steep-walled valley where the river has numerous shoals and islands. Stratum II, containing 14.1 km^2 (19.8% of the reservoir), is characterized by a narrow valley with little floodplain, few shoals, and no islands. This stratum

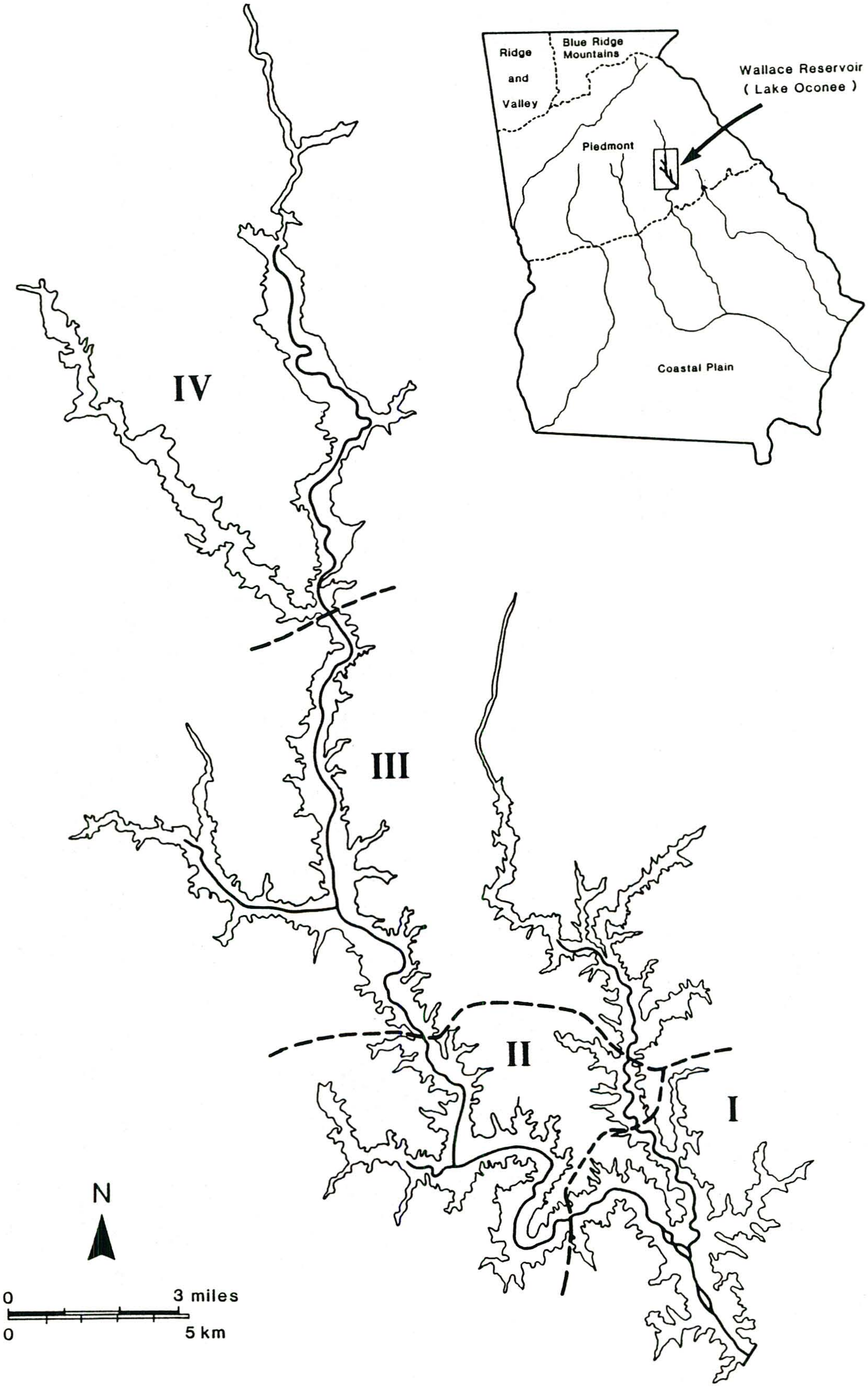

Figure 1. Physiographic Strata of the Wallace Reservoir.

contains several major tributaries, which, along with the Oconee River itself, exhibit wide, pronounced levees and broad terraces well above the river channel. Stratum III, containing 23.7 km^2 (33.3% of the reservoir), consists of a meandering river channel within a flat-floored, broad, shallowly incised valley. Levees are long and broad but terraces, while common, are only slightly more elevated than the levees. The northernmost stratum IV, containing 19.2 km^2 (26.9% of the reservoir), includes the Oconee River along with its principal tributary, the Apalachee River. This stratum is very similar to Stratum III, but with wider, more swampy floodplains that almost totally encompass the reservoir. In general, prior to filling, the reservoir basin had a narrow valley with numerous shoals and little floodplain at its southern end, wide fertile floodplains in the northern half, and a transitional zone.

Overview of Previous Surveys

In many respects the history of archeological survey in the Wallace Reservoir Basin parallels the historical development of survey in the Southeast as a whole. Prior to the WMS, four types of site recording accounted for the sites reported in the state of Georgia's archeological site files for the Wallace Reservoir area. These were (1) the often anonymous recording of large, well known sites, particularly mound sites, (2) reporting of smaller, more obscure sites by avocational archeologists and arrowhead collectors, (3) recording of sites as a result of a thematically or spatially oriented research projects by a professional archeologist, and (4) legislatively prompted cultural resource management surveys. Early reservoir surveys in Georgia were, for the most part, either Smithsonian Institution-sponsored river basin surveys or underfunded, power company-sponsored efforts. One of the most extensive of the former was the survey of Lake Allatoona (Caldwell n.d.a) in which 180 sites were discovered. A sobering example of the latter type of survey involves Lake Sinclair, immediately south of the Wallace Reservoir, where a total of $700 was allocated in the 1960s to survey the 8215 ha reservoir basin (Caldwell n.d.b). Until the 1970s reservoir survey was clearly geared to locating only large, artifact-rich, potentially stratified or readily visible sites. Alluviation and heavy vegetation presented substantial impediments to site discovery and precluded any attempt at full-coverage survey.

