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CHERT RESOURCES IN GEORGIA: ARCHAEOLOGICAL AND GEOLOGICAL PRESPECTIVES

SHARON I. GOAD

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CHERT RESOURCES IN GEORGIA:
Archaeological and Geological Perspectives

by

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ABSTRACT

Chert is a compact, siliceous mineral occurring in the Coastal Plain and the Ridge and Valley Provinces. It is found in discontinous, widely scattered outcrops generally associated with Paleozoic and Tertiary Period limestones. Although the primary economic importance of chert today is as a crushed stone, road building material, the aboriginal populations of the state extensively utilized chert in manufacturing a variety of tools.

Given the importance of chert as an aboriginal raw material, very little research concerning the origin and classification of chert has been conducted. This report, by no means an exhaustive or sophisticated geologic guide, discusses the major varieties of Georgia chert, their location, and their characteristics. Additionally, this report presents the results of a qualitative analysis of chert tools and debitage from archaeological sites in central Georgia which attempts to discern and interpret changing chert utilization within the area. The potentialities of trace element analysis in quantitatively characterizing chert resources is discussed and a preliminary Neutron activitation analysis of 33 chert resource samples is presented.

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I. CHERT RESOURCES OF GEORGIA

Introduction

The quantity and distribution of chert potentially available to prehistoric populations represent important variables in developing and defining subsistence-settlement models for the various aboriginal populations of Georgia. Because chert is: (1) uniformly well preserved on archaeological sites, (2) a plentiful element of the cultural debris on sites, (3) physically heterogeneous between geologic formations, and (4) present in numerous locations in Georgia, comparison of chert of known geological sources against "cultural" chert may be useful in gaining a more detailed picture of utilitarian resource procurement. Information on the distribution and quantity of chert might, for example, enable us to infer the size, shape, and location of the territory necessary for a group to control in order to insure continuous access to this staple raw material.

Furthermore, groups situated some distance from chert sources would require exchange relationships with groups occupying the chert-producing localities. Changes in chert procurement might, therefore, indicate shifts in exchange preferences attributable to socio-political factors, decreasing territorial boundaries, or other factors.

To assess the chert potentialities of Georgia, it will be necessary to define and briefly review on a regional basis the types of chert resources available, and to establish both qualitative and quantitative criteria for their identification. Once identified, these criteria may be utilized for the identification of chert from archaeological sites and tentative source areas may be assigned. It will also be useful to discuss the probable effects of continuing chert exploitation on the long-term availability of this raw material, the possible effects of changes in subsistence pattern on chert procurement, and to suggest possible relationships between chert distribution and prehistoric settlement patterning. Finally, it will be important to discuss a more comprehensive data collection program that would allow for a more thorough analysis of chert resources, their procurement, and distribution.

Definition of Chert

There is considerable lack of agreement concerning the definition of chert and its distinction from flint. Both chert and flint are insoluble silica residues in limestone and chalk deposits. Petrographically cherts and flints are structureless forms of chalcedony, both of which are aggregates of cryptocrystalline silica. Chert is generally associated with limestones; flint with chalk. Chert may be tabular, flint nodular; chert may be more splintery than flint; one may be darker than the other; chert may be impure flint; or vice versa. Since these two substances are very similar and their uses are similar the term chert will here be used to refer to any number of fine grained silica material with conchoidal fracture.

Several related materials also utilized by aboriginal populations are agate, chalcedony, and jasper. Agate is a silica, mainly chalcedony, with varigated bands or patterns. Chalcedony is cryptocrystalline quartz and chert which is microscopically fibrous. Jasper is a crypocrystalline quartz with a dull fracture and often a reddish color. These materials occur in Georgia in small amounts but are not considered in this report.

Chert is distributed throughout many of the physiographic areas of Georgia, and may be differentiated utilizing such variables as color, texture, inclusion, and fracture properties. The following sections briefly discuss these properties as they apply to chert in general.

Color. Common chert colors range from black or brown through white, yellow, gray and cream. This variation is the result of the inclusion of various chemical impurities.

Black and gray coloration is due to carbonaceous impurities present during formation. Some black chert, "fresh" chert, is newly exposed and will weather to gray or some other color. Archaeologically some black or gray chert may be the end product of heating, roasting, or smoking

(Struever 1973). The high gloss produced by heating may aid in distinguishing these later colors from natural black and gray.

Red, yellow, pink, and green colors are the result of ferric inclusions. The presence of magnesium or manganese also produces a red coloration; chromium a yellow. These colors may also be due to heat treatment, to be discussed later.

Other colors such as white, cream, and blue are due to the presence or absence of a number of elements. Post-depositional weathering, patination, and leaching also result in these lighter colors.

Banding, the inclusion of streaks or spots of various colors, is attributable to depositional impurities or to the presence of impurity concentrations (Blatt, Middleton and Murray 1972). Successive layering during deposition also results in banding (Taliaferro 1934). Abrupt physical or localized changes result in mottling. In chert this often appears as areas of dark color in a light background. Elongated areas of mottling are called streaks.

Color may also be affected to some degree by the presence of certain chemical substances in the soil or by soil type. Luedtke (1976: 81) states that Mid-western soils often bleach chert white with blackened pyritic areas; while sandy soils cause severe oxidation, staining surfaces red or yellow.

Surface finish. Another physical characteristic of chert is its opacity or light reflecting characteristics. The surface finish of unaltered chert ranges from the nearly transparent to translucent or opaque. One distinguishing characteristic between chert and flint is that chert is opaque on thin edges and flints are translucent.

The surface finish of chert ranges from dull to semi-glossy. Heat treated chert has a lustrous, glossy texture that is "greasy" to the touch.

Texture. Chert is composed of elongated polyhedral crystals. Macroscopically the texture is smooth, fine, and hard. Microscopically chert may contain inclusions that aid in its identification. These inclusions are generally of a fossiliferous or oölithic nature.

Oölithic inclusions are small, calcerous grains ranging in size from 0.25 to 2.00 mm in diameter. Microscopically they resemble grains or "bumps."

Fossiliferous chert contains the inorganic remains of small fossil bodies. Casts of fossils also occur in chert. Crinoids, corals, bivalves, trilobites, and sand dollars are common fossil inclusions.

Fracture. Fracture is the manner of breaking and appearance of chert when broken. Chert fractures are generally conchoidal. Fracture properties do not appear useful in differentiating the major chert localities.

Heat treated chert. Special note should be made concerning heat altered chert. Heat altered chert has been intentionally treated by the application of heat. The methods of heat treatment have been extensively discussed by Mandeville (1973) and Struever (1973). The thermal pretreatment of chert modifies the structure of chert by recrystallizing its silica and producing a finer, and more workable material. Thus, coarse grained, poor quality chert can be altered to a chert that is of a higher quality.

When subject to heat chert generally changes color, to a bright pink, orange, or purple or a smoky gray and the surface becomes glossy and "greasy" to the touch. These two characteristics allow for the separation of heat treated from non-treated chert.

This brief description of several of the physical properties of chert has introduced several aspects which may be utilized in the visual differentiation of chert sources. The following sections discuss the geologic history of Georgia in relation to chert and provides, utilizing the above categories, brief descriptions and discussions of the major chert deposits in Georgia.

Sources of Chert

Chert often forms a prominent part of the topography of a specific area, due to its hardness and resistance to weathering. Chert deposits can be grouped into three major categories dependent upon their location and stage of weathering:

1. Bedrock or in situ chert which remains embedded in its original matrix and occurs only in these actual outcrops.

2. Weathered or residual chert is the result of weathering processes which have removed the chert from its matrix without transporting it from its original geographic location.

3. Redeposited chert has been weathered from its matrix and transported to a new geographic location.

Within these three categories chert may occur in bands or deposits of up to several feet in thickness. It may also occur as nodules, blocks, or boulders or as cherty flakes in weathered limestone or shale soils. The following sections will utilize these categories in describing the chert deposits of Georgia.

Geological Formations Associated with Chert

Georgia has been subjected to many geologic conditions which have resulted in the current (Holocene) surface. The state may be divided into a number of physiographic regions based upon variables such as lithology and topology. For simplification these have been grouped here into three regions: the Ridge and Valley, the Blue Ridge and Piedmont, and the Coastal Plain (Fig. 1).

Additionally Georgia may be divided into geologic provinces (regions) defined by the age of deposition of their bedrock. These geologic regions, roughly corresponding to the physiographic regions, are: the Paleozoic, the Crystalline, and the Coastal Plain (Fig. 2).

The oldest lithological formations of the state are those of the Crystalline Region, which date to the Pre-Cambrian and Cambrian System (600 million). These form a broad belt extending from the Fall Line to the Ridge and Valley. The geology of this area consists of ancient shales, limestones, and sandstones now altered to quartzites, marbles, mica and schists. Although no large deposits of chert are found in the Crystalline Region there are reported outcroppings of jasperoid (Charles Cressler, Personal Communication) and agate (Paul Fish, Personal Communication).

The Paleozoic Province in the northwestern corner of the state includes formations of the Cambrian System and the Ordovician, Silurian, Devonian, Mississippian and Lower Pennsylvanian periods (100 million and after). Sandstones form many of the ridges in this area with nonresistant rocks such as shales and limestones forming the valley areas and the Lookout Plateau. Major chert deposits include the Knox dolomite, Armuchee, and Ft. Payne.

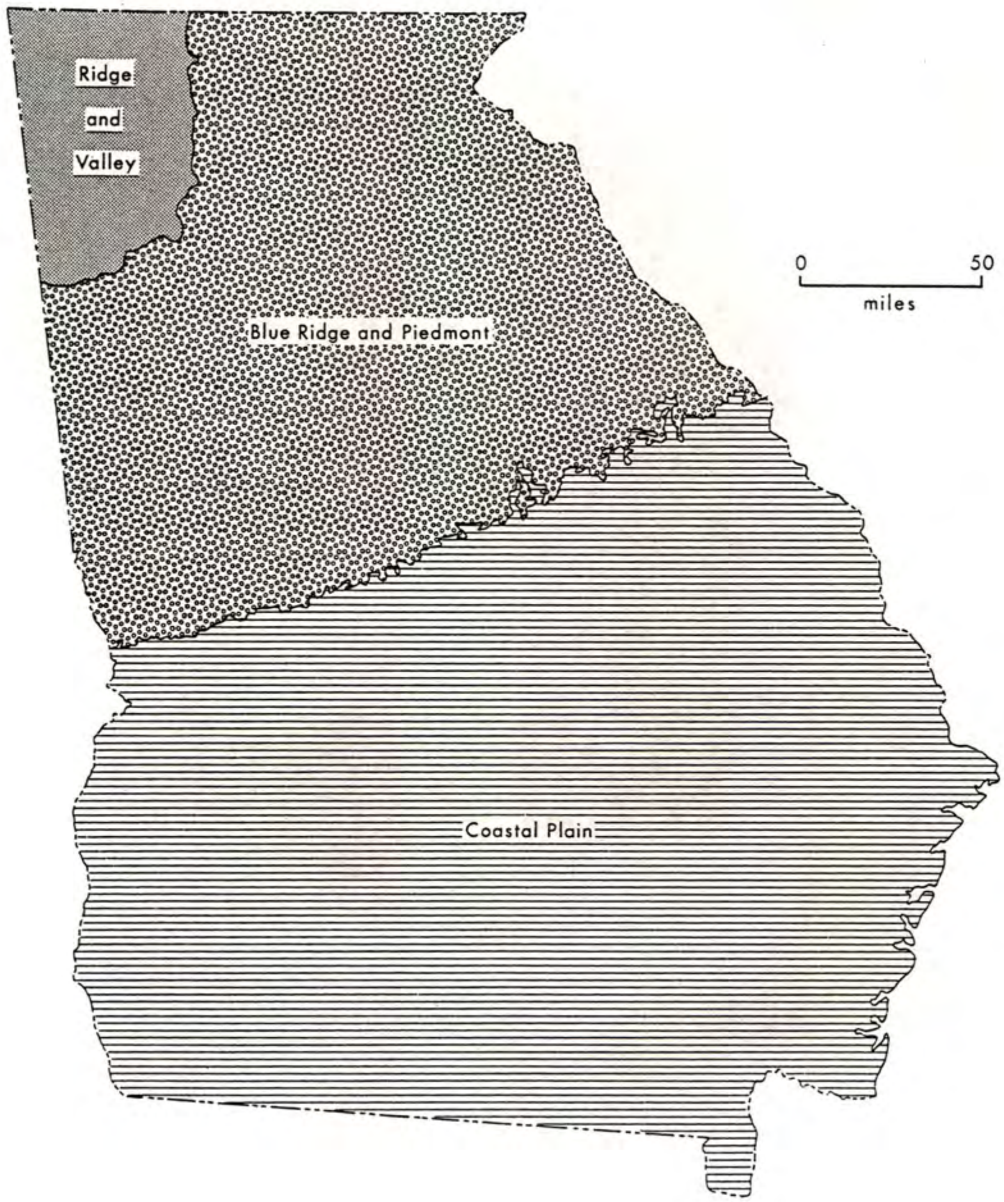

Figure 1. Physiographic Regions of Georgia.

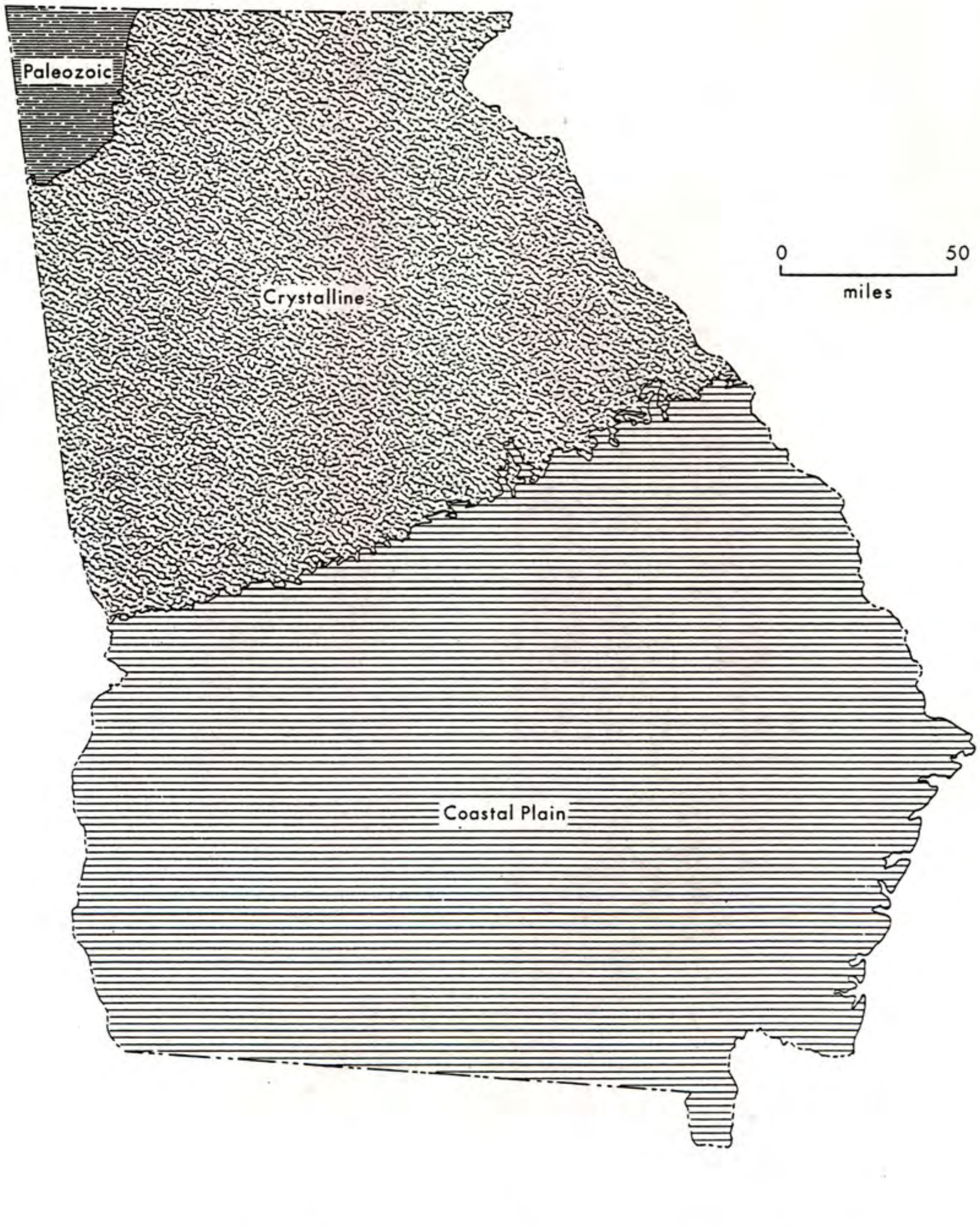

Figure 2. Geologic Provinces of Georgia.

The youngest geologic formations are the sedimentary rocks of the Coastal Plain formed during the Upper Cretaceous Period and Cenozoic Era (c. 80 million). The Coastal Plain may be divided into six subareas which differ in topography and lithologic composition as well as age (Fig. 3). Detailed descriptions and maps of these subareas may be found in Faircloth (n.d.), Brantle (1916), Veatch and Stephenson (1911) and Marsalis and Friddel (1975). The cherts of the Coastal Plain are generally distributed in the Cretaceous Period and early Cenozoic epochs.

To summarize limestone and chert bearing deposits occur in the Ridge and Valley and Coastal Plain Provinces. Tables I and II list the geologic formations of Georgia and the corresponding depositional periods. The chert bearing formations are discussed below beginning with the Ridge and Valley Province.

Ridge and Valley Province

The Ridge and Valley Province is part of the Appalachian Valley (Butts 1948:3). The terrain consists of parallel valleys separated by ridges. Lowland areas average 800 to 900 feet above sea level with the highest ridges reaching an altitude of above 1,600 feet.

Carbonates and shales are abundant in the Ridge and Valley, forming the ridges and broad valleys of this province. The carbonates of this area are the principal chert-bearing formations and belong to the Conasauga Formation, the Knox Group, the Chickamauga Limestone, and the Bangor Limestone.

Chert deposits of the Ridge and Valley may be assigned to the Upper Cambrian (Conasauga Formation), the Upper Cambrian/Ordovician (Knox Group and Chickamauga Limestone), the Devonian (Armuchee Chert), and the Mississippian (Fort Payne Chert and Bangor Limestone) (Fig. 4, Table I).

Upper Cambrian System

Conasauga Formation. The Conasauga Formation was named by Hayes (1891:143) from the Conasauga River, Georgia. The formation is composed mainly of shales and limestones and is exposed in several areas of the Ridge and Valley (Cressler 1963, 1964a, 1964b, 1970).

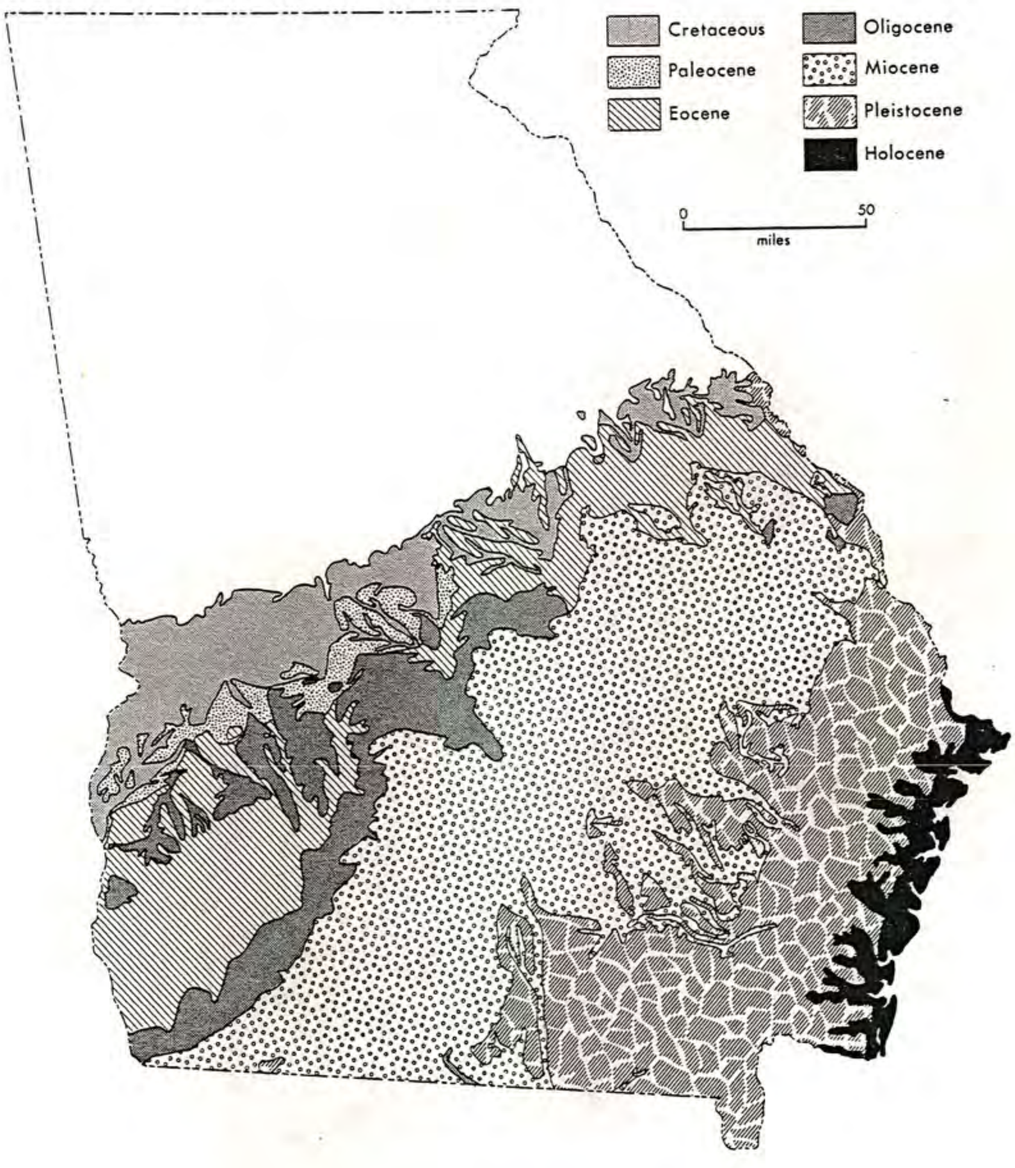

Figure 3. Geologic Formations of the Coastal Plain.

TABLE I. GEOLOGICAL FORMATIONS OF THE RIDGE AND VALLEY PROVINCE

ERA	Period	Formation	
PALEOZOIC	Pennsylvanian		
	Mississippian	Mississippian undifferentiated	
		Bangor limestone	
		Floyd shale	
		Fort Payne chert	
		(Fort Payne chert, Armuchee chert)	
	Devonian	Armuchee chert, Frog Mountain	
	Silurian	Red Mountain Formation	
	Ordovician		Upper & Middle Ordovician Murfreesboro limestone
		Chickamauga	
			Newala limestone
		Knox Group	
	Cambrian		Maynardville limestone
		Conasauga Group	
		Rome Formation	

TABLE II. GEOLOGICAL FORMATIONS OF THE COASTAL PLAIN

System	Series	Group	Formation	
Quaternary				
Tertiary	Pliocene		Atlamaha	
			Charlton	
	Miocene		Duplin	
			Marks head	
	Oligocene	Appalachicola	Alum Bluff	
			Chattahoochee	
			Vicksburg	
	Eocene		Jackson	Twiggs clay Ocala lime
		Claiborne	Barnwell sand	
			Mc Bean	
			Wilcox	
			Midway	
	Paleocene		Clayton	
Cretaceous				

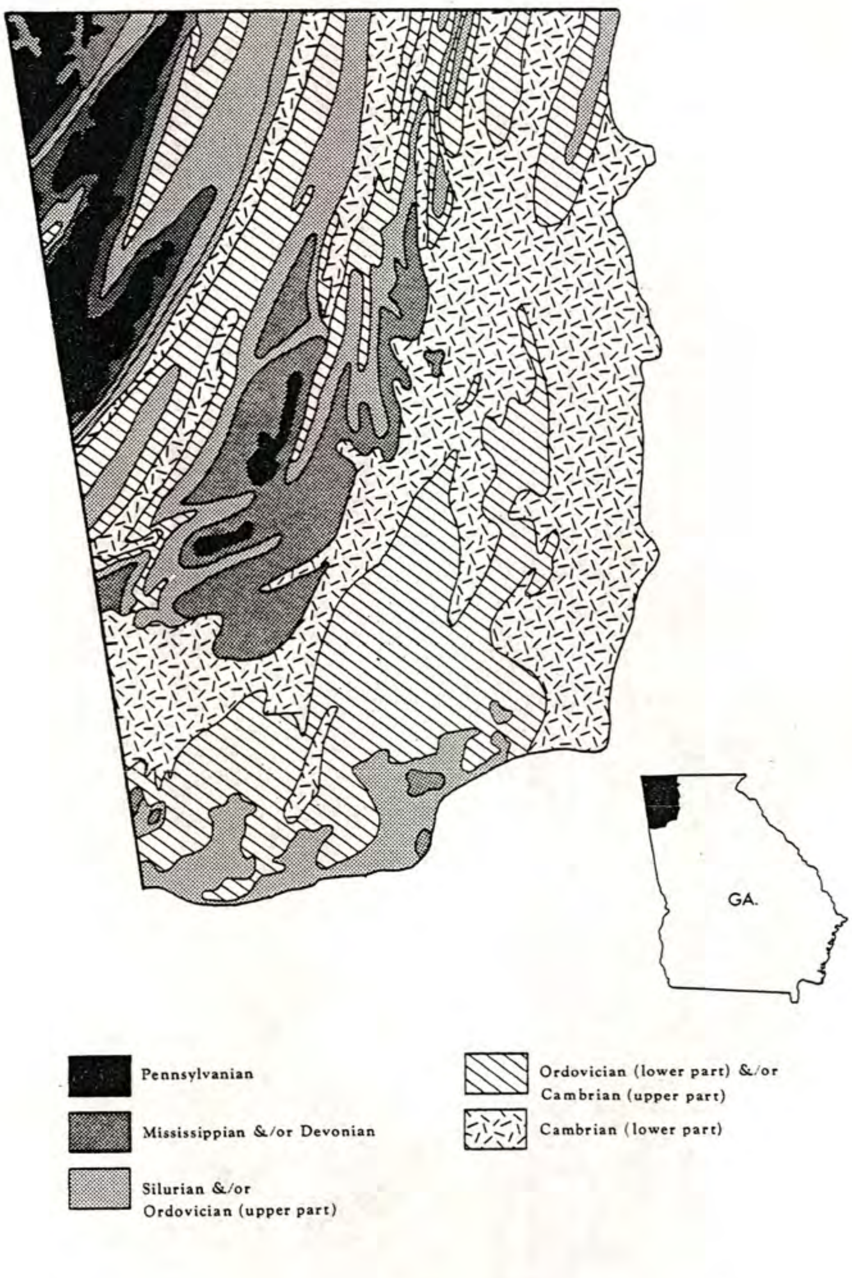

Figure 4. Geologic Formations of the Ridge and Valley.

Conasauga chert occurs in fine grained lenticular masses near Adairsville (Spalvins 1969:49), and as nodules, blocks, or cherty "shatters" in Floyd County (McCallie 1925:141). In Floyd and Polk counties, the Upper Unit of the western belt of the Conasauga Formation contains chertlike siliceous nodules up to 8 inches across that collect on the ground surface (Cressler 1970:12).

Conasauga chert is dark gray, black, or tan and is often oölithic (Spalvins 1969:49) (Table III). It is sometimes classified as chalcedony. This chert tends to be brittle and has a dull luster. Heat altered Conasauga chert is dark black with a mottled luster. Although it is locally abundant and easily worked (C. Cressler, personal communication), Conasauga chert does not appear to have been widely utilized by aboriginal populations.

The locations of several Conasauga chert sources are given in Appendix I.

Upper Cambrian/Ordovician System

Knox Group. The Knox Group of Late Cambrian and Early Ordovician age was named by Safford (1869) for the type locality in Knox County, Tennessee. The Knox Group in Georgia includes three formations: the Copper Ridge Dolomite of Late Cambrian age, and the Chepultepec Dolomite and Longview Limestone, both of Early Ordovician age (Butts and Gildersleeve 1948:16). The Knox Group disects the province in several northeast/southwest bands consisting mainly of gray and brown dolomite.

Copper Ridge Dolomite. The Copper Ridge Dolomite consists of light- to medium-gray, thickly to massively bedded, cherty dolomite and brownish-gray asphaltic dolomite (Cressler 1970:13). The dolomite of the Copper Ridge is highly siliceous with large quantities of chert residuum. This chert occurs as layers and boulders varying in color from light to dark gray and black. It is generally hard and vitreous with a jagged surface (Cressler 1970:13). Heat alteration produces a darkened color and a high surface gloss. In Catoosa County, weathered Copper Ridge Dolomite yields a chert that is white or light gray and "dense, tough, and porcelaneous" (Cressler 1963:11).

Table III. CHARACTERISTICS OF RIDGE AND VALLEY CHERTS

Chert	Color	Inclusion	Luster	Texture
Conasauga	dark gray black tan	oölithic	dull	brittle
Knox Group				
Copper Ridge	light to dark gray, black		dull	hard and vitreous
	white, light gray		porcelaneous	dense, tough
Chepultepec	yellow, white	fossiliferous, oölithic rhombic cavities	dull	"worm-eaten," hard
Longview	reddish, white, gray		soft	hard brittle
Newala	black, gray, white, purple, white or smoky bands, drab or olive green		dull	hard vitreous
Armuchee	black, medium to dark gray	fossiliferous	dull	
Fort Payne	black, blue-gray, bluish white, white	fossiliferous (especially crinoids)	soft, high luster	smooth, fine-grained, may also be dense and brittle
Bangor	black, blue-gray	fossiliferous	soft, high luster	smooth, fine grained

Chepultepec Dolomite. The Chepultepec Dolomite consists of dolomite and a few limestone beds. Most of the dolomite is medium- to light gray ranging in thickness from several inches to more than 10 feet. Several layers of chert as much as 10 feet thick are present but chert in thin layers and nodules is more common (Cressler 1963:11).

The Chepultepec has chert which is soft, largely porous, and has the appearance of "worm-eaten wood" (Cressler 1964a:7, 1963:11). The chert contains many rhombic cavities from decayed dolomite crystals. Chert on the surface is yellow, white, or yellowish-white; soft and with a dull luster. Thin-bedded chert is relatively hard and shatters when struck into sharp, jagged pieces.

Fossils are fairly common. Oölitic chert with small white oölites is characteristic of Chepultepec chert (Cressler 1963:11).

Chert of the Chepultepec is commonly referred to by archaeologists as "rotten chert." It shatters easily and is generally too soft for artifact manufacture. It does not appear to have been extensively utilized by aboriginal populations.

Longview Limestone. The Longview Limestone consists of light- to medium-gray dolomite interbedded with aphanitic limestone. This limestone contains many layers and nodules of chert, and the residuum of the Longview is often littered with chunks and pieces of chert (Cressler 1963; 1970).

The layers and nodules of the Longview are reddish colored although white and gray chert is sometimes found. This chert tends to be hard and brittle. Weathered chert occurs as small, smooth pieces and nodules (Cressler 1963:11). Chert of the Longview have a soft luster, and upon heating appear bright orange to dark red with a high, smooth gloss.

The Knox Group, then, includes a variety of cherts which vary from red, yellow, and white to gray and black (Table III). The predominant color is black or black-gray sometimes banded with white or gray. Of the Knox Group, the Copper Ridge Dolomite chert commonly occurs in aboriginal sites and appears to have been more widely utilized than Chepultepec Dolomite or Longview Limestone chert. The locations of Knox Group chert are given in Appendix I.