As reviewed by DePratter (1976), one thematically oriented survey and the recording of two well known mound sites accounted for the eight reported sites in the Wallace Reservoir basin prior to 1971. Cultural resource management surveys began with a one-person, 12 week survey conducted in 1971 in order to determine the types of sites present in the reservoir area (Smith 1971). Smith located 59 sites in the proposed reservoir area by examining scattered patches of exposed ground such as logging roads, plowed fields, and borrow pits (DePratter 1976:9). Similar survey techniques were employed by Wood and Lee (1974) and Wood (1974), who discovered and recorded 79 more sites in an attempt to demonstrate the relatively great density of sites in the area. By limiting survey to exposed ground surfaces, these surveys necessarily focused on upland ridges and ridge slopes where logging roads and bulldozed loading areas would expose shallowly buried artifacts. Surveyors only partially and superficially examined the thickly vegetated and heavily alluviated floodplains.

The major pre-construction survey conducted in 1974 and 1975 (DePratter 1976) attempted to redress the biases of the previous surveys by focusing on floodplains and terraces which, based on Smith's (1971) and other surveys (e.g., Caldwell n.d.a), were assumed by DePratter (1976) to contain buried sites. The principal goal of the survey was to locate and evaluate sites so that specific mitigation plans could be formulated. The survey employed both systematically and intuitively placed posthole digger tests and located 140 new sites. DePratter (1976) considered several means of subsurface sampling and concluded that a manually operated post hole digger was the most practical tool for densely vegetated areas, although it is limited to depths of about 2.0 m below surface and is effective only on sites with sufficient artifact density (DePratter 1976:16).

One phase of this survey was a probabilistic sampling study in which 354 systematically placed posthole digger tests led to the discovery of 17 sites (Wood 1976). This early study on subsurface probability sampling demonstrated that it can be a useful but very labor intensive means to characterize the site distribution of an area. The remaining

517 tests were intuitively placed in areas that, based on the excavators' prior experience in the area, seemed likely to contain sites. Erosional remnants in the floodplain, natural levees, terraces, and the junction of streams were the most frequently tested areas (DePratter 1976:17).

Several other very small, impact related surveys were conducted prior to construction. Wood (1977) surveyed a small tract for the proposed tailrace and Wood (1975) surveyed several bridge and road widening areas. DePratter (1976:487) estimates that 10% of the reservoir impoundment area was surveyed prior to clearing and that 154 sites were known (Table 1).

Table 1. Site Discovery at Wallace Reservoir.

	Sites Discovered	Cumulative Total	Cumulative Density sites/km^2
Greater Reservoir Area (approx. 20,934 ha, DePratter 1976:485)			
Before 1960	8	8	0.04
Smith (1971)	59	67	0.32
Wood & Lee (1974)	65	132	0.63
Wood (1974)	14	146	0.70
DePratter (1976)	140	286	1.37
Impoundment Area Only (approx. 7,690 ha)			
DePratter (1976)	111	154	2.00
WMS: sites	1231	1385	18.01
occurrences	1723*	3108	40.42
Total	**2954**	**3108**	40.42

*may include some previously known sites; data insufficient to determine.

Survey Methods

While the methods and results of the pre-clearing survey have been detailed (DePratter 1976) and summarized (DePratter 1983), the same is not true for the more extensive post-clearing WMS. Only one paper (Fish et al. 1978) has been presented on the survey. Notes on survey methods, monthly field reports, field notebooks, site forms, and guides for completion of the site forms are on file at the Department of Anthropology, University of Georgia. Summaries of survey methods have remained in unpublished manuscript form (Paulk 1977; Ledbetter 1978). Because of the introduction of new methods and the large size of the WMS it continues to serve as a model for much archeological survey in Georgia and warrants a more accessible discussion of the methods involved. The following discussion is derived in large part from the notes prepared by Paulk (1977).

The WMS was composed of three distinct components, a full-coverage surface survey of the cleared reservoir basin, a subsurface backhoe survey of four 0.5 mi wide transects in the reservoir basin and a surface survey of discontiguous tracts of cultivated land in four 1.0 mi wide transects adjacent to the reservoir basin. The latter two components were essentially supplements to the full-coverage survey, with the subsurface survey providing an indication of the type and number of sites missed by the surface survey due to alluviation. The upland survey outside of the reservoir provided an indication of site distribution beyond the immediate reservoir basin. The latter survey duplicated the methods employed by the full-coverage survey (explained below), but was severely limited to the relatively small, scattered tracts of exposed ground surface. Surveys conducted later, independently of the Wallace Reservoir Archaeological Project (e.g., Elliott 1981), examined large (531 ha), contiguous upland areas near the reservoir and provided a much better comparison to the full-coverage basin data.

The subsurface backhoe survey tested known sites and located buried sites not found by the full-coverage surface survey, thus providing the means to quantify the number of buried undiscovered sites in the entire reservoir. The prospecting phase of the subsurface survey was conducted by Jerald Ledbetter (1978) who used a backhoe to excavate 10 m long, 1 m wide, 3 m deep trenches at 80 m intervals along alluvial features such as levees and terraces. Two crew members would examine the removed soil and trench profiles for artifacts and midden staining, while Ledbetter would watch and feel for cultural material in the alluvium.

In terms of area covered, sites discovered and data produced, the full-coverage surface survey of the reservoir basin constituted by far the bulk of the WMS. To maintain consistency, only two teams of two people each conducted the survey. Greg Paulk and Jan Fortune initiated fieldwork and refined the survey methodology established by project director Paul Fish. When, after six months, it became apparent that one team could not complete the survey in the allotted time, Tom Gresham and John Doolin were brought in, allowing completion in a total of 15 months. The teams covered 5289 ha in 320 field days for an average of 8.26 ha per person-day. The amount of area surveyed varied considerably, depending chiefly on site density. The maximum monthly survey rate was 23.0 ha per person-day, while the lowest was 5.5.