Ordovician System

Newala Limstone. The Newala Limstone of Early Ordovician age was named for Newala Post Office, Shelby County, Alabama (Butts 1926: 95). The Newala is a rather thick-bedded limestone that forms the basal member of Chickamauga Limestone (Butts and Gildersleeve 1948: 19). The limestone varies from light gray to dark blue-gray and generally occurs in beds of one to four feet in thickness.

In places on weathered outcrops, chert occurs as widely scattered nodules or in thin discontinuous beds. The Newala chert is hard and vitreous and ranges in color from blue-gray to black with occasional white, pink, or purple (Table III) (Butts and Gildersleeve 1948:19). Many nodules are banded with concentric layers of white or smokey gray. When heated the black chert becomes lustrous; the pink and purple darken to red or orange. The banded cherts tend to shatter when heated. Chert from the Newala closely resembles Knox Group chert and is not easily identified out of context.

A list of some Newala chert deposits appears in Appendix I.

Middle Ordovician

Chickamauga Limestone. The Chickamauga Limestone was first described by Hayes (1890) for exposures along Chickamauga Creek, Chattanooga, Tennessee. The Chickamauga occurs in belts of blue to gray limestones with varying amounts of siltstone and claystone (Cressler 1963, 1964a). Chert in layers and nodules is present in some parts of the formation.

In the Rabbit Valley area chert occurs as brownish-black nodules of irregular shape embedded in the limestone (Allen and Lester 1957: 63). Near Chickamauga Creek, northeast of Kensington, black, ropy chert occurs in gray or blue Murfreesboro Limestone (Butts and Gildersleeve 1948:23). Thin bands of drab or olive green chert may be found within limestone boulders in the Lookout Plateau, Rabbit Valley, and Chickamauga area (Allen and Lester 1957:63-67, 90).

Chert of this period was not readily available and was sufficiently difficult to recover to prevent its common use as an aboriginal raw material. Deposits of Chickamauga Limestone chert are listed in Appendix I.

Devonian System

Armuchee Chert. The Armuchee Chert is named from the town of Armuchee, Georgia (Hayes 1902:3). The Frog Mountain Sandstone also of Devonian age (Hayes 1894:470) appears to be a clastic facies of the Armuchee Chert, and in many places includes beds and nodules of chert (Cressler 1970:36).

The Armuchee is a black or medium- to dark-gray, thinly bedded chert that is fossiliferous. The weathered exposures are generally nodular and are dark-gray and locally sandy and ferruginous (Cressler 1970:39). Newly exposed chert may have a reddish-brown surface. The Frog Mountain chert is often interbedded with quartzite and is a medium- to dark-gray in color. See Appendix I for a list of Armuchee Chert deposits.

Mississippian System

Fort Payne Chert. The Fort Payne Chert of Early Mississippian age was named by Smith for Fort Payne, Alabama (1890:155-156). The Fort Payne occupies narrow belts in the Ridge and Valley Province and covers wide areas along the flanks of the Horn, Johns, Turkey, Chattooga, Pigeon, and White Oak Mountains, and along Taylor Ridge. This chert forms ridges of low to moderate relief, and consists of about 200 feet of thin- to thick-bedded chert (Cressler 1970:41).

The Fort Payne Chert occurs in layers ranging from several inches to several feet in thickness as well as in residual or *in situ* nodules and blocks. This chert is distinguishable from Knox and Newala cherts by its numerous fossils, usually in the form of crinoids cemented together by silica (McCallie 1901:102).

The color of Fort Payne chert ranges from black to blue-gray, bluish white, and white; the blue-gray being the predominant color. The bedded chert is brittle, dense, gray to black in color and evenly bedded (Cressler 1963:16). The texture of Fort Payne Chert is smooth and fine grained with a soft high luster. When heated the chert becomes dark gray, or with intense heat a clear light red. It is easily worked, abundant, and occurs in areas where it can be readily quarried. It appears to have been the most extensively aboriginally utilized chert of the Ridge and Valley. Appendix I lists several Fort Payne Chert outcroppings.

Bangor Limestone. The Bangor Limestone was named by Smith (1890:155-157) for Bangor, Blount County, Alabama. It originally included all rocks of Mississippian age above Fort Payne Chert but has been restricted to limstone above the Hartselle Sandstone Member of the Floyd Shale (Cressler 1970:50). This Upper Mississippian formation contains nodular chert embedded in a blue-gray limestone. This chert is similar in color and texture to the Fort Payne, and is difficult to distinguish from it.

Summary

The chert resources of the Ridge and Valley Province are of Paleozoic Era deposition, primarily the Upper Cambrian, Ordovician and Mississippian Systems. These cherts occur sporadically near the southeastern edge of this province, increasing in abundance in the northwestern portion.

Ridge and Valley chert occurs as discontinuous beds within the Conasauga Formation, Knox Group, the Newala Limestone, the Armuchee Chert, and the Fort Payne Chert. They also occur as nodules within these formations and as redeposited nodules, blocks, and shatter, especially in the Conasauga formation.

The color of the Ridge and Valley chert is predominantly black, gray, or blue-gray. Red, yellow, green, blue-white, white, and purple are secondary colors. Heat treatment darkens the black or gray chert and increases the intensity of the other colors. As with all heat-altered cherts the luster is glossy.

Chert from the Conasauga, Knox, Newala, and Fort Payne was available in sufficient quantities for raw material exploitation by aboriginal populations. Chert of the Knox Group and the Fort Payne is abundant and appears to have been the chert most extensively utilized by prehistoric populations.

Coastal Plain Province

The remaining chert deposits of Georgia are sporadically distributed through the Coastal Plain Province. These cherts are

Tertiary Period formations, limited primarily to Eocene and Oligocene Epoch deposits. The major occurrences of Coastal Plain chert are in southwestern Georgia, west of the Flint River, along the Fall Line, and in southeastern Georgia along the Savannah River below Augusta (Fig. 3).

Chert in the Coastal Plain occurs as residual chert nodules and boulders or scattered along streams and ridges, or as outcropping beds. Table II lists the chert bearing formations of the Coastal Plain and their relative geologic ages.

One problem encountered in studying the stratigraphy of this province is lack of a uniform stratigraphic terminology describing the geology of the area. Although deposits of a given age may be found throughout the Coastal Plain, the lithology and the name assigned to these deposits varies. Generally the Coastal Plain is divided into the east Georgia section from the Savannah River to Twiggs or Bibb County and a western section from this area to the Chattacoochee River (Marsalis and Friddel 1975:25). Correlative South Carolina terminology is utilized in the eastern section; Alabama terms in the western Georgia section (Table IV). Each section is described separately under the appropriate Tertiary Epoch.

Paleocene Epoch

Clayton Formation. The Clayton Formation is a Paleocene formation occurring in a northeasterly band from Georgetown to Macon County (Fig. 3). Chert in the Clayton formation occurs as small yellow nodules or lumps associated with residual sand (Cooke 1943: 41). This chert generally occurs in areas where the Clayton limestones have been bleached out leaving residual chert.

Clayton formation chert is characteristically yellow to brown in color, is very brittle, and has a glossy, almost polished, luster. White and heavily patinated white chert is associated with the formation near the Flint River (Table V). Appendix I lists known Clayton chert sources.

TABLE IV. GEOLOGIC FORMATIONS OF THE COASTAL PLAIN, WESTERN AND EASTERN GEORGIA.

ERA	SYSTEM	SERIES	GROUP	WESTERN GEORGIA	CENTRAL AND EASTERN GEORGIA
CENOZOIC	QUATERNARY	Holocene		Alluvium	Alluvium Holocene shoreline complex
		Pleistocene		Terrace deposits	Shoreline complexes
	TERTIARY	Pliocene			Duplin Marl
		Miocene		Miccosukee Fm.	Miccosukee Fm.
				Hawthorn Fm.	Hawthorn Fm.
		Oligocene	Vicksburg	Suwannee limestone	Suwannee Limestone
		Eocene	Jackson	Ocala limestone	Irwinton sand, Sandersville limestone and Cooper Marl
					Twiggs clay
					Ocala limestone
				Moodys Branch Fm.	Clinchfield sand
			Claiborne	Lisbon Fm.	McBean Fm.
				Tallahatta Fm.	
			Wilcox	Hatchetigbee Fm.	
				Tuscahoma Fm.	
		Paleocene		Gravel creek sand	
			Midway	Clayton Fm.	

Eocene Epoch

The Eocene Epoch is subdivided into three stages (Table IV) among which the Claiborne and Jackson are chert producing. The Eocene formations abut the Fall Line (Fig. 3) and extend along the northern periphery of the Coastal Plain. The Claiborne and Jackson stages are discussed below.

Claiborne Stage. The Claiborne Stage consists of the Lisbon formation in western Georgia and the McBean Formation in central and eastern Georgia (Table II) (Marsalis and Friddel 1975:25). Masses of chert are common in both formations, predominately in the form of large nodules or blocks. They are compact, vitreous and are normally quite brittle. The chert ranges from red, yellow, cream, and blue to mottled or striped. This chert has a dull sheen or luster and is fossiliferous (Table V). Some contain so many fossil bodies that they are sandy or grainy in appearance and are called "silicified chert hash" (Sandy et al. 1966).

Heat altered chert of the Claiborne Stage is generally bright pink, dark red, or bright orange. They have a high gloss and commonly appear "spotted" due to the presence of fossils or casts which turn chalky white when heated.

Porous, tripoli-like flint, jasper, and chalcedony often co-occur with chert in these formations (Veatch and Stephenson 1911: 289). These do not appear to have been extensively utilized as an aboriginal raw material.

Jackson Stage. The Jackson Stage sediments are referred to as Ocala Limestone in western Georgia and as Twiggs Clay, Irwinton Sand, and "Cooper Marl" in eastern and central Georgia (Table II) (Marsalis and Friddel 1975:25). These later three are usually lumped as the Barnwell Sand, or Barnwell Formation (Huddleston et al 1974:2-8).

Chert of the Jackson Stage is found embedded in a limestone matrix or as residual nodules and blocks along rivers, streams, and ridges. Blocks and boulders of chert occur along the bluffs of the Flint River. Nodules and blocks of chert are also found in the Barnwell Sands, especially in Burke County where they may be found along the crests of low, rolling hills.

Table V. CHARACTERISTICS OF COASTAL PLAIN CHERTS

Chert	Color	Inclusion	Luster	Texture
Clayton Formation	yellow, brown heavily patinated white		glossy	brittle
Eocene Epoch				
Claiborne Stage	Red, yellow, cream, blue, mottling and striping	calcerous material	dull	compact, vitreous, brittle
Jackson Stage	black, tan, red-yellow, cream, white	calcerous material	dull	grainy
Oligocene Epoch	white	fossiliferous	dull	porous
	translucent, red, yellow, brown, brown or tan banding	fossiliferous	dull	dense, vitreous, brittle
Miocene Epoch	yellow, tan		dull	

The color of Jackson Stage chert ranges from black or tan to red, yellow, cream, and white. The Jackson Stage chert has a dull luster and is normally grainy; most nodules containing large inclusions of calcerous materials. Calcareous inclusions are fossiliferous with inclusions of corals and sponges. Upon heating Jackson Stage chert resembles Claiborne Stage chert in color (pink, dark red, or orange) and texture with many whitish fossil inclusions (Table V).

The cherts of the Claiborne and Jackson stages appear to have been extensively utilized by aboriginal populations throughout the state (Jones 1880). Intensive utilization of these resources is indicated by the presence at many Eocene outcroppings of chert cores and debitage. Appendix I lists Eocene chert resources.

Oligocene Epoch

Oligocene Epoch sediments of the Coastal Plain are confined primarily to a narrow, diagonal band running from the north-central Coastal Plain to the southern border of Georgia. Outcrops also occur along the Savannah River and near the Fall Line (Fig. 3). The limestone formations of this series are variously referred to as the Suwannee Limestone (Marsalis and Fridell 1975:25) and the Vicksburg Formation (Veatch and Stephenson 1911:307).

The chert of the Oligocene Epoch varies in character with geographic location. Chert in the outcrops along the Savannah River differs from chert in outcrops from the other localities and will be described separately.

Large boulders of chert outcrop along the Flint River in southwestern Georgia from Albany to Bainbridge. Weathered Oligocene soils in the area contain scattered chert fragments, and thin beds also occur in the soil horizon. Along the Savannah River, chert may be found along ridgetops, and blocks of chert outcrop in many places.

White porous chert is common wherever Oligocene Epoch rocks are the underlying geologic formation. The white color is due to the porosity of the rock. This chert is highly fossiliferous containing a variety of mollusks (Table V).

Other Oligocene Epoch chert especially in southwestern Georgia is dense, compact, vitreous, and brittle, ranging in color from translucent to red, yellow, or brown. Some brown or tan banded chert also occurs. Oligocene Epoch chert has few fossil inclusions and may have been formed by replacement of limestone (Veatch and Stephenson 1911:306-311). Heat altered chert is glossy and a dark red or deep brown. Jasper nodules may also occur in the Suwannee limestones.

A multitude of colors from dark gray, slate black, clear, cream, brown, white, and blue-white or mottled are common in the deposits near the Savannah River. The texture of this chert ranges from smooth to grainy. All are fossiliferous and have a soft, dull luster. Heat treatment produces a glossy surface sheen and a yellow to dark red color. The outer surfaces are usually a darker red than the inner core. The workability of this chert is excellent although a few nodules may be porous and of poor quality. Appendix I lists a number of Oligocene chert deposits.

Chattahoochee Formation. The Chattahoochee is an Oligocene Epoch formation exposed on the Ocmulgee River and near Briar Creek in Screven County. Many of the limestones in this formation have been replaced by fragmental beds of chert containing corals and other fossiliferous inclusions. The chert closely resembles that found in Suwannee limestone and cannot be separated from it except, perhaps, by a difference in the kinds of coral inclusions present (Cooke 1943: 24).

Miocene Epoch

Miocene chert occurs in the Tampa formation (Fig. 3, Table V). This chert is localized, occurring only in Grady, Mitchell, and Worth counties. Miocene Epoch chert is residual in nature and occurs as small nodules. Its color is yellow to tan and it has a dull sheen (Table V). Little additional information concerning Miocene chert is available. A list of chert sources is provided in Appendix I.

Summary

The range of variation is much greater among the cherts of the Coastal Plain Province than that of the Ridge and Valley. Much of the chert is residual making it difficult to assign to a particular epoch, and there is a close resemblance among all cherts from the Tertiary System. There is also an overlap in color variation and in fossil inclusions which confuses identification. The "silicifed chert hash" of the Eocene formations is perhaps the most readily identifiable Coastal Plain chert, although others may be identified utilizing a type collection.

Coastal Plain chert was extensively utilized by prehistoric populations from the Archaic (7000 B.C.) through the Mississippian (A.D. 1500) periods. The Eocene and Oligocene Epochs appear to have provided the bulk of Coastal Plain chert raw materials but other sources were sporadically utilized. These aspects of exploitation will be discussed in later sections of this report.

This section has attempted to delineate the chert resources of Georgia and briefly describe their related lithological characteristics and period of deposition. Those qualitative aspects of each specific deposit, that may permit their identification have been defined.

The following sections address the quantitative aspects of chert identification and present the results of one such analysis meant to provide a baseline of information for the study of Georgia cherts. These sections are followed by the qualitative analysis of chert utilization by prehistoric populations in central Georgia, specifically Green, Morgan, and Putnam Counties, and a discussion of future application and research.

II. QUANTITATIVE ANALYSIS OF GEORGIA CHERT

Introduction

The visual identification of cherts may be accomplished to some degree utilizing the criteria established in Section I of this report. However, there is a great deal of overlap among deposits in many of these visual criteria hampering identification.

The fact that ambiguities do exist in the identification of chert does not mean that the qualitative approach should be totally abandoned. Visual attributes are often distinctive and can be utilized in formulating and answering certain broad archaeological questions. However, other attributes must also be determined and utilized to reinforce or modify decisions based on visual criteria. Preferably, these attributes are objectively determined and quantifiable.