The specific survey methods, as well as the entire concept of full-coverage survey, were geared to the near optimal ground surface visibility conditions created by land clearing procedures. Approximately 72% of the reservoir was cleared of wooded vegetation by clearing contractors. While timber contractors harvested most of the trees, specially equipped bulldozers sheared the remaining ones and raked them, along with other vegetational debris, into linear piles for burning. This clearing procedure, which avoided stump removal, resulted in continuous, shallow ground surface disturbance with little severe impact to sites.

Another clearing practice that greatly affected survey conditions was the burying of burned debris. The clearing contractors dug a little over 2000 trenches into which the charred remains of burn piles were pushed and covered. These bulldozed trenches averaged 3 m in width, 15 m in length, and 2 m in depth, but created disturbances four times the area of the trench itself. These burn burials were placed mostly on alluvial landforms and provided an expedient means to detect many deeply buried sites. Burn burials were far more common in the northern half of the reservoir, which had a great deal more alluviated land. Also, when the survey was begun, in the southern half, many debris piles had not been burned and buried. Some debris, particularly in upland areas, was pushed into natural depressions and covered with soil from adjacent landforms.

The principal factor affecting ground surface visibility was vegetation regrowth over the 15 month survey period. Regrowth initially consisted of clumps of grasses and isolated broadleafed weeds. Although during the course of the summer the weeds became patchy and as tall as 1.5 m, site detection and artifact collecting were not severely impeded. The amount of regrowth was not noted unless it was severe; a few, generally small areas of floodplain were not surveyed because of total regrowth.

The survey was conducted using 1:2400 (3.05 m contour interval) reservoir project maps prepared by the Georgia Power Company. Most of the pedestrian survey was conducted with crew members 10 m apart. Coverage followed natural topographic features, rather than rigidly prescribed transect lines. The spacing would increase on steep slopes, wetlands, and overgrown areas. Also, the surveyors would zig-zag in these areas to examine areas with the greatest ground surface exposure. All burn burials, other bulldozer disturbances, and erosional gullies (particularly in the floodplain) were examined. The area immediately beyond the reservoir boundary was superficially surveyed with above ground features such as house sites, agricultural terraces, rock piles, rock outcrops, and rock shelters noted on survey maps.

When artifacts were encountered, a very standardized set of procedures was implemented. The first task was to spiral out from the initial artifact find to determine if the area contained ten or more artifacts. Areas with less than ten artifacts were considered "artifact occurrences," a concept designed to reduce paperwork and labor. Virtually all of the environmental and descriptive information recorded for sites was recorded for artifact occurrences, but paperwork was reduced by not having to complete Georgia state site forms and time was saved by scaling down artifact collecting procedures. Hearths, shell middens, chimney and house foundations, prehistoric quarries, rock shelters, and areas containing ten or more artifacts in a continuous scatter were considered sites. Site recording consisted of mapping site limits on the project maps (and in field notebooks when sites were small or peculiarly shaped), recording environmental variables and collecting artifacts.

Site limits were roughly determined with an initial walk-over of the site area, which also allowed an appraisal of artifact density. The density and uniformity of the artifact distribution dictated collecting procedures. Under optimal collecting conditions, and when the artifact distribution was relatively dense and uniform, the portion of the site with the typical density was selected for density sampling. This consisted of collecting every artifact, exclusive of fire-cracked rock, in a 10 m diameter circle. The remainder of the site was then systematically collected in 1 m wide transects placed on 3 m intervals. The surveyors would walk parallel lines across the site, collecting all artifacts (except fire-cracked rock) within arm's length. The limits of cultural material were flagged or noted during the systematic collecting for final site size determination.

When artifact distributions were uneven and/or sparse due to partial clearing, heavy disturbance, substantial regrowth or the nature of the site, the density circle was abandoned and the site was either systematically collected (as described above) or generally collected. A general surface collection would include all diagnostic and most other artifacts recovered during a thorough walk-over of the site. Sites exposed in burn burials were totally collected. A soil sample (0.5 l) was obtained from the surface of each site.

Information recorded on field site forms included site size, degree and type of disturbance, landform, degree and direction of slope, and collecting procedures. Field notebooks were maintained to provide a daily log of sites and occurrences located and to record field conditions. Four to five hours were required to collect and record large (approximately 1.0 ha) sites; small (approximately 0.1 ha) sites could be completed in half an hour.

The project maps were used to record the location and size of sites and occurrences and to indicate springs, outcrops, survey conditions, areas not surveyed, and historic features immediately beyond the reservoir boundary. Samples of unusual (non-quartz) lithic materials were obtained throughout the reservoir and their locations were plotted on the project maps.

Wallace Reservoir Project laboratory personnel conducted artifact analysis and recorded a few additional variables.

Artifacts were sorted into project-wide categories. Lithics were sorted into eight tool and four debitage categories, each divisible into five classes of raw material. Prehistoric ceramics were sorted into well established types based on temper and surface decoration. Most sherds were plain and/or eroded and were thus unidentifiable to specific type. Ground stone tools and historic artifacts were typed and briefly described. After the sorting and tallying, two project workers (Dan Elliott and Paul Webb) reviewed culturally diagnostic projectile points and decorated ceramics to establish component identifications for the WMS sites and occurrences. Based on numbers of diagnostic artifacts, "major" and "minor" components were identified. Finally, sixteen variables, describing site provenience, size, nature, physiography, and components, were coded and entered on computer for all sites and artifact occurrences.

Summary Survey Data

Survey Coverage. Although we refer to the Wallace Mitigation Survey as full-coverage survey, far less than 100% of the land area was actually examined. The Wallace Reservoir floodpool encompasses about 7690 ha, of which about 7144 ha was land surface, the remainder being the Oconee River and four of its major tributaries. A total of 5289 ha in the reservoir was uniformly cleared and intensively surveyed, providing 74% coverage of the land area. The unsurveyed land consisted of 50 wooded fish plots, each about 2 ha in size, 40 wooded wildlife habitats ranging from 3 to 38 ha, about 15 large pastures, and several strips of wooded floodplain that had not been cleared at the time of the survey. Table 2 compares total land areas and areas surveyed by strata for floodplain-terrace and upland area. The delineation of floodplain-terrace and upland areas was conducted by the author for this paper. Because there is no soil survey data for the entire reservoir, the delineation was based mainly on topography as depicted on USGS 7.5' topographic maps. Soil survey maps and site landform data were used to confirm and refine the topographically based delineation. The table reveals that a lower percentage of the floodplain and terraces were surveyed compared to the uplands. This reflects the fact that most of the uncleared fish and wildlife reserves were in floodplains. The low survey coverage figure of Stratum IV reflects the large floodplains with many wildlife reserves and numerous large pastures located in this northernmost stratum.

Table 2. Land Area Surveyed (ha).

	Floodplain/Terraces		Uplands		Total		%	Ratio of Upld/Fld-Terr
Stratum	Total	Surveyed	Total	Surveyed	Total	Surveyed	Surveyed	Surveyed
I	502	472	925	671	1427	1143	80.1	1:1.42
II	736	516	677	601	1413	1117	79.1	1:1.16
III	1705	1361	664	627	2369	1988	83.9	1:0.46
IV	1757	927	161	114	1918	1041	54.3	1:0.12
Total	4700	3276	2427	2013	7127	5289	74.2	
% Surveyed	69.7		82.9		74.2			

The three components of the WMS recorded information on 1359 sites and 1764 artifact occurrences. As shown in Table 3, the bulk of these sites and occurrences were found by the surface survey. The WMS increased the number of recorded sites in the reservoir by almost eight times over the combined total of the four previous surveys. Before presenting some summary description of the survey results, we will examine the WMS data set to see how complete a record it is.

Since intensive surface survey of 74% of the reservoir land area yielded 1296 sites (3019 sites and occurrences), a direct extrapolation suggests that 100% coverage would have yielded 1751 sites (4080 sites and occurrences) if vegetation were the only obscuring factor. However, these figures are probably misleadingly high because (1) much of the 26% of uncleared land was low and wet and unlikely to support an average site density, and (2) an edge effect was discernible: many sites, largely in unsurveyed areas were partially revealed (and recorded) along the edge of the unsurveyed tracts. Many of the wooded, unsurveyed fish plots and

Table 3. Sites and Occurrences Recorded by the Wallace Mitigation Survey.

	Surface	Subsurface Transect	Upland Transect	TOTAL
Sites	1296	18	45	1359
previously known	81	2	2	85
newly discovered	1215	16	43	1274
Occurrences	1723	0	41	1764
Total Sites and occurrences recorded by WMS	3019	18	86	3123

wildlife habitats were situated in the floodplains of small creeks or in swampy areas of larger floodplains; similar or adjacent cleared and surveyed areas often yielded few or no sites. As an alternative to simple extrapolation, the number of sites not located because of remaining vegetation was estimated by using the survey maps to examine each unsurveyed parcel, comparing it to adjacent cleared areas of similar landform and relief and estimating the number of sites and occurrences likely to be obscured. Although a subjective process, the author believes this will more accurately reflect the number of obscured sites than extrapolation from the survey sample. By this means, I estimate that a total of 235 sites and 163 occurrences remained undiscovered in vegetated portions of the reservoir pool.

The other principal factor obscuring sites and making the WMS a less than 100% survey is alluviation. Estimates of the number of sites not discovered because of alluviation can be made using the subsurface survey data, in which 16 buried, previously unknown sites were discovered (Ledbetter 1978). The four half-mile wide transects constitute about a 9% sample of the floodplain; their distribution by physiographic strata aids in making them a representative sample. Based on this sample, and assuming that the subsurface testing found all sites, we can calculate, by physiographic strata, that the total number of alluvially buried sites not discovered by DePratter (1976) or the surface survey is 151, as shown in Table 4. By these calculations, then, 135 sites remained buried and undiscovered.

Table 4. Computation of Number of Alluvially Buried Sites in the Wallace Reservoir.

Stratum	Total floodplain (ha)	Area tested[1]	% of floodplain tested	Sites discovered[1]	Predicted no. of buried, sites
I	502	68	13.5	8	59
II	736	42	5.7	1	17
III	1705	137	8.0	1	12
IV	1757	168	9.6	6	63
TOTAL	4700	415	8.8	16	151

[1] by subsurface survey (Ledbetter 1978)

O°Steen (1983:76-77) used the subsurface survey data to calculate that 37% of the Early Archaic sites in the active floodplain were buried and missed by the WMS. This is roughly similar to my figure of 29.8% for sites in general in the floodplain that were missed. The difference in these figures may reflect that earlier sites are more likely to be alluvially buried. As O'Steen notes (1983:71), this has a negative but not serious impact on most analyses of Early Archaic distribution.

It is instructive in regard to site discovery effectiveness, to compare the WMS results with those of the previous surveys. DePratter (1976) lists 154 sites with known locations that have been recorded in the reservoir by his and previous surveys. The WMS re-located and recorded 73 of these sites, some as occurrences. Fifteen of the previously known sites were to be excavated and were intentionally avoided by the WMS, and 52 were in unsurveyed pastures, wildlife habitats, and wooded areas. There are, thus, 14 sites recorded by DePratter (1976) that were missed by the WMS. Most of these are deeply buried sites on islands or levees. The six sites on islands had artifact-bearing strata between 60 and 175 cm below surface, while the four levee ridge sites contained artifact-bearing strata at 40 to 160 cm below surface (DePratter 1976). While ten deeply buried, previously known sites were missed by the WMS, many of these buried sites were re-located and many more new such sites were discovered. Of the remaining four sites that were not re-located, one may have been just outside of the reservoir, two may have been obscured by grassy regrowth, and the fourth may have been mislocated by the previous survey.

In summary, I have estimated that 235 sites may have been undiscovered by the WMS because of vegetation and 135 because of alluviation. The 1385 sites known from the reservoir basin would then constitute a 78.9% sample of the estimated total of 1755 and the WMS tally of 1314 sites would constitute a 74.9% sample.