A number of techniques are available for the quantitative analysis of chert. These include microscopic and trace element analyses, including X-ray and optical omission spectroscopy and neutron activation analysis (For a complete discussion of these techniques see Luedtke 1976:109-116).

Although no comparison of these techniques is available, the majority of analysts utilize neutron activation analysis. The archaeometric literature contains numerous articles discussing the application of this technique, its procedures, standards, and equipment (cf. Aspinall and Feather 1972; de Bruin et al 1972; Luedtke 1976). This technique was selected for the preliminary analysis of Georgia chert.

Sampling Geologic Chert Sources

A major problem encountered was the selection and sampling of chert localities. The aim was to devise a practical field strategy allowing for the collection of a maximum number of definitive samples.

Major chert localities were identified using geologic maps, Field Trip guides, available geologic literature, and information supplied by geologists. Sampling loci were selected based on ease of access, chert type, and deposit size.

Chert sampling was conducted using the following guidelines:

1) Chert samples were taken at the initial appearance of any deposit or layer within a deposit.
2) Chert was collected at irregular intervals of 10 to 100 meters within each deposit or bed.
3) Samples of unusual chert in any deposit were collected.
4) Evidence of quarrying activities was recorded.

Samples were taken from deposits of major chert types in the Coastal Plain and Ridge and Valley provinces. Samples for analysis were selected from this collection (Fig. 5, Table VI).

Sample Preparation

Samples for analysis were obtained by first removing several large flakes from each sample. These were removed by direct percussion using a quartzite hammerstone. Flakes with no cortical material were selected and wrapped in one mil polyethylene. This package was placed on a cement surface and hit several times to produce chippage. The resultant chips were checked for contamination occurring during breakage and were then placed in 2 ml plastic vials. Chips were handled with teflon tipped forceps.

When ready for analysis each chip was washed in distilled water, air dried, and weighed. Weights ranged from 98 - 101 mg. Each sample was placed in a polyethylene vial and thermally sealed. Three U.S.G.S. standards AGV-1, W-1 and DTS-1 were weighed and placed in similar vials to be used as absolute standards.

Irradiation

Samples were irradiated for seven hours at a flux at 1.1×10^{14} n/cm^2 - sec. Samples were allowed to decay for 15 days to reduce the interference caused by Na--24 (T 1/2 + 15 hr), before they were counted.

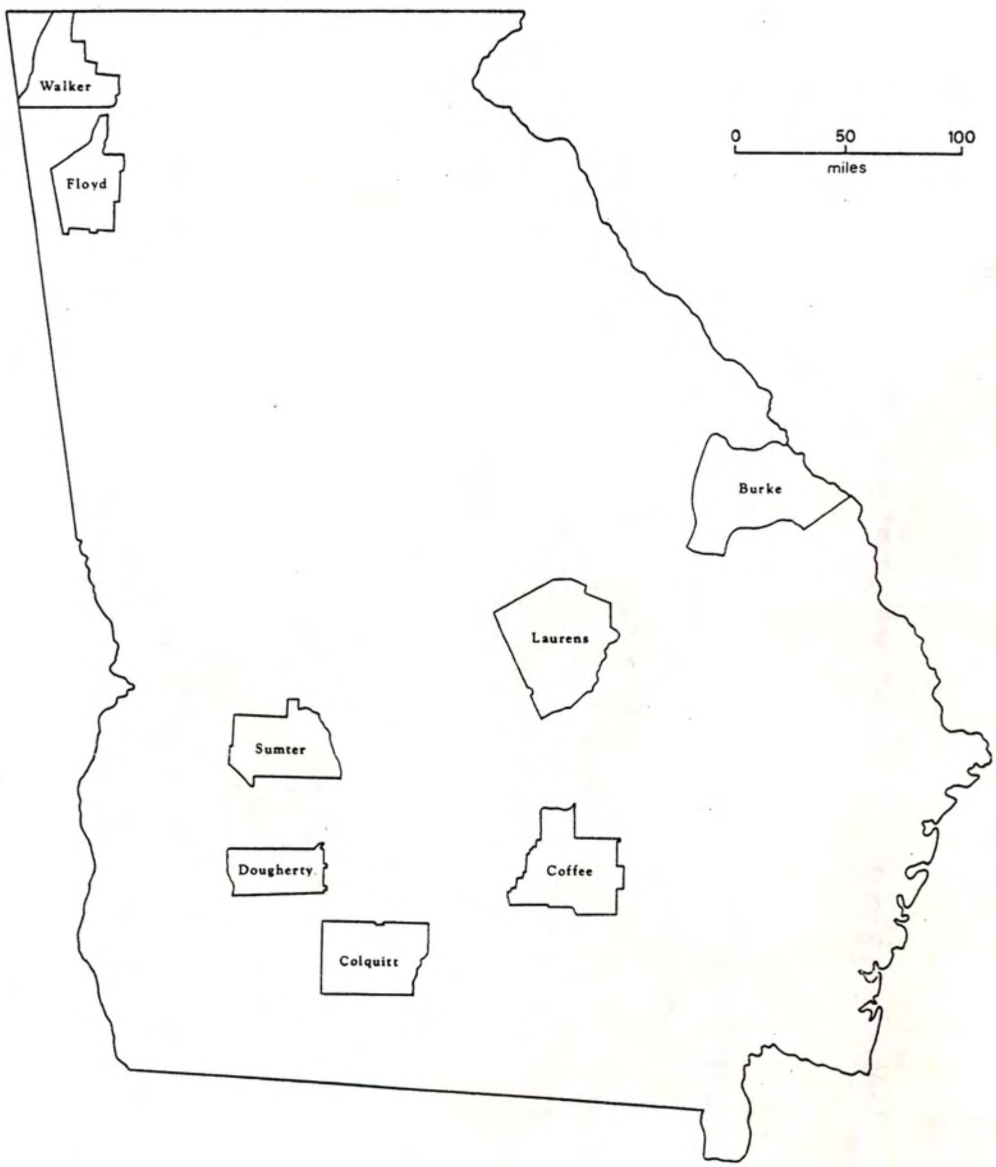

Figure 5. County Localities of Chert Samples.

Table VI

Chert Samples

Sample No.	Chert Type	Location	Color
1	Mississippian	Cooper Ridge	Gray
2	Fort Payne	Taylor Ridge	Blue Gray
3	Fort Payne	Simms Ridge	Blue Gray
4	Fort Payne	Pigeon Mountain	Black
5	Fort Payne	Pigeon Mountain	White
6	Fort Payne	Pigeon Mountain	Pink
7	Newala	Kensington	Black
8	Newala	Kensington	White
10	Oligocene Epoch	Albany	Brown
11	Fort Payne	Floyd County	Blue Gray
12	Barnwell Sand	Burke County, Site 1	Honey and Red
13	Barnwell Sand	Burke County, Site 1	Blue White
14	Barnwell Sand	Burke County, Site 1	Red Banded Blue
15	Oligocene Epoch	Albany	Honey
17	Barnwell Sand	Burke County, Site 2	Blue White
18	Barnwell Sand	Burke County, Site 2	Honey
19	Barnwell Sand	Burke County, Site 1	Pink
20	Barnwell Sand	Burke County, Site 1	White
21	Barnwell Sand	Burke County, Jenkins	White
22	Barnwell Sand	Burke County, Jenkins	Brown
23	Barnwell Sand	Burke County, Site 1	White, Red spots
24	Barnwell Sand	Burke County, Site 1	Brown
25	Barnwell Sand	Burke County, Site 1	Red, Heat Altered
26	Barnwell Sand	Burke County, Site 1	White
27	Barnwell Sand	Burke County, Site 1	Brown
28	Oligocene Epoch	Laurens County	Brown
29	Oligocene Epoch	Laurens County	White
30	Knox Group	Peavine Ridge	Black
31	Eocene Epoch	Sumter County	Brown
32	Eocene Epoch	Sumter County	Pink
33	Miocene Epoch	Colquitt County	Red
34	Miocene Epoch	Coffee County	White

Analysis

The samples were counted for 10 minutes using an 18% lithium drifted germanium {Ge(Li)} gamma-ray detector and a 4096 channel computer based pulse height analyzer.

The software used scanned the resulting spectra, locating peaks and printing out peak area and energy. It does not print out background for each peak so minimum detectable concentration for each element of interest was not determined. Calculations of the average interference free detection limit (at the 95% confidence level) was utilized (Table VII). The actual detection limit for a given sample may be 10 to 100 times greater than that listed in Table VII.

Results

Analysis of cherts from different sources. As can be seen from Table VIII there is a considerable concentration range for some elements, but for other elements these ranges are less varied and more overlapping. Extreme values do occur, but these appear to be somewhat consistent with other chert samples from the same locality.

Correlated Data

Examination of the data from different sources reveal that, in keeping with other geologic material, the rare earth concentrations in chert are highly correlated with one another. A 90% or higher correlation coefficient is common in spite of the varied range of absolute concentration for individual elements. Some correlation was also found among the ferrous elements detected, with a correlation of 99% existing between Iron and Cobalt.

Treatment of Data

The interpretation of data in Table VIII presents some difficulties due to the large range of individual values and the small number of samples analyzed. Distributional maps plotted for ppm and log (ppm) do not in many cases reflect a normal distribution. Positive skewness is indicated for many values. When samples are separated into group localities the distributions more closely approximate a

TABLE VII

Detection Limits Neutron Activation Analysis

Samarium (Sm)	0.015
Europium (Eu)	0.004
Hafnium (Hf)	0.031
Cerium (Ce)	0.19
Calcium (Ca)	60.
Chromium (Cr)	0.053
Thorium (Th)	0.016
Uranium (U)	0.16
Ytterbium (Yb)	0.023
Gold (Au)	0.01 (ppb)
Antimony (Sb)	0.020
Silver (Ag)	0.001
Zirconium (Zr)	6.1
Scandium (Sc)	0.002
Iron (Fe)	7.0
Cobolt (Co)	0.01
Lanthanum (La)	0.04

Average interference free detection limit given in ppm except as noted.

Table VIII

Concentration of Elements Present in Chert Samples from Georgia*

Sample No.	Sm	Eu	Hf	Ce	Ca	U	Th	Cr	Yb	Sn	Zr	Sc	Fe	Co	La
1	1.68	0.158	0.169	9.67	0.307	15.50	0.445	8.44	nd	5.650	129.00	0.520	0.057	0.422	8.32
2	1.24	0.140	0.430	7.20	nd	nd	1.600	10.10	0.220	nd	nd	0.800	0.178	nd	5.94
3	nd	0.044	0.370	4.91	0.211	4.53	0.619	8.14	nd	0.640	34.60	0.530	0.078	0.469	3.83
4	6.31	1.290	3.340	82.90	0.367	51.00	12.900	103.00	4.210	12.700	377.00	13.200	7.910	90.500	84.30
5	0.41	0.051	0.022	nd	nd	nd	0.139	3.66	0.266	0.220	nd	0.281	0.188	0.825	3.76
6	4.96	0.529	nd	7.16	nd	nd	0.594	7.77	2.680	nd	nd	0.811	0.188	2.180	22.10
7	nd	nd	nd	1.21	nd	2.32	nd	nd	nd	0.303	18.20	0.026	0.011	0.185	1.23
8	nd	nd	0.109	0.61	nd	0.35	0.203	1.63	nd	nd	nd	0.118	0.022	nd	nd
10	3.30	0.420	nd	7.12	nd	1.60	0.304	7.26	0.907	0.835	nd	2.440	0.085	nd	5.11
11	nd	0.034	0.151	2.37	0.455	2.46	0.518	10.20	nd	0.729	nd	0.452	0.080	0.565	2.22
12	nd	0.131	nd	4.11	nd	7.86	nd	5.13	0.411	0.271	nd	0.095	0.013	nd	4.44
13	0.17	0.031	nd	nd	nd	nd	nd	2.21	nd	nd	nd	1.525	nd	nd	nd
14	0.57	0.110	nd	3.90	nd	1.58	0.168	5.20	0.637	nd	nd	0.151	0.758	2.530	3.72
15	0.20	0.052	nd	0.50	nd	nd	0.211	1.81	0.378	nd	nd	0.102	0.044	nd	nd
17	nd	nd	nd	3.86	nd	7.44	nd	6.02	0.117	nd	29.60	0.123	0.045	nd	4.37
18	nd	nd	nd	4.57	nd	2.23	0.231	6.65	0.120	nd	nd	0.180	0.050	nd	3.21
19	nd	0.019	nd	0.96	nd	0.35	nd	2.45	nd	0.095	nd	0.044	0.047	nd	1.12

Sample No.	Sm	Eu	Hf	Ce	Ca	U	Th	Cr	Yb	Sn	Zr	Sc	Fe	Co	La
20	1.83	0.433	nd	5.41	nd	4.38	nd	5.97	5.530	0.143	35.50	0.102	0.018	nd	4.10
21	0.21	0.037	nd	1.13	nd	0.77	0.303	6.09	0.203	0.119	nd	0.314	nd	nd	1.23
22	nd	0.018	0.080	1.98	nd	2.00	0.170	3.76	0.131	0.409	nd	0.147	0.019	nd	2.58
23	1.72	0.033	nd	2.11	nd	1.26	nd	15.80	2.960	0.289	nd	0.127	0.158	1.400	3.00
24	0.45	0.101	nd	2.84	nd	2.30	nd	7.50	0.469	0.324	nd	0.177	0.317	0.370	4.41
25	0.25	0.034	nd	nd	nd	nd	0.281	2.61	0.300	0.356	nd	0.165	0.607	0.414	1.22
26	nd	0.014	nd	0.72	nd	0.65	0.065	2.47	nd	0.092	nd	0.087	0.016	nd	nd
27	1.96	0.408	nd	2.51	nd	1.15	nd	4.80	2.870	nd	nd	0.069	0.016	nd	2.41
28	0.98	0.101	nd	2.60	nd	nd	1.780	9.41	0.247	nd	nd	0.262	0.019	nd	3.58
29	nd	nd	nd	nd	nd	nd	nd	2.36	nd	0.380	nd	0.049	0.519	11.300	nd
30	nd	0.113	nd	9.47	nd	2.01	nd	3.55	nd	0.912	79.20	0.134	0.020	nd	14.20
31	0.50	0.064	nd	1.61	nd	nd	0.019	3.07	0.176	nd	nd	0.121	0.017	nd	1.41
32	20.00	2.600	nd	56.60	nd	2.01	nd	18.40	11.500	nd	104.00	0.150	0.102	nd	114.00
33.	1.35	0.144	nd	3.76	nd	nd	2.680	16.30	0.284	nd	nd	0.411	0.030	nd	4.81
34	27.60	3.400	nd	67.50	nd	2.56	nd	21.90	13.500	0.341	150.00	0.195	0.105	nd	119.00

* All values given in ppm. except Fe (%).

normal distribution. Other researchers have found that for geologic material, especially chert, the logarithmic set shows a Gaussian variation (Al Kital 1969; Harbottle 1970; de Bruin 1972; Aspinal 1972, Luedtke 1978). Since the differences between the two distributions are marginal it was decided to evaluate mean values of concentrations for multi-sample localities directly. Actual concentrations were utilized for single sample localities.

In reference to Table VIII several localities may be identified by their high or low levels of concentration of certain elements. Generally, higher element concentrations are found among chert of the Ridge and Valley, lower levels among those of the Coastal Plain (Figs. 6 and 7).

Newala and Knox Dolomite chert contain undetectable amounts of Sm and Yb, while Fort Payne chert has fairly high concentrations of La and undetermined amounts of Hf (Fig. 6). High levels of concentrations of Cr, La, and Zr are characteristic of chert from the southwestern Coastal Plain. Zirconiun was undetectable in Burke County chert.

Figure 6 is a graph of mean element concentration for Ridge and Valley chert localities. Fort Payne chert contains consistently higher element concentration levels than the other localities. Knox dolomite chert also has fairly high concentrations. Both chert types are alike in texture, luster, and dark gray or black coloration, and would be expected to be somewhat similar. Newala chert has lower concentrations overlapping those of the Coastal Plain.

Coastal Plain cherts tend to cluster near the lower element concentration levels (Fig. 7). An exception is the Sumter and Douglas counties' chert which has high Zr and La concentrations overlapping Ridge and Valley chert localities.

These graphs, although descriptive in nature, suggest that differences in element concentrations do exist between the Ridge and Valley and Coastal Plain chert.

Burke County Chert. Fourteen chert samples were taken from three quarry sites in Burke County (Fig. 8). These samples provide some insights into the homogeneity of chert from a general locality

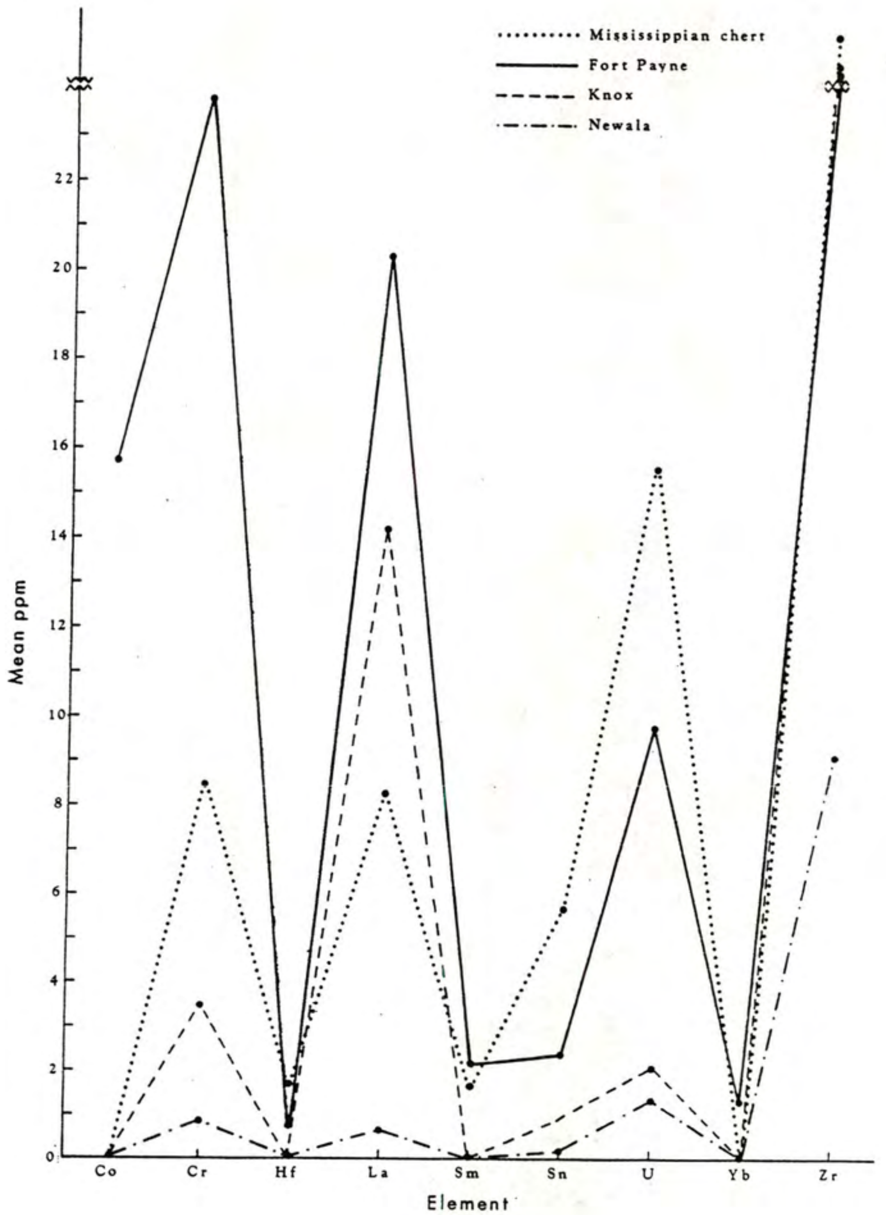

Figure 6. Trace Element Concentrations of Ridge and Valley Chert

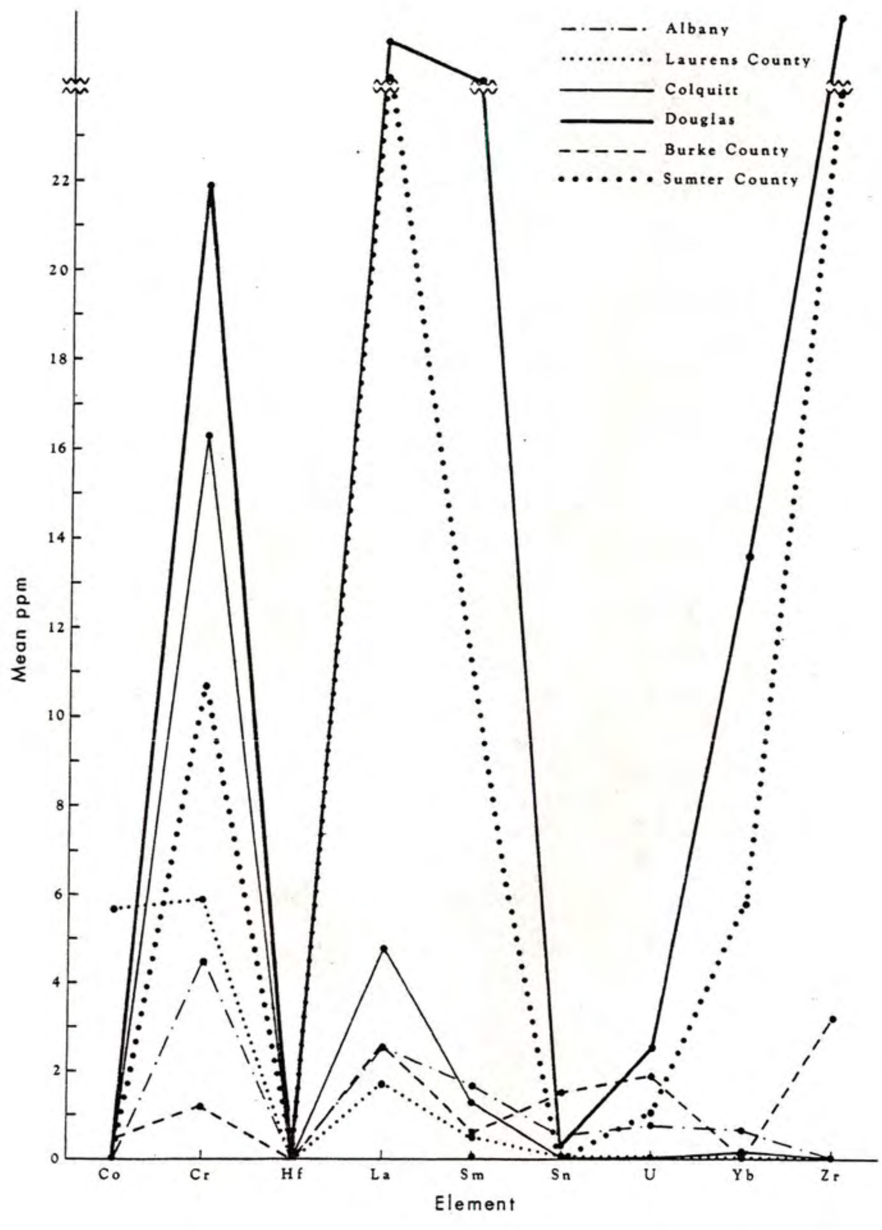

Figure 7. Trace Element Concentrations of Coastal Plain Chert.

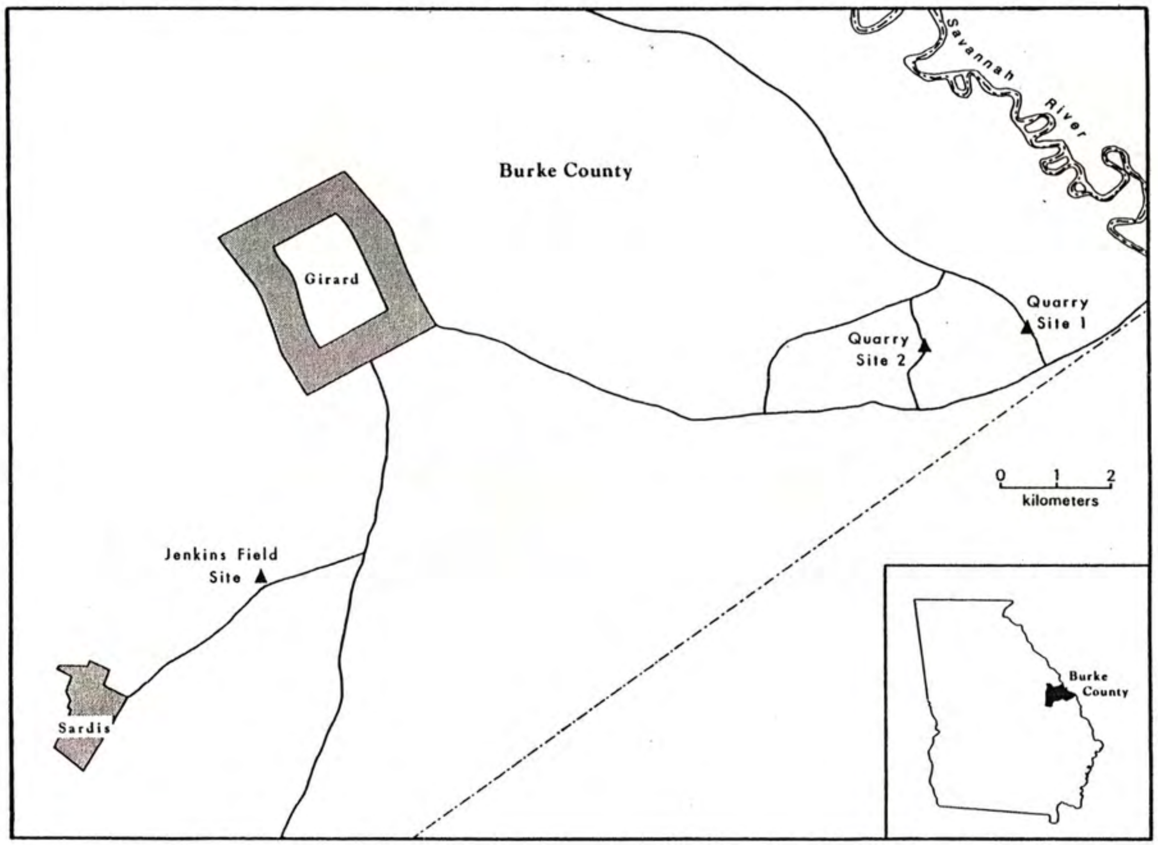

Figure 8. Location of Burke County Quarry Sites.

and differences that might arise due to color variation. All chert are from Barnwell Sand deposits and should be fairly homogeneous geologically. Color and locality are given in Table VI.

All values appear to be within the same order of magnitude and do not vary to any great extent. These values appear to be more homogeneous than those from other areas. Analysis of additional samples from other localities should indicate homogeneity within localities and specific chert types (See Luedtke 1978).

There is very little difference in the three localities. Jenkins field has a lower concentration of Ce than the other quarries, and quarry 2 has a high Zr concentration. All other elemental concentrations are similar in these localities.

Color differences do not appear to have any great effect on concentrations. Ferrous concentrations are present in brown and red colored chert but not in quantities appreciably higher than others. The highest Fe concentrations in samples 14 and 25 are from pink or red banded chert, but other red banded chert has lower concentrations.

One heat altered sample, 25 was included. It is not significantly different from other samples from quarry site 1.

Statistical Analysis

The statistical technique discriminant analysis was employed to test the validity of the chert localities. Discriminant analysis is a technique used in multivariate statistical analysis to facilitate the classification of unknown objects within previously defined groups. In the present case we have a number of defined chert localities. Discriminant analysis can be applied to this original data to test the a priori classification of which they were based, and suggest re-classification of group subsets.

Discriminant Analysis

The discriminant analysis used was from the Statistical Package for the Social Sciences (Klecka 1975). The selection criteria was the direct method in which all the independent variables are entered concurrently into the analysis. The discriminant functions are created directly from the entire set of independent variables.

A number of different groupings of localities were run using this analysis (Table IX). The result of the seven group analysis indicated that 87.5% of the known cases were correctly classified by the seven group solution. 90.63% were classified using a three group solution and 93.75% utilizing two regional groups.

This suggests that given the small sample size a regional grouping is a more appropriate treatment of data, than a further subdivision into more specific localities. Variables 14 and 24 both from Burke County were the only samples incorrectly classified by the two group solution. This may be partially attributed to relatively high concentrations of Fe and Co in these two samples.

General Conclusions

The technique of Neutron activation analysis has been shown to be both sufficiently accurate and reproducible, and demonstrates that variation exists in the trace element content of chert from different localities.

The existence of distinct patterns may be explained in terms of environmental deposition. The Ridge and Valley chert was deposited during the Paleozoic; the Coastal Plain during the Tertiary Period.

In general it is felt that further analysis of chert resources from Georgia will enable the differentiation of localities, and of specific formations such as Fort Payne, Knox Group, and Barnwell Sand.

Although no artifacts were analyzed, it appears that a general regional assignment to source localities would be possible utilizing the analyzed chert resource data group and utilizing discriminant analysis to assign these unknowns to specific regional groups.

The solution of 87.5% correct case assignment for a more local 7 group discriminant analysis, suggests that the groups utilized are logical and with increasing sample size might prove useful.

In summary, the preliminary analysis suggests that groups of chert may be distinguished utilizing the technique of neutron activation analysis. There are many other localities in Georgia where chert resources are available for aboriginal use. Future studies

Table IX

Groupings Utilized in Discriminant Function

Two Group Sample

Group 1	Group 2
Sample No. 1-8, 11, 30	Sample No. 10, 12-29, 31-34.

Three Group Sample

Group 1	Group 2
Sample No. 10, 15, 28, 29, 31-34	Sample No. 12-14, 17-27

Group 3

Sample No. 1-8, 11, 30

Seven Group Sample

Group 1	Group 2
Sample No. 28,29	Sample No. 10, 15, 31-34
Group 3	Group 4
Sample No. 7, 8	Sample No. 30
Group 5	Group 6
Sample No. 12-14, 17-27	Sample No. 2-6, 11

Group 7

Sample No. 1

should include these additional chert types. Artifacts such as those discussed in Section III of this report should be analyzed, to compare the qualitative findings with the quantitative analysis.

III. ABORIGINAL CHERT UTILIZATION: A TEST CASE

Introduction

Prior to the selection of chert artifacts for trace element analysis a prehistoric population(s) exhibiting the utilization of a number of chert types had to be found. A number of criteria were utilized in selecting the study area. First, the area had to exhibit a long temporal occupation and have an established chronology. Second, the area had to contain few, if any, indigenous chert deposits. And, third, the area selected had to have been extensively surveyed archaeologically.

The area selected was the Wallace Reservoir area in Green, Morgan, and Putnam counties of central Georgia (Fig. 9). The Wallace Reservoir is located in the Washington Slope district of the southern Piedmont physiographic section (Clark 1976) of central Georgia, an area corresponding to the crystalline geologic province. Chert deposits are not common in this area, although an outcropping of cryptocrystalline metasediment, "agate," was recently reported (Paul Fish, Personal Communication). The area is located about halfway between the chert deposits of the Ridge and Valley and those of the eastern Coastal Plain (Fig. 9). Environmental and landform barriers prohibitive to chert acquisition in either area are minimal. The nearest Ridge and Valley chert deposits are approximately 257 kilometers from the reservoir and those of the Coastal Plain 190 kilometers.

The Wallace Reservoir area includes the Oconee River and its various tributaries and encompasses a number of environmental zones from alluvial bottomlands to hardwood, deciduous uplands. Extensive archaeological reconnaissance, beginning in 1973 has identified over 1000 sites with temporal occupations ranging from the Early Archaic (7000 B.C.) to the Late Mississippian (A.D. 1500).