Site Distributions. The remainder of this paper will use the large data set generated by the WMS surface survey to provide some general characterizations of site distribution in the Wallace Reservoir. The data from the other components of the survey will not be used because the subsurface backhoe survey data has been dealt with to a limited degree by Ledbetter (1978) and the data from the upland survey beyond the reservoir is difficult to use because of the discontiguous and unquantified coverage of the transects. Both sites and occurrences occur in much greater density on upland landforms than on alluviated terraces and floodplains (Table 5). While site density on uplands is generally four times that of floodplains and terraces, the difference varies considerably between physiographic strata, with only a three-fold difference in Stratum II but a six-fold difference in Stratum I. Much of this variability is due to the differential discovery rates of alluvially buried sites among strata. If the projected number of undiscovered floodplain sites (Table 4) are added to the known number, the ratio of upland to floodplain/terrace site density becomes less variable (Table 6). We see that the two northern strata (III and IV), with expan

Table 5. Density of Sites and Occurrences in Surveyed Area.

	Floodplain & Terrace		Uplands		Total	
	n	n/km^2	n	n/km^2	n	n/km^2
Sites						
I	42	8.90	373	55.59	415	36.31
II	66	12.79	223	37.10	289	25.87
III	146	10.73	272	43.38	418	21.03
IV	103	11.11	71	62.28	174	16.71
TOTAL	357	10.90	939	46.65	1296	24.50
Occurrences[1]						
I	67	14.19	387	57.68	454	39.72
II	75	14.53	261	43.43	336	30.08
III	177	13.01	371	59.17	548	27.57
IV	266	28.69	115	100.88	381	36.60
TOTAL	585	17.86	1134	56.33	1719	32.50
Sites & Occurrences[1]						
I	109	23.09	760	82.16	869	76.03
II	141	27.33	484	80.53	625	55.95
III	323	23.73	643	102.55	966	48.59
IV	369	39.81	186	163.16	555	53.31
TOTAL	942	28.75	2073	102.98	3015	57.00

[1] data missing for 4 occurrences

sive floodplains, have a significantly greater density of occupation of uplands than floodplains/terraces, compared to the southern two strata. This is an important consideration because comparatively little of the uplands of Strata III and IV (see Table 2) was surveyed and a great deal of the settlement system in this area was not included in this survey. A subsequent survey of uplands near the north end of the reservoir (Elliott 1981) confirmed a high site density for the area.

Site density in floodplains does not vary greatly among strata, and density in the uplands does not trend in either direction along the river (Table 6). Significant differences do occur with the densities of occurrences, where it is seen that Stratum IV has nearly twice the density of the other strata for both floodplains/terraces and uplands. Many of these occurrences are Mississippian and may reflect a non-occupational use of the land beyond nucleated villages. The total site and occurrence densities show Stratum I signifi-

Table 6. Ratio of Upland Sites to Projected Floodplain Sites.

	Floodplain and Terrace				Uplands	
	known	Projected undis-covered	Total	n/km^2	n/km^2	Projected ratio (U/F & T)
I	42	59	101	21.4	55.6	2.6/1
II	66	17	83	16.1	37.1	2.3/1
III	146	12	158	11.6	43.4	3.7/1
IV	103	63	166	17.9	62.3	3.5/1

cantly higher than the other strata, but these figures may reflect the relatively greater amounts of uplands surveyed (where site and occurrence densities are much higher) more than cultural/behavioral factors.

The precision with which sites can be identified to culture-chronological components varies through time and by intensity of study. Excavation at the Dyar Mound site in the reservoir (Smith 1981) and other analyses of Wallace Reservoir data have permitted a recognizable division of the Mississippian period into 150 to 200 year increments. Working with Early Archaic sites, O'Steen (1983) distinguished five Early Archaic horizons based on characteristic point types. The determination of components for the WMS sites and occurrences by Elliott and Webb was conducted at a broader scale of temporal reference, with components identified to either ten culture-chronological periods (e.g., Middle Woodland, Early Mississippian) or, if that were not possible, to 11 broader categories based on artifact content (e.g., unidentified lithics, unidentified stamped ceramics, undifferentiated Mississippian).

Table 7, presenting densities of components by physiographic strata, shows some broad patterns that have been examined in greater detail by others. For example, the greater density of Archaic sites in the southern strata (I and II) parallels O'Steen's (1983) distribution of Early Archaic sites, a distribution she attributes to the favorable abundance of diverse micro-habitats in the southern strata. As Table 7 shows, there is a uniform trend toward more intense occupation of the southern strata for all components, suggesting that the more diverse physiography was attractive to the range of subsistence strategies employed throughout the prehistoric and historic periods. Table 8 summarizes the culture historical sequence of the Wallace Reservoir and shows a remarkably uniform intensity of use until the Mississippian period.

Table 7. Components per km^2 Surveyed.

	Archaic		Woodland		Mississippian		Unknown lithic		Unknown ceramic		Historic	
	sites	occ.	sites	occ.	sites	occ.	sites	occ.	sites	occ.	sites	occ.
I	18.5	3.1	9.0	0.9	17.2	1.5	5.7	23.4	7.1	9.5	12.8	2.4
II	14.8	2.9	5.4	0.5	14.1	2.4	2.8	16.5	4.5	6.9	8.3	1.5
III	10.3	1.4	5.4	0.4	13.1	2.7	1.9	11.9	3.6	10.2	4.4	1.6
IV	8.1	2.4	2.8	0.6	9.0	3.3	1.7	14.5	4.2	13.9	3.5	1.1
Total N	666	121	299	25	708	132	152	839	246	532	362	179

Table 8. Occupation Density Through Time.

Period	Span (yrs)	Components	Components/100 yrs
Paleoindian	? 1000	36	3.6
Early Archaic	2000	249	12.5
Middle Archaic	3000	493	16.4
Late Archaic	2000	337	16.9
Woodland	2000	324	16.2
Mississippian	600	860	143.3
Historic	200	541	270.5

Comparison of Post- and Pre-Clearing Surveys

The WMS site data can be compared to the results of the previous surveys of the Wallace area and to other large-scale Piedmont surveys in order to see differences in component composition, site size, assemblage size, site location by landform, and site/component densities. In general, the combined results of the previous Wallace area surveys--Wood and Lee (1974), Wood (1974), and DePratter (1976)--which together constituted about a 10% sample of the sites ultimately discovered, provided an accurate assessment of the total cultural resource base. Statistical comparisons of site size distributions by landform (floodplain, terrace, uplands) and component show few significant differences between the pre-clearing data and the WMS data. A pervasive trend, the discovery of more small sites and relatively fewer large sites by the WMS, became statistically significant only in the uplands and when sites of all components were compared. If occurrences are included with the WMS data, however, the tendency for the WMS to locate small sites becomes pronounced (Figure 2). Of those WMS sites and occurrences where site size could be fully determined, 68.6% were less than 1000 m^2, in contrast to the 31.2% determined by the combined previous surveys.