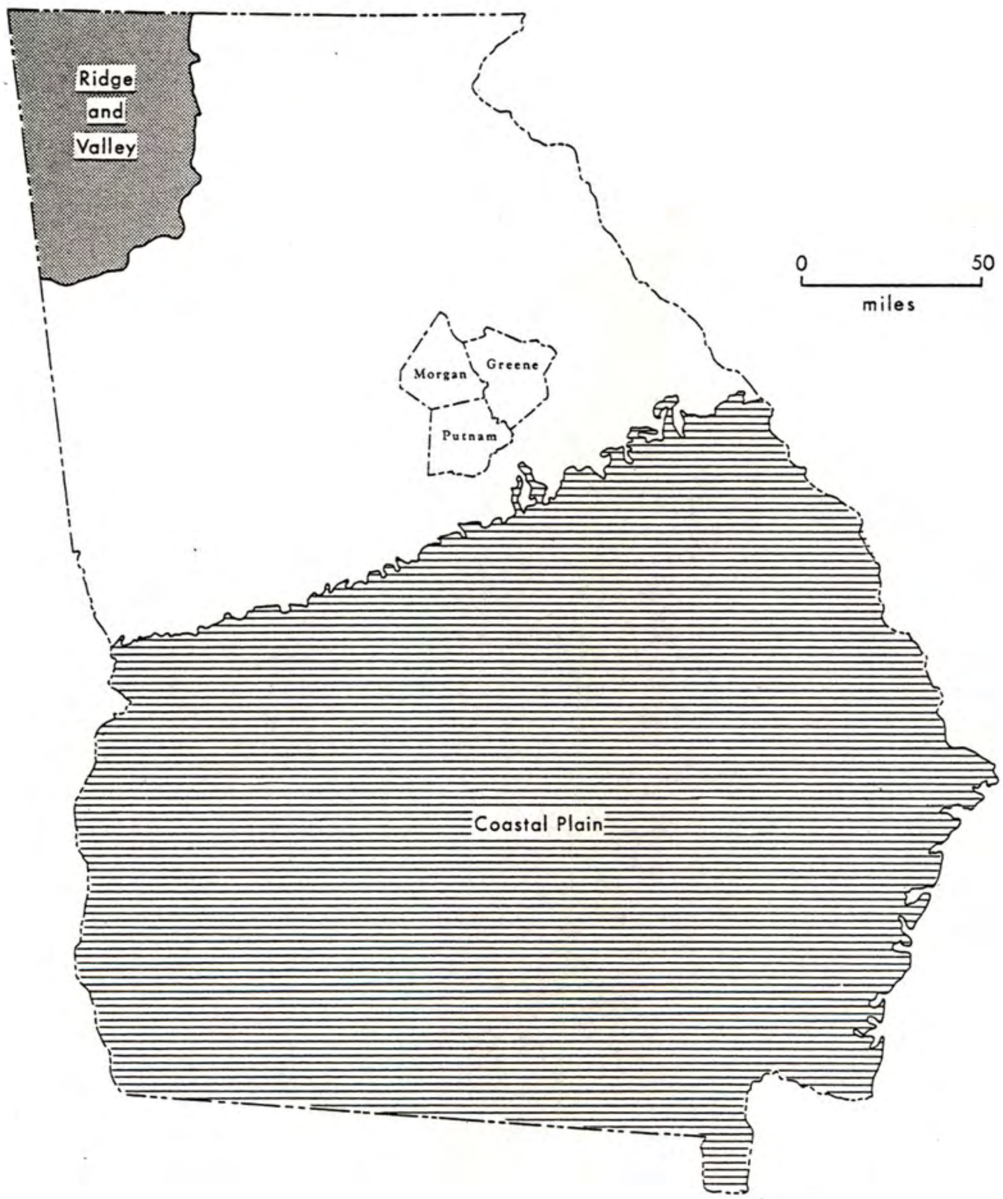

Figure 9. Wallace Reservoir Study Area.

This study did not utilize all located sites. Only those chert bearing sites located by the 1974/1975 survey were examined. A list of these sites and their temporal periods are given in Table X. Individual site descriptions may be found in the 1974 survey report (DePratter 1976). Figures 10-11 show the sites located by this survey.

Chert Identification

A total of 38 single and multicomponent sites contained chert artifacts or debitage. The chert artifact types ranged from projectile points and scrapers to debitage and debris. Criteria such as color, luster, texture, and inclusions established in Section I were utilized in the qualitative identification of these cherts. In many cases patination made identification impossible, and some fragments were too small for consideration. Table XI lists each site and the types of chert present. No attempt was made to discriminate between flakes and debris or to identify flake type.

Description of Chert Utilization

Several general conclusions are apparent. First, very little chert was recovered from Woodland Period sites. Quartz and quartzite materials are common at Woodland sites and it appears to have been the major lithic raw material utilized during this period. Secondly, there appears to have been a shift in chert resource utilization from the Archaic through the Mississippian Periods. Coastal Plain cherts appear more frequently in the earlier sites; Ridge and Valley cherts in later periods.

The major Coastal Plain cherts represented are Burke and Screven county chert from the eastern edge of the Coastal Plain and those from the Albany area. Ridge and Valley deposits include Ft. Payne, Knox Group, Newala, and a few occurrences of Conasauga chert. A single flake of Duck River, Tennessee chert is the only exotic chert recovered.

Although a variety of colors occur, several color patterns predominate. Heat treated orange and rose cherts are common, as

TABLE X

Sites utilized in this report.

Site Number	Archaeological Period
Ge 5	Mississippian
Ge 10	Archaic
Ge 25	Archaic/Lamar
Ge 26	Archaic
Ge 34	Middle Woodland/Lamar
Ge 101	Early Mississippian
Ge 108	Lamar
Ge 131	Middle Archaic/Lamar
Ge 135	Archaic
Ge 141	Middle Archaic
Ge 142	Early Archaic
Ge 148	Lamar
Ge 153	Lamar
Ge 162	Multicomponent
Ge 173	Late Woodland/Early Mississippian
Ge 176	Lamar
Ge 185	Middle Archaic
Ge 190	Lamar
Hn 102	Middle Archaic
Hn 103	Middle Archaic
Mg 43	Archaic/Lamar
Mg 44	Archaic
Mg 73	Archaic/Lamar
Mg 89	Lamar
Mg 94	Archaic/Lamar
Mg 91/92	Lamar
Pm 121	Middle Archaic
Pm 126	Early Archaic/Lamar
Pm 131	Archaic
Pm 143	Middle Archaic/Lamar
Pm 200	Middle Archaic
Pm 201	Early Mississippian
Pm 202	Lamar
Pm 205	Middle Archaic/Lamar
Pm 207	Multicomponent
Pm 208	Archaic/Early Mississippian/Late Mississippian
Pm 213	Archaic
Pm 224	Archaic
Pm 226	Lamar
Pm 228	Early Mississippian/Late Mississippian
Pm 235	Archaic

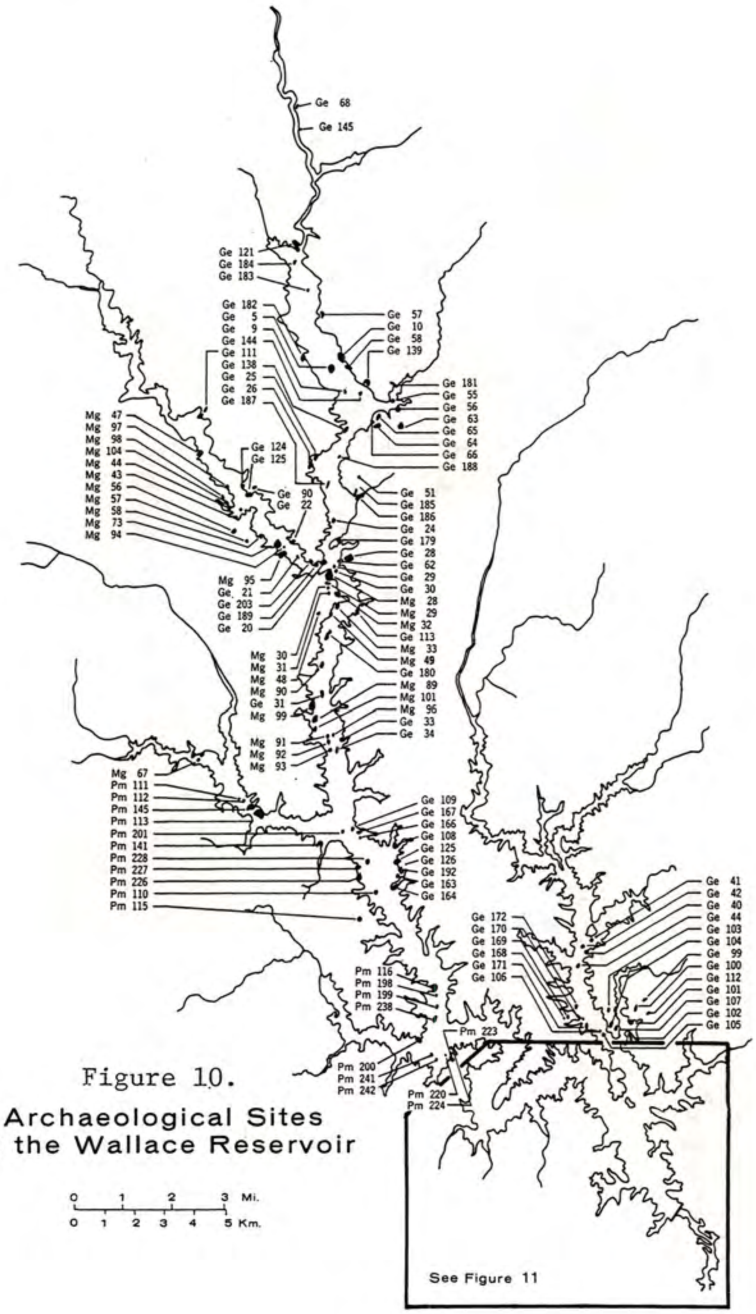

Figure 10.

Archaeological Sites in the Wallace Reservoir

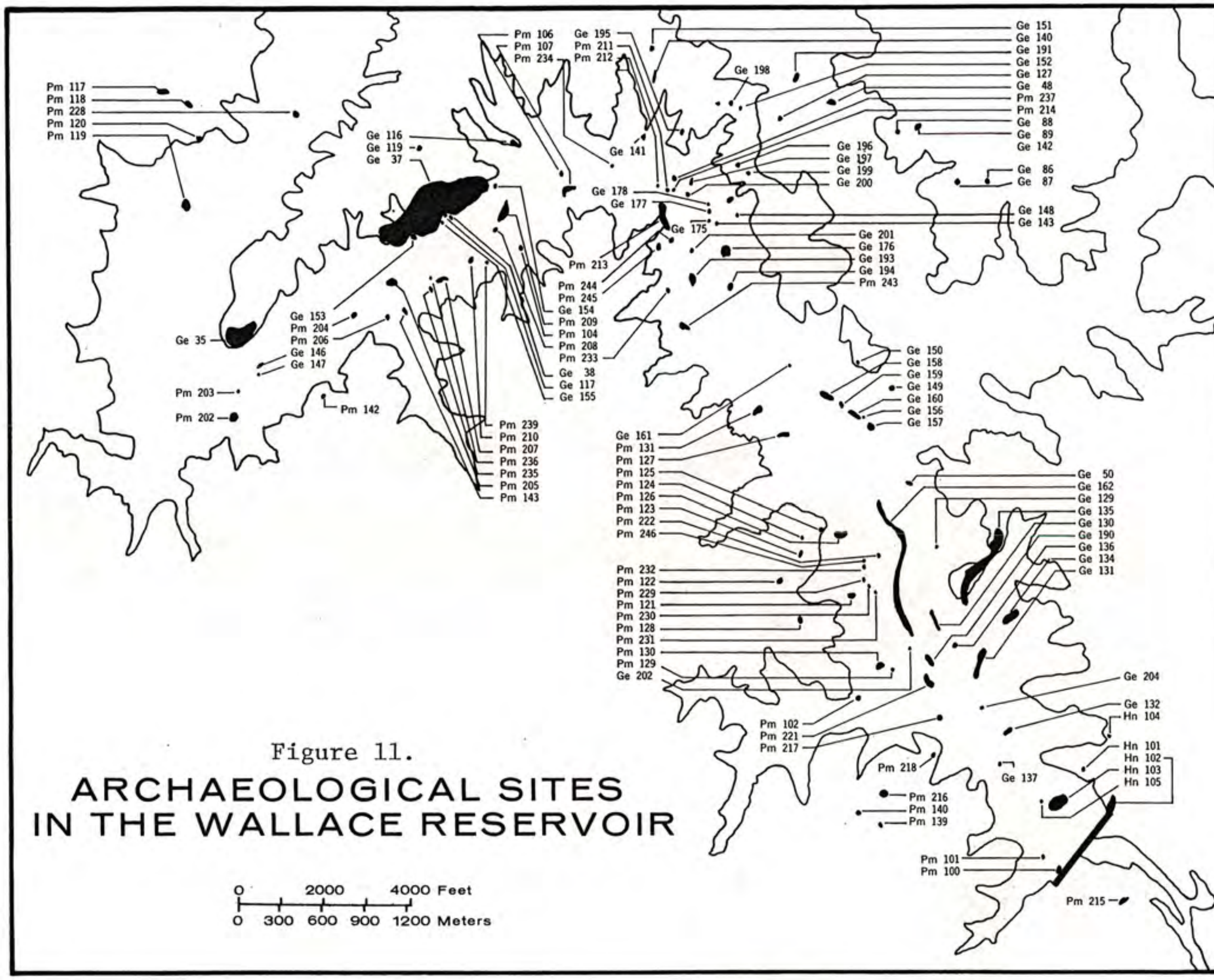

Figure 11.

ARCHAEOLOGICAL SITES IN THE WALLACE RESERVOIR

TABLE XI

Probable location of archaeological chert

9Ge5

Number	Probable Source Location
2	Ft. Payne
1	Green Knox
1	Knox
2	Coastal Plain, Burke County
3	Coastal Plain, heat treated
1	Patinated
1	Unidentified

9Ge10

Number	Probable Source Location
17	Ft. Payne
5	Knox
1	Knox, heat treated
4	Conasauga
16	Coastal Plain, Burke County
2	Coastal Plain, unidentified white
7	Dark Red Albany
1	Coastal Plain patinated
15	Coastal Plain, heat treated
25	Patinated
65	Unidentified fragments

9Ge26

Number	Probable Source Location
1	Coastal Plain, heat treated
3	Patinated
4	Unidentified

Table XI (contd).

9Ge34

Number	Probable Source Location
1	Ft. Payne
3	Coastal Plain, Burke or Screven counties
4	Coastal Plain, evidence of smoking and spalling, unidentified area
1	Coastal Plain, heat treated
2	Patinated

9Ge101

Number	Probable Source Location
1	Ft. Payne
1	Knox
2	Red Knox
3	Coastal Plain, Laurens County, or southwestern
7	Coastal Plain, Burke County
3	Coastal Plain, heat treated
9	Patinated (Coastal Plain)
16	Unidentified

9Ge108

Number	Probable Source Location
1	Heat treated, spalled, probably Coastal Plain
2	Unidentified

Table XI (contd).

9Ge131

Number	Probable Source Location
1	Knox
15	Coastal Plain, Laurens County
4	Albany Red
4	Coastal Plain, heat treated
11	Patinated

9Ge135

Number	Probable Source Location
2	Albany Red
7	Heat treated, unidentified
4	Unidentified

9Ge141

Number	Probable Source Location
2	Newala, white
1	Knox
1	Knox or Newala, heat treated
6	Coastal Plain
1	Coastal Plain, heat treated
3	Unidentified

Table XI (contd).

9Ge142

Number	Probable Source Location
2	Ft. Payne
5	Newala
6	Knox
1	Coastal Plain, probably southwest
1	Coastal Plain, Albany
1	Coastal Plain, unidentified
5	Coastal Plain, heat treated
12	Patinated
10	Unidentified

9Ge148

Number	Probable Source Location
1	Ft. Payne
4	Patinated, Coastal Plain
1	Unidentified

9Ge153

Number	Probable Source Location
4	Ft. Payne
1	Conasauga
26	Coastal Plain, heat treated
2	Patinated

Table XI (contd).