Site sizes could be directly compared when 19 previously known sites had site size reliably determined by the WMS. Of these, 13 reflected increased size from the estimate made when the site area was wooded. Most of the increases in site size were substantial, with only one showing less than a 100%

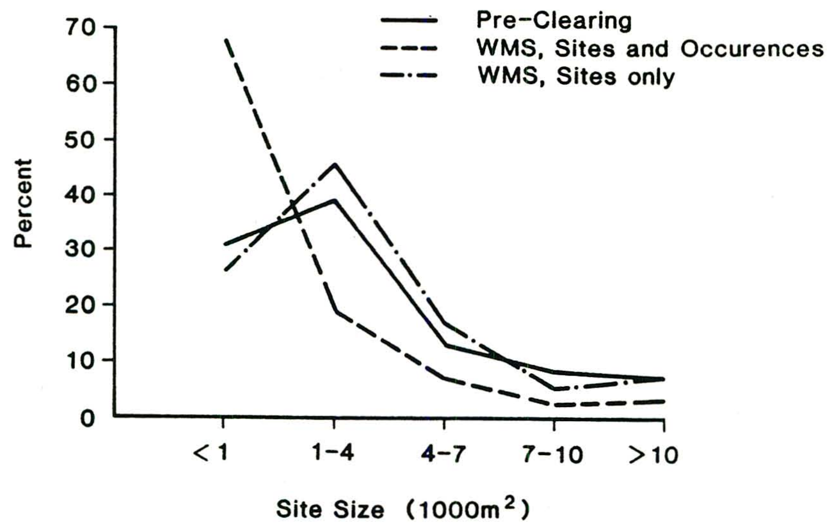

Figure 2. Site Size Distribution for Pre-Clearing and Post-Clearing Surveys.

increase. Two of the sites showed over a 1000% increase. Fewer sites were demonstrated to be smaller than estimated by the earlier surveys. Of those six that were, the size after clearing was not greatly different, as four of the sites exhibited differences of less than 100%.

These data probably reflect the fact that site sizes determined from the pre-clearing surveys were estimates of minimum site size based on a small number of shovel tests. Even though DePratter (1976) usually delineated site limits greater than that actually demonstrated in the field, to provide a buffer zone, sites were often larger than the shovel testing and very limited surface exposure had indicated. However, the greater site size after clearing may, in part, result from the dispersal of artifacts during the clearing process. The generally few and slight negative changes in site size from pre-clearing to post-clearing states probably reflect inclusion of the buffer zone during the initial surveys and show that, in some cases, the previous surveys very accurately determined site size under wooded conditions. In addition to changes in site sizes, there were four cases where a previously known large site was determined by the WMS to be two or more smaller sites. There was one case where two previously known sites were determined by the WMS to actually be one contiguous site.

Previous surveys of the Wallace area documented a wide range of cultural components, including an abundance of Late Mississippian sites (DePratter 1976). However, in comparison with the WMS data set (Figure 3), DePratter's pre-clearing survey significantly over-represented the Late Mississippian component and significantly under-represented the historic component (chi-square = 75.6, df = 8). Also, the previous surveys found no evidence of Paleoindian or Late Woodland Napier occupation, yet both components were well represented in the WMS.

The goals and biases of the various pre-clearing surveys are reflected in the distribution of sites by landform. In the surface exposure surveys (Wood and Lee 1974; Wood 1974), 73.4% of the sites found were in uplands, principally on ridge tops, and only 8.9% were in floodplains. With the largely subsurface survey of DePratter (1976), only 38.1% of the sites were in uplands while 41.7% were in floodplains.

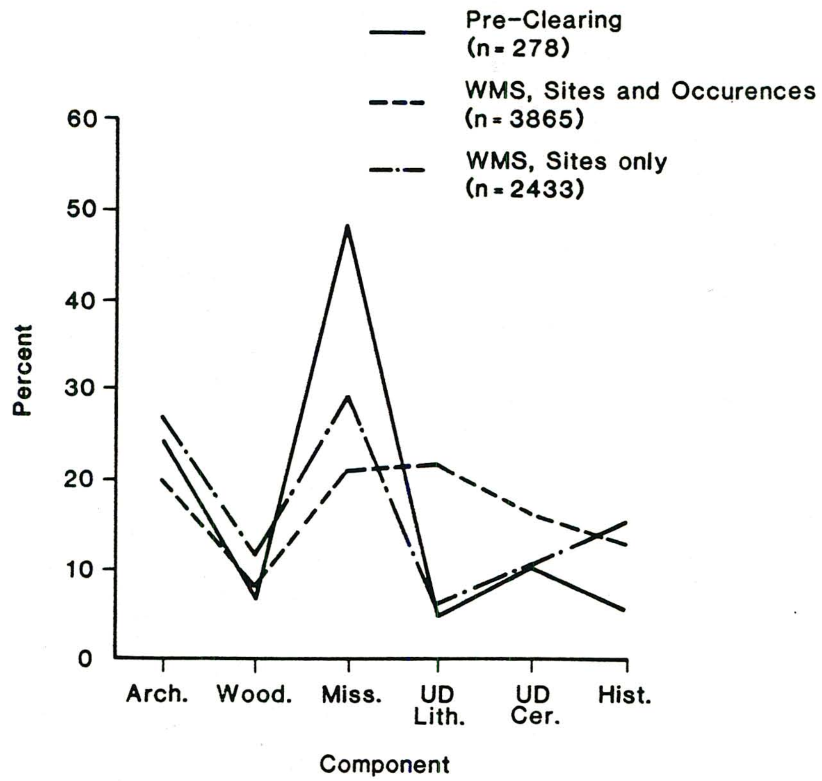

Figure 3. Relative Frequency of Components.