9Ge162

Number	Probable Source Location
14	Ft. Payne
5	Ft. Payne, heat treated
3	Conasauga
7	Knox
8	Coastal Plain, Burke County
12	Coastal Plain, heat treated
171	Patinated

9Ge173

Number	Probable Source Location
1	Coastal Plain
2	Unidentified

9Ge185

Number	Probable Source Location
5	Green Knox
3	Coastal Plain, Albany
8	Patinated

9Ge190

Number	Probable Source Location
1	Newala
	Knox
	Unidentified

Table XI (contd).

9Pm121

Number	Probable Source Location
4	Ft. Payne
1	Newala
7	Knox
2	Coastal Plain, Burke County
1	Coastal Plain, Albany
14	Coastal Plain, heat treated
20	Patinated

9Pm126

Number	Probable Source Location
5	Ft. Payne
1	Knox
1	Conasauga
4	Unidentified, heat treated
12	Patinated
1	Unidentified

9Pm131

Number	Probable Source Location
2	Coastal Plain
4	Unidentified

Table XI (contd).

9Pm143

Number	Probable Source Location
1	Ft. Payne
1	Knox
7	Coastal Plain, Burke County
2	Albany Red
1	Coastal Plain, Albany
6	Coastal Plain, heat treated
3	Patinated
40	Unidentified

9Pm200

Number	Probable Source Location
4	Coastal Plain, heat treated, Burke County
2	Unidentified

9Pm202

Number	Probable Source Location
1	Albany Red
4	Coastal Plain
9	Patinated

Table XI (contd).

9Pm205

Number	Probable Source Location
10	Ft. Payne
7	Knox
1	Coastal Plain, Albany
6	Coastal Plain, Burke County
7	Coastal Plain
8	Patinated
25	Unidentified

9Pm207

Number	Probable Source Location
3	Knox
3	Coastal Plain, Burke County
3	Patinated
92	Unidentified fragments or cortex

9Pm213

Number	Probable Source Location
5	Ft. Payne
10	Knox
3	Newala
1	Conasauga
2	Coastal Plain, Burke County
1	Albany Red
11	Coastal Plain, heat treated
30	Patinated

Table XI (contd).

9Pm224

Number	Probable Source Location
2	Coastal Plain heat treated, Burke County

9Pm226

Number	Probable Source Location
1	Newala/Knox
2	Patinated

9Pm228

Number	Probable Source Location
3	Ft. Payne, heat treated
1	Knox
1	Albany Red
1	Coastal Plain
8	Coastal Plain, heat treated, Burke County
2	Coastal Plain, heat treated
2	Unidentified

9Pm235

Number	Probable Source Location
1	Coastal Plain, heat treated, Burke County
12	Patinated
1	Unidentified

Table XI (contd).

9Mg43

Number	Probable Source Location
1	Knox
8	Coastal Plain, Burke County
2	Coastal Plain, heat treated

9Mg44

Number	Probable Source Location
1	Albany Red
4	Coastal Plain, heat treated

9Mg73

Number	Probable Source Location
2	Newala
2	Coastal Plain, heat treated
2	Unidentified

9Mg89

Number	Probable Source Location
1	Albany Red
2	Coastal Plain, Burke County
1	Coastal Plain, heated

Table XI (contd).

9Mg92

Number	Probable Source Location
1	Coastal Plain, Burke County
3	Unidentified

9Mg94

Number	Probable Source Location
1	Ft. Payne, heat treated
1	Patinated
3	Unidentified

Table XI (contd).

9Hn102

Number	Probable Source Location
1	Knox
1	Green Knox
2	Coastal Plain, Burke County
3	Coastal Plain, heat treated
5	Unidentified

9Hn103

Number	Probable Source Location
1	Ft. Payne
1	Ft. Payne, heat treated
3	Green Knox
2	Coastal Plain, Burke County
1	Coastal Plain
1	Coastal Plain, heat treated
13	Unidentified

are tan, blue-gray, and black. A dull, dark red color is also found.

Over 50 percent of the chert had been heat altered to some extent. Application of this process to both Coastal Plain and Ridge and Valley cherts is suggested. More Coastal Plain chert shows alteration than those of the Ridge and Valley, probably due to the excellent workability of unaltered Ridge and Valley chert.

Another trend, discussed later, is suggested in the type and size of flakes from each chert province. Coastal Plain chert tends to be larger and often contain cortical material. Ridge and Valley chert flakes are generally small, and do not have cortical material.

After initial qualitative observation the sites were divided into temporal periods for more detailed consideration. Trends in utilization at single component sites were considered first. Multicomponent site data were then compared with these data.

Archaic (7000 B.C. - 1000 B.C.)

Early Archaic. The Archaic Period is represented by 21 single or multi-component sites (Figs. 12-13). The majority of the sites are Middle Archaic (5000 B.C. - 3000 B.C.) or have simply been labeled Archaic due to a lack of diagnostic artifacts. Table XI lists these Archaic sites and gives the suggested sources for their chert artifacts.

Two Early Archaic (7000 B.C. - 5000 B.C.) sites were identified by the survey; one of which (9Pm126) was multicomponent. The single component site, 9Ge142, contained cherts from both the Ridge and Valley and Coastal Plain provinces (Table XI). A large number of cherts from this site were heavily patinated and unidentifiable. Ft. Payne, Knox, Conasauga, and Coastal Plain cherts were recovered from site 126.

Site 142 is located in the southern section of the reservoir; site 126 the mid-section (Fig. 12, 13). It was expected that these sites, particularly 142 would contain Bibb and Laurens county or other southwestern Coastal Plain cherts, due to their proximity to the area, but this was not the case. The representation of a wide

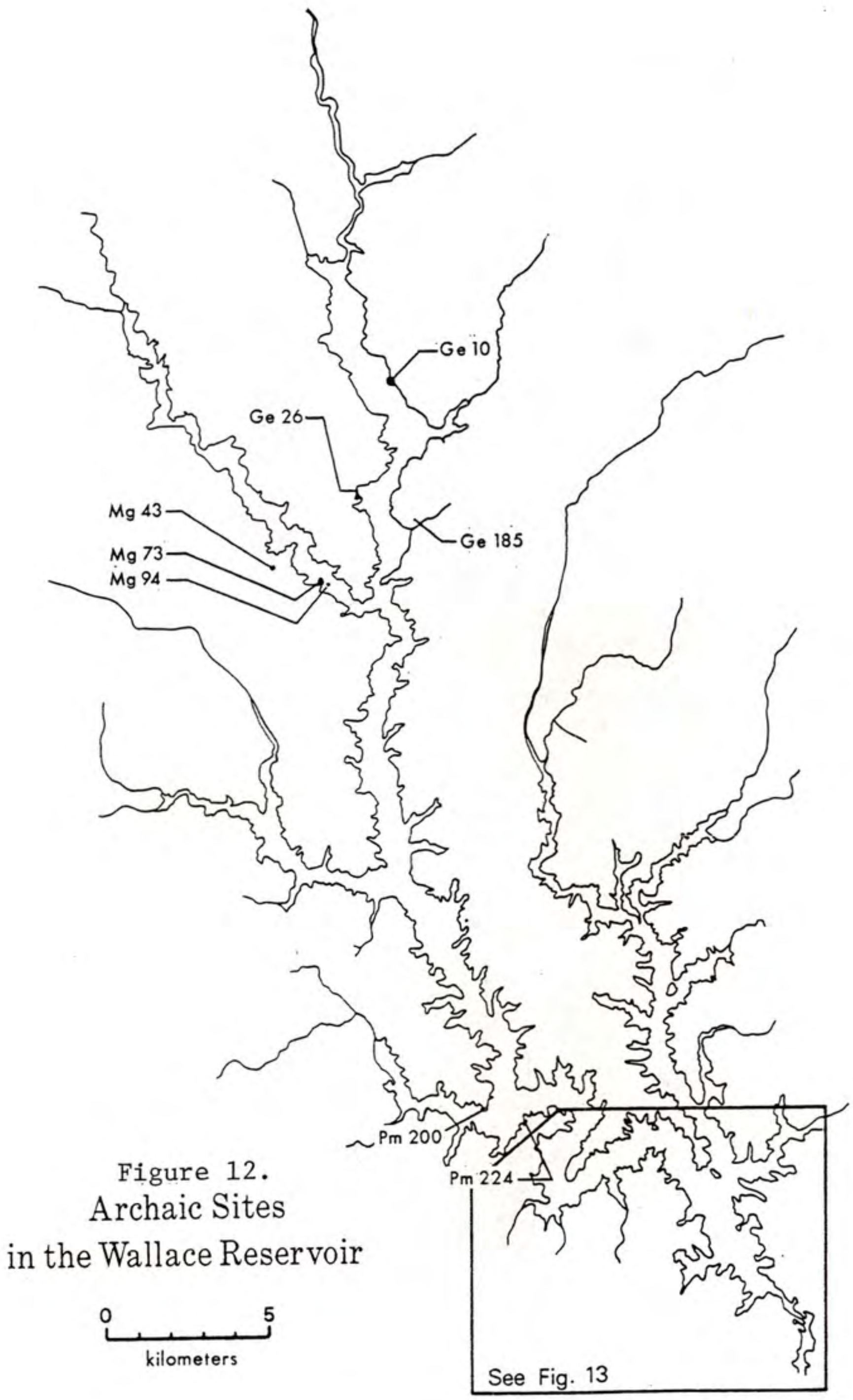

Figure 12.
Archaic Sites
in the Wallace Reservoir

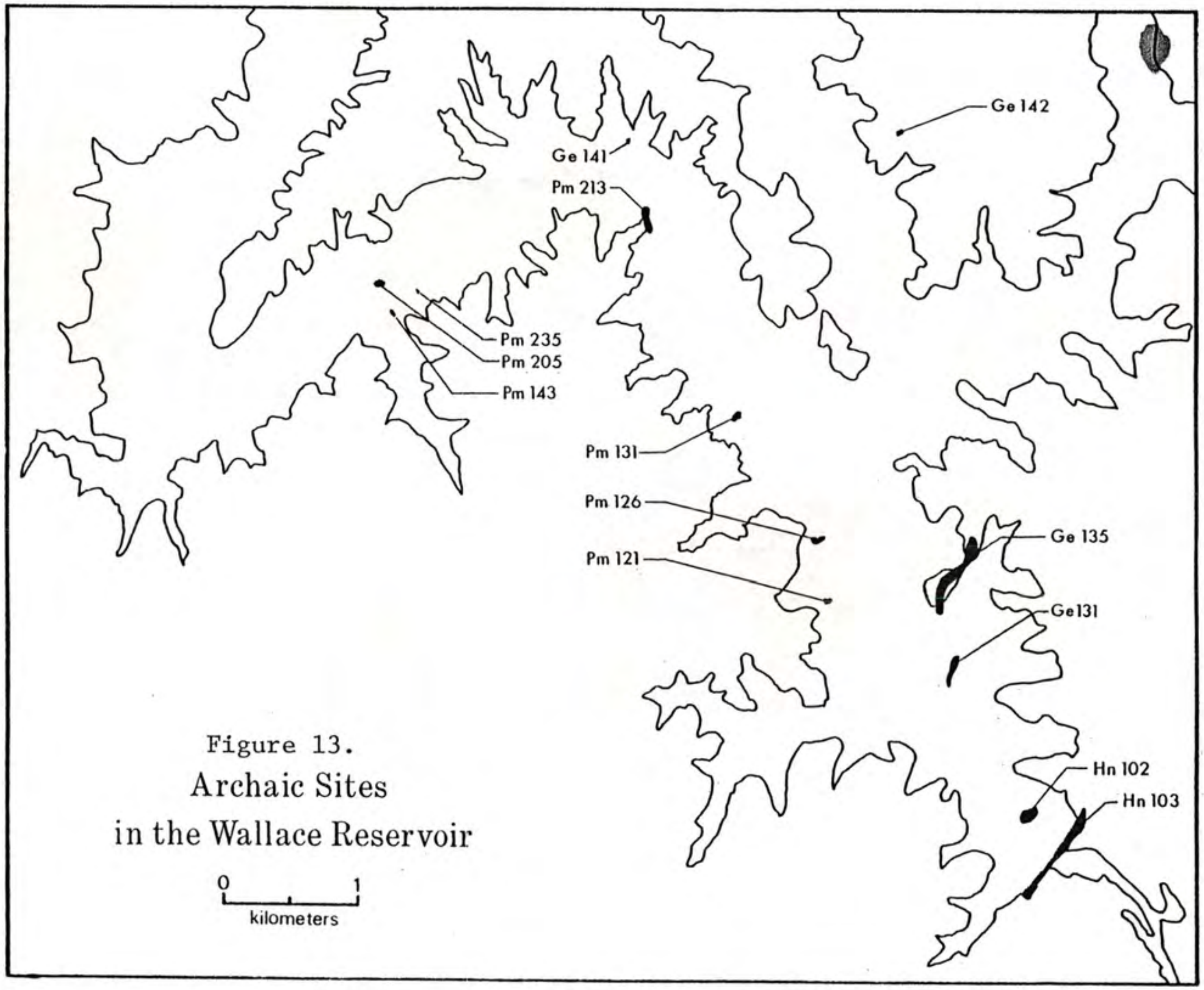

Figure 13.
Archaic Sites
in the Wallace Reservoir

variety of cherts suggests access to a number of deposits. Acquisition of these resources may have been direct as a result of seasonal movement by the group, to the areas in question.

Middle Archaic

Seven single component and two multicomponent sites were reported for the Middle Archaic Period (5000 B.C. - 3000 B.C.). Seven of these sites are located in the southern part of the reservoir; one near the mid-point; and one at the northern end of the area (Figs. 12, 13). Table XI lists these sites and their probable chert source area.

The majority (80%) of the identifiable cherts from these sites represent Coastal Plain varieties. A few flakes of Ridge and Valley cherts of the Ft. Payne type do occur, along with a type of olive green chert similar to Knox Group but fossiliferous. The Coastal Plain chert varieties have been qualitatively assigned to Burke and Laurens counties, and areas in southwestern Georgia around Albany. Some cherts were heat treated, but most were unaltered.

The Burke County cherts are the most numerous cherts at Middle Archaic sites. These sources are less than 200 kilometers from the reservoir area and represent the closest exploitable resource. The small number of Ridge and Valley cherts suggests that contact with this area was decreasing while ties or direct access to Coastal Plain cherts remained the same or increased.

Undifferentiated Archaic. Those sites with undifferentiated Archaic material were labeled Archaic by the original survey. Six of the undifferentiated sites were single component Archaic sites while four possessed Lamar components. These sites are found scattered throughout the reservoir area (Figs. 12, 13). Cherts from both the Ridge and Valley (Conasauga, Ft. Payne, and Knox), and the Coastal Plain (Burke and possibly Laurens counties) were identified.

Summary

Cherts from both the Coastal Plain and Ridge and Valley Provinces were identified at Archaic sites. Although a trend in resource exploitation can be detected throughout the Archaic Period the majority of the identifiable cherts are Coastal Plain varieties. The principal areas of exploitation were Burke and Laurens counties and the southwestern area around Albany for the Coastal Plain Province. Ridge and Valley cherts include Ft. Payne, Knox, Newala, and Conasauga.

Heat treatment of chert during the Archaic period appears minimal. Both Ridge and Valley and Coastal Plain chert shows evidence of heat alteration. It does not appear, however, to have been extensively utilized by Archaic populations in the Wallace Reservoir.

A shift in chert exploitation or resource preference is suggested for the Archaic Period. Identified Early Archaic chert was obtained from both the Coastal Plain and Ridge and Valley. This suggests the area was in contact with both Provinces or included these areas in its seasonal subsistence round.

During the Middle Archaic chert resource exploitation of the Ridge and Valley deposits declines. Exploitation centers on the Coastal Plain, particularly the Burke County, Briar Creek area near the South Carolina border. This increasing dependence on Coastal Plain resources may be attributed to several factors. Ties with exploitation areas to the north may have been severed by groups living near or controlling these deposits. Changing settlement systems may focus on utilization of other resources in the Burke County area and secondarily chert. Social or exchange ties with these groups may be stronger and more important to maintain for as yet unknown reasons.