Combining these survey data, the pre-clearing surveys indicated that about half of the sites were located on uplands, while about 30% were in the floodplain and 20% on terraces (Figure 4). The WMS site data revealed a higher percentage of upland sites (72.4%) and a lower percentage of floodplain sites (17.7%). Much of this difference is accounted for by the alluvially buried sites missed by all surveys. If the previously calculated projected number of undiscovered, alluvially buried sites are added to the known sites in the floodplain, the WMS figure for the floodplain approaches that of the previous surveys (Figure 4). There still remains a significant under-representation of upland sites by the previous surveys.

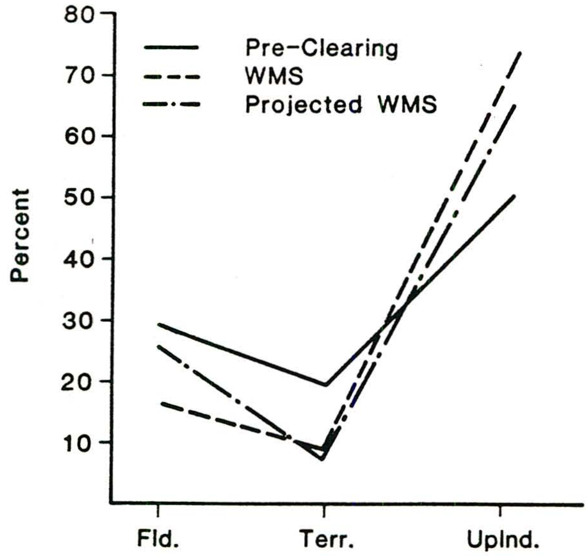

Figure 4. Site Distribution by Landform.

One major reason for the under-representation of upland sites by the pre-clearing survey is highly significant because it has implications for many surveys of large, wooded tracts being conducted today. The previous surveys of the Wallace area focused, in the uplands, on nearly level land, principally ridge tops, hill tops, and saddles (Wood and Lee 1974). Of the 939 upland sites recorded by the WMS, only 22% (n = 205) were on ridge tops, the remainder being entirely confined to slopes. Over 8.5% (n = 80) of the WMS upland sites were on slopes greater than 10%.

One final comparison between the two survey data sets concerns assemblage size: the WMS recovered much larger artifact collections than the previous surveys. Using as a sample those sites (not including occurrences) within the four 0.5 mi wide subsurface survey transects, Fish et al. (1978) showed that WMS collections averaged almost nine times the size of pre-clearing collections, as shown below.

	No. of Artifacts	
	Pre-WMS	WMS
range	3 - 4264	10 - 3689
median	13	113

Although the recovery of larger artifact collections often led to the recovery of diagnostic artifacts, and hence component identification, the percentage of sites unidentifiable to prehistoric component actually rose slightly, from 19.8% with the previous surveys to 21.9% for the WMS data. This may reflect the WMS having located a greater percentage of small, specialized activity sites that would not contain diagnostic artifacts.

The comparison of pre-clearing survey results with WMS results showed that the former surveys were able to produce a fairly accurate description of site distributions by landform, component and size based on a 10% sample of the sites eventually discovered. The pre-clearing surveys, however, generally understated site size and significantly overstated the relative frequency of Mississippian sites in the reservoir basin. One of the greatest differences in the data sets is the percentage of small sites discovered. When artifact occurrences are included with sites, the WMS recorded over twice the percentage of small site (less than 1000 m^2) than did the pre-clearing surveys.

The Case for Full-Coverage Survey

The Wallace Mitigation Survey is unprecedented in the Southeast for its combination of extensiveness, high site detection rate, and large artifact collections. The immense data set generated by the survey has only been partially utilized, mostly by analyses geared to specific cultural periods. These studies, however, rather dramatically demonstrate the necessity of full coverage survey, particularly in regard to the analysis of rare phenomenon, data subsets and detailed spatial analyses.

At least three classes of sites were unrecorded by previous surveys and have been studied using the WMS data. O'Steen et al. (1983) worked with two of these classes quarries and Paleoindian sites--to distinguish three types of Paleoindian sites and to spatially relate these types to outcrops and quarries. Using the survey data to delineate quarry zones, O'Steen et al. (1983) further used the data to determine that there was a proportionately higher occupation of these zones during Paleoindian times than during any other period. Late Woodland Napier sites were also not recorded by previous surveys, but the 40 sites recorded by the WMS are being used by Teresa Rudolph (1986) in a comprehensive study of Woodland period subsistence and settlement in northeast Georgia. Rudolph (1985) has suggested that Napier sites tend to be alluvially buried and may be systematically missed and under-represented in less intensive surveys.

Two studies have focused on the classes of sites detected by the previous surveys but for which an adequate sample was obtained only with the full coverage survey. O'Steen (1983) examined Early Archaic settlement in the reservoir by landform, physiographic strata, major drainages, and culture/temporal subdivisions (horizons). This type of cross-tabulation analysis required the large sized data set produced by the WMS to avoid cells with one or no cases. Another class of sites, that containing shellfish remains, was encountered by the previous surveys (accounting for 11% of the sites); but the greater number produced by the WMS has facilitated an interpretation of shellfish use during the Late Mississippian period (Rudolph 1978).

Full-coverage data was essential for a detailed spatial analysis of soapstone procurement and use conducted by Elliott (1980), in which he tested the hypothesis that the amount of soapstone used on a site steadily decreases with increasing distance from the source unless complicating factors, such as redistribution centers, were involved. Elliott's analysis required both the discovery of relatively rare soapstone quarries and extensive, full-coverage recording of artifactual data in a continuum from the source to distances as great as 7 km away.