The southwestern Coastal Plain cherts also begin to be utilized in increasing amounts suggesting developing ties with this area. The Oconee River probably provided an efficient communication route to groups living further to the south.

Those sites represented as "Archaic" exhibit wide ranging exploitative patterns. Generally, Ridge and Valley cherts cluster in the northern Archaic sites decreasing in quantity in more southern sites. Geographic proximity by the northern most Archaic sites may be a factor in determining chert procurement.

To summarize, the Archaic population's preference for an exploitation of chert resources appears to have changed gradually throughout the period. The Archaic period is often described as one of increasing regional differentiation (Caldwell 1958; Winters 1976) with a reliance on local resources. Since chert was not locally available, the Archaic population's selection of a chert source may have been influenced by such factors as territorial boundaries, socio-political ties, exchange relationships, seasonal round, and other factors (Caldwell 1958:11-14; Gould 1969:110-121). Personal or group preference may also have been involved as well as ceremonial or tribal custom (See for example Gould 1969).

The distance involved in transporting chert may not have been the critical factor in source selection (Gould 1969). Chert manipulation and "workability" may have influenced preference, but the selection of Ridge and Valley chert by the more northerly sites and the Coastal Plains area by sites in the southern portion of the reservoir suggests that distance was, in some ways, a limiting factor. Wilmsen (1974) noted that Paleo-Indian peoples at the Lindenmeier site, exhibited differing chert preferences, reflecting differences in seasonal round, some families moving north of the site, some to the south. In an earlier report, Wilmsen (1973) notes three possible sources of lithic procurement have been identified. The average distance of these sources is 500 km.

The distance of sites in the Wallace Reservoir to chert source areas has been noted. The approximate distance from a central point in the Reservoir to the Ridge and Valley is 257 km, to the southeastern Coastal Plain 241 km, and to the southwestern Coastal Plain is 450 km. The ease of accessibility to all source areas is approximately equal, although movement in the Coastal Plain may have been facilitated by the penoplane and the presence of large linking river systems, such as the Oconee/Ocmulgee. As discussed nongeographic factors such as territorial or political boundaries probably influenced and directed access to available sources.

Woodland Period (1000 B.C. - A.D. 900)

Toward the end of the Late Archaic and throughout most of the Woodland Period there is a change in lithic resource preference. Chert is no longer a major lithic raw material. Quartz, quartzite, and rhyolite are the predominant lithic materials. At the present time there is no single explanation for this change in resource preference. It may represent an increasing tendency toward regionalization (Caldwell 1958:34-45), or it may suggest changing functional usages in tools requiring the use of a mineral with different lithological characteristics (an unlikely assumption).

It might also be suggested that increasing regional variation in some way reflected increasing territorial identities that limited access to chert resources and forced reliance on indigenous lithic materials. Although undocumentable the suggested change in subsistence from hunting and gathering to incipient horticulture may have limited mobility and fostered changes in the importance of hunting. Changing attitudes toward hunting might affect ideas concerning lithic utilization. Time factors and distance may have also become more important considerations.

A few cherts are found at Woodland period sites. These include both Ft. Payne and Coastal Plain chert (Table XI). It is possible that the small quantity of chert found represents reutilization of earlier period debitage.

Those Woodland period sites utilizing chert are in the northern part of the Reservoir (Figs. 14, 15). However, location does not appear to be an affector of lithic procurement and utilization.

Mississippian Period (A.D. 900 - A.D. 1550)

The majority of Mississippian period sites reported by the survey belong to the Lamar Phase (A.D. 1400 - A.D. 1550) (Figs. 14, 15). Two sites 9GE101 and 9Pm228 contain Early Mississippian (A.D. 900 - A.D. 1000) components. The preliminary qualitative chert analysis for the Mississippian period is given in Table X.

The Early Mississippian sites contain Ft. Payne and Coastal Plain (primarily Burke County) chert. Both areas are equally represented and for the first time there is some evidence of heat treatment being applied to Ridge and Valley cherts.

The Lamar Phase sites can be grouped geographically into a northern and southern cluster (Figs. 14, 15). The predominant chert

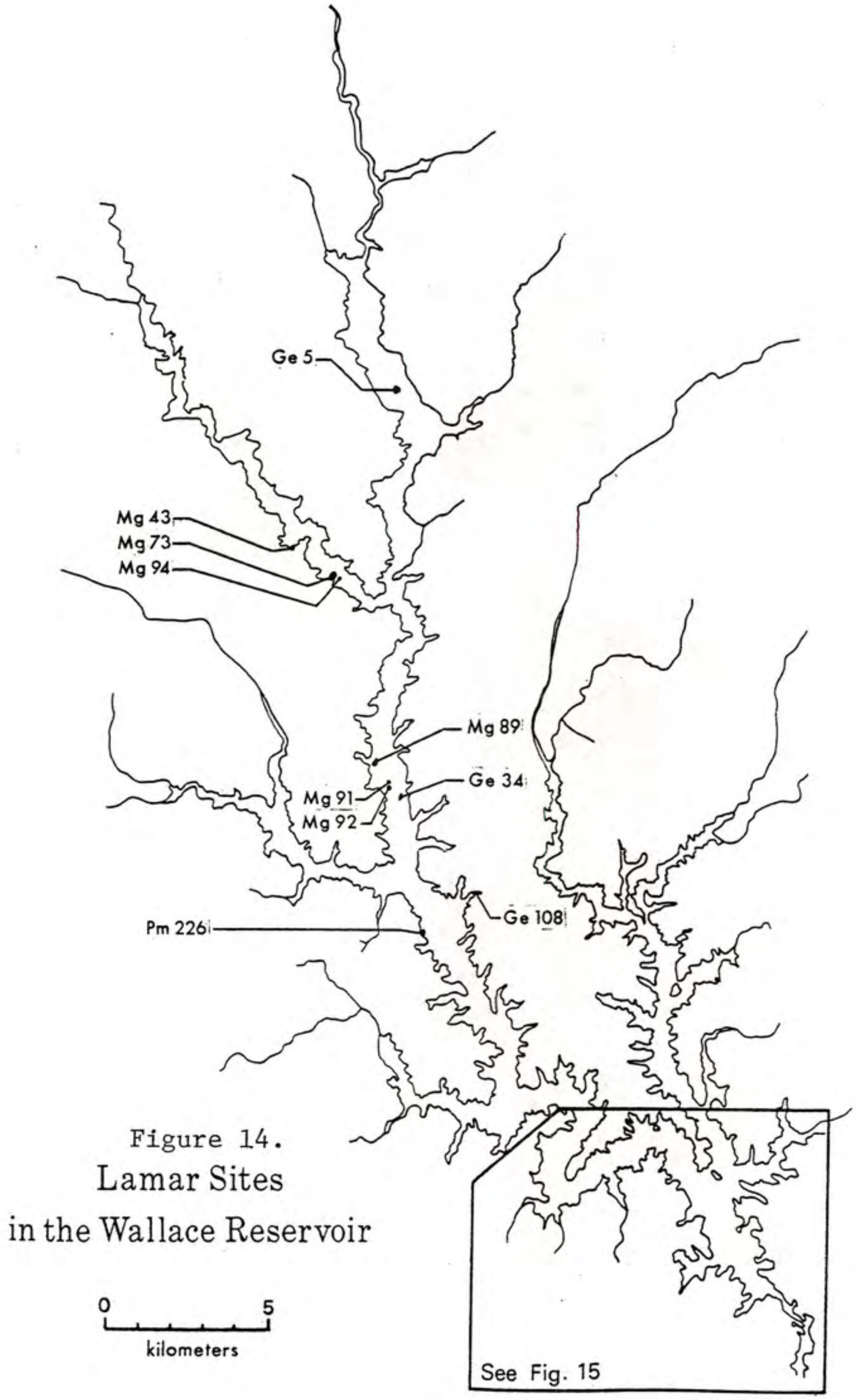

Figure 14.
Lamar Sites
in the Wallace Reservoir

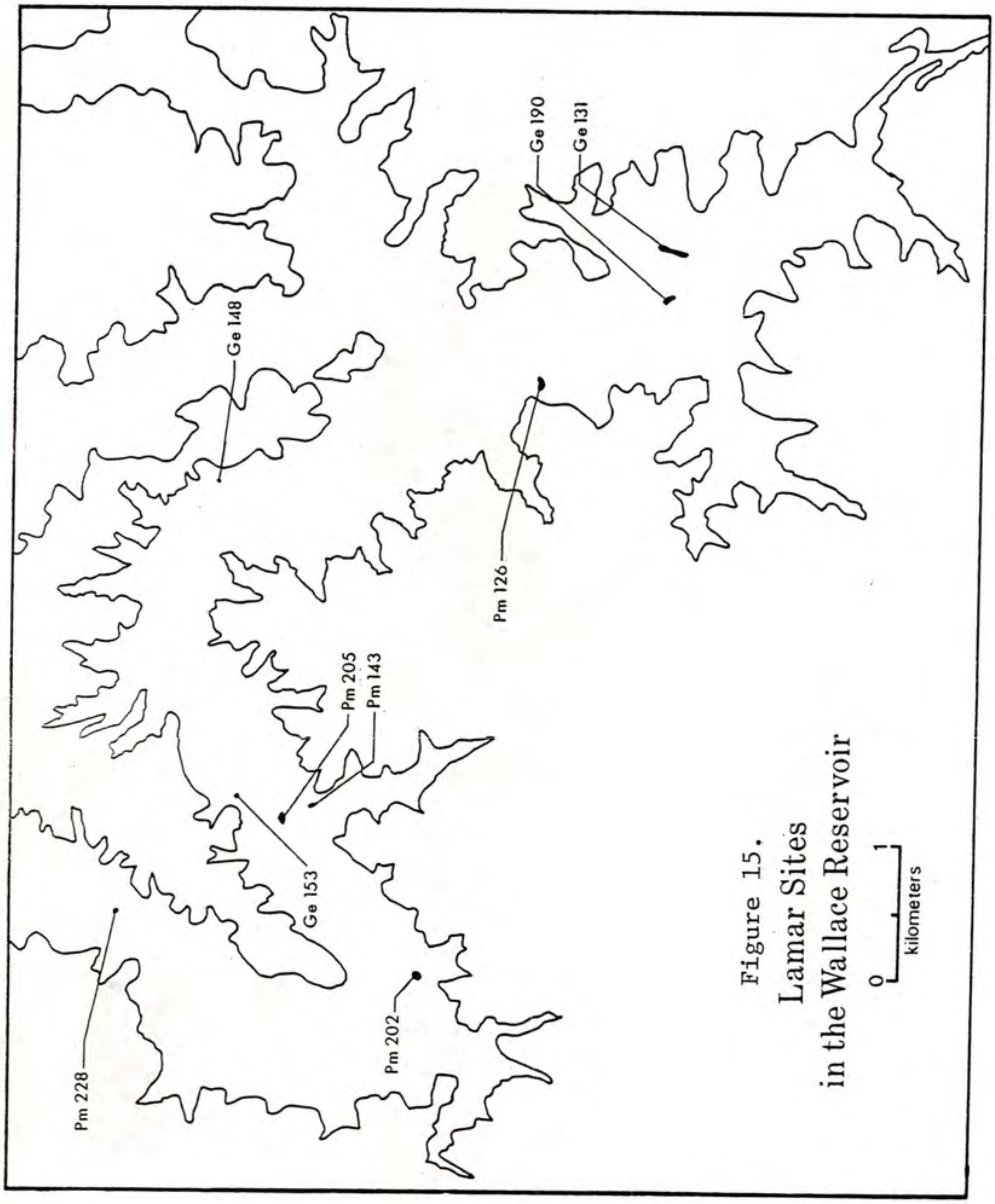

Figure 15.
Lamar Sites
in the Wallace Reservoir

represented at these sites are from the Ridge and Valley: Ft. Payne, Knox, and a variety of green Knox, and from the Coastal Plain: Burke County and areas near Albany, Georgia. There is some tendency for coastal Plain chert to be found in the southern cluster of sites.

The majority (>80%) of the Mississippian period chert is from Ridge and Valley deposits. These cherts are found in abundance in northern sites, decreasing in frequency in southernmost sites in the reservoir. Ft. Payne is most abundant with Knox and Green Knox found in lesser quantities. The Ft. Payne chert may have been selected for its finer texture and excellent "workability." A small proportion of the Ft. Payne and Knox flakes exhibit some degree of heat alteration. Among the Coastal Plain chert, the fine grained Albany chert and the heat altered Burke County chert are among the most common.

The preference for Ridge and Valley chert may be indicative of the types of tools manufactured during the Mississippian period. The increasing utilization of heat alteration, especially among Coastal Plain chert suggests the necessity of fine textured materials.

The use of Ridge and Valley chert may reflect increasing cultural or political contacts with Mississippian populations in the area (such as those at Etowah). The Dyar site is the most northern Mississippian site in the Reservoir with chert. Perhaps this site was instrumental in securing chert, either directly or via exchange, and supplying it to the other sites within the area.

It might also be suggested that during the Mississippian the focus of sites in Georgia was concentrated in the Ridge and Valley, Blue Ridge, and Piedmont and away from the Coastal Plain (Larson 1971:63-64). The shift toward Ridge and Valley chert is, perhaps, indicative of involvement with Mississippian period sites further to the north. Other Mississippian period sites such as Tugaloo, Estatoe, Chauga, and Hollywood are located along the Savannah River, near Burke County and the southeastern Coastal Plain chert. The presence of chert from this area during the Mississippian period might reflect these contacts.

Ethno-historic references by the early explorers and later settlers are often utilized in describing Late Mississippian socio-political organization, and resource procurement. Few references to chert exchange are found in these references. C. C. Jones (1873) reported that the older adult, "beloved" men of the Cherokee who could not engage in warfare or lacked the stamina for hunting spent the winter months manufacturing projectile points. During the summer the men travelled extensively in Georgia and South Carolina exchanging these points.

The exchange or trade of stone commonly occurred in areas where suitable indigenous stone was not available. The Spanish and French explorers reported that stones of various types, including flints, were obtained from the Flint River, through exchange (Le Moyne 1875:7; Fontaneda 1854:20).

One flake of exotic "Duck" River chert was identified from a Lamar Phase site. This chert type has been tentatively identified as the source for many of the large ceremonial chert artifacts found at Mississippian sites throughout the Southeastern United States. No artifacts made from this chert have been identified in the Reservoir area.

Summary

The chert recovered by the 1974/1975 survey has been preliminarily assigned to sources ranging from the Ridge and Valley to the Coastal Plain. It has been suggested that although small quantities of all types of chert are utilized in every period, there is a major shift in resource exploitation; chert utilization in the Archaic Period relying primarily on Coastal Plain material; that of the Mississippian Period on material from the Ridge and Valley.

Several criteria were proposed to account for this change ranging from increasing territorality, to changes in lithic preference. Chert resources are locally abundant in the Ridge and Valley and Coastal Plain Provinces. In these areas they may be found along ridgetops, as erosional outcrops, as residual cherts in the Barnwell Sands Formation of the soils of Floyd County, or in the tertiary formations of the Coastal Plain. Chert cobbles or pebbles may also be found as stream-bed gravels. Literally millions of square meters of in situ and redeposited chert were available to aboriginal populations.

Procurement of chert would, then, simply be a matter of collecting cobbles, boulders, and nodules of appropriate size for artifact manufacture. In terms of the quantity of chert available and ease of procurement residual deposits in Coastal Plain sands, shatter, nodules, and boulders along ridgetops or in valley floors would have been easily accessible.

An alternative method of chert procurement, possible in the Coastal Plain, is the quarrying of buried residual chert in the sandy soils of the area. C. C. Jones (1880) and Charles Lyell (1845:126) describe such residual chert quarries along the Savannah River in Burke and Screven counties, Georgia. Recent observations of quarries in Burke, Dougherty, and Macon counties indicate that the quarrying of buried chert was employed.

Two non-geological factors