The greatest potential of the WMS, the Mississippian period data set, is only now being fully exploited in a dissertation by James Rudolph (1984). The presence of Dyar Mound, a Mississippian mound and village site in the Wallace Reservoir, had long been known and provided an indication that the reservoir may have contained a Mississippian center and perhaps a portion of a political entity. All of the pre-clearing surveys discovered large numbers of Late Mississippian sites and it became clear that the Wallace Reservoir area was indeed a major occupation zone during the Late Mississippian Lamar period. One of the first major attempts to understand Lamar period settlement in the area was Lee's (1977) analysis of the pre-clearing site survey data. Lee used a cluster analysis to discern three classes of sites based on size and artifact content, then used a spatial cluster analysis to identify four agglomerations of sites which he attributed to probable socio-political units (Lee 1977:153). Lee cautioned that his analysis was hampered by small sample size (149 sites).

One of the first uses of the WMS data in regard to Mississippian settlement was an analysis by Rudolph and Blanton (1980) in which the significant increase in the number of sites during the Mississippian period (from Etowah to Late Lamar) was quantified at about ten-fold and attributed to population growth. They also noted a temporal trend toward greater site density in the southern shoals area of the reservoir, where a more diverse food resource base may have been increasingly needed. While Rudolph and Blanton's (1980) analysis and conclusions could have been drawn from a sample of sites, the fact remains that the analysis was not done until the full-coverage WMS data was available, foregoing the use of DePratter's (1976) pre-clearing data. This probably reflects one of the most fundamental advantages of full-coverage data, greater reliability through a larger data base.

A major contribution to the understanding of Lamar settlement was the tentative identification of a late prehistoric, chiefdom-level province along the Oconee River by Smith and Kowalewski (1980). Based on size ranking and spatial distribution of mound sites, including Dyar and a smaller mound in the Wallace Reservoir (9Ge35), they proposed a hierarchical system of political entities centered on the mound sites and composing, in sum, an Oconee Province. The existence of this province was subsequently strongly supported by the ethnohistoric evidence presented by Hudson et al. (1984) which indicates that Hernando DeSoto recognized a hierarchical political entity in what appears to be the Oconee River drainage. Although Smith and Kowalewski's (1980) analysis made only peripheral use of the WMS data, it provided a provocative, testable framework for conducting more detailed settlement analyses.

Another important contribution to Mississippian settlement pattern analysis was the identification, by pottery traits, of 100-150 year temporal units within the Lamar period, accomplished through excavation at the Dyar Mound site (Smith 1981) and the Joe Bell site (Williams 1983). With this finer tuned chronological control, settlement and demographic change could be better examined. Thus, Elliott (1980) was able to subdivide Mississippian sites found in a survey adjacent to the Wallace Reservoir into four temporal units and determine that the uplands exhibited an intensive occupation during the proto-historic period Dyar phase of the Lamar period. J. Rudolph (personal communication, 1986) has completed a reanalysis of the rim sherds from all WMS Mississippian sites and occurrences as a means of establishing finer chronological control on the survey data. He has proposed (Rudolph 1984) to examine the relationship among population size, settlement patterns, and economic change in the Oconee River valley during the Mississippian period by using a series of linear programming models. In essence, he is using modeling to examine demographic shifts in a horticultural society and is testing these models with WMS data. The full coverage data is important primarily for its size but also for its continuity through physiographic strata and environmental niches.

Future Directions

Archeologists working on the Wallace Reservoir Project immediately recognized that the WMS was a very valuable means of gathering a uniquely complete record of human utilization of a large, usually forested sub-region of the Southeast. A comparison with other more recent full coverage reservoir surveys in Georgia shows a tremendous variation in site densities (Table 9). The three principal factors producing this variation of densities are variable definitions of "a site" (i.e., the exclusion of artifact occurrences by some researchers), the method and difficulty of calculating area actually surveyed, and actual site density. The high density of the WMS is a function of all three of these factors. The disparity in the data make inter-basin comparisons of settlement patterns virtually impossible and point out the tremen-

Table 9. Comparison of Site Densities AmongRecent Reservoir Surveys in Georgia.

Project	Reference	km surveyed	Sites[1]	Sites per square km	Notes
Entire Pool					
WMS	This paper	52.89	3019	57.1	
Wallace Reservoir (pre-clearing)	DePratter 1976	7.56	158	20.9	2
Russell Reservoir	Taylor & Smith 1978	44.95	490	10.9	3
Above Pool					
W. F. George Reservoir	Knight & Mistovich 1984: 44	40.50	163	4.0	
West Point Lake	Rudolph 1979: 34, 40	32.38	1008	31.13 32.32	4
Lake Lanier	Rudolph 1980: 41	15.3	530	34.6	
Allatoona	Ledbetter et al. 1987	130.1	1063	8.17	

1 includes occurrences
2 based on author's estimate of 10% coverage of floodpool
3 based on author's estimate of 27.23% coverage of floodpool
4 projected density based on author's figures for low and high probability areas

dous advantage of surveying uniformly cleared land with a standardized methodology.

The concept of large-scale, full coverage survey and specific WMS methods have been employed in several surveys near the Wallace area. Elliott (1981, 1985), Ledbetter and O'Steen (1986), and Rudolph and Blanton (1980) have reported on surveys of 200 to 531 ha tracts of uplands near, but not adjacent to, the northern portion of the reservoir. These surveys were instigated primarily to complement the WMS data set, which was lacking in upland survey at the northern end of the reservoir. These surveys demonstrate that the WMS methods are replicable and a practical means of recovering detailed, quantifiable site data from relatively large tracts of land. The completed and ongoing analyses of the WMS data, as well as the potential for other analyses, have demonstrated that such large scaled, full-coverage survey data are needed to address many of the questions that researchers in the Southeast are now asking. Many of these questions dealing with spatial relationships have never been asked in the Southeast because full coverage survey of large areas has been considered impossible, or at least highly impractical. The fortuitous uniform clearing of the 5000 ha Wallace Reservoir is not necessarily a unique phenomenon, especially in a long term perspective. The surveys of Elliott (1981, 1985), Ledbetter and O'Steen (1986), and others of large clear-cut tracts of land provide a key to realistically enlarging the WMS data base or conducting an entirely new large-area, full-coverage survey. Such surveys will clearly have to be accretional, long term projects taking advantage of various types of clearing over a matter of decades. With long term commitment, probably through an institution, very large areas (thousands of km^2) could be largely surveyed by examining cultivated fields, clear-cuts, development tracts, and other fortuitously cleared parcels of land.

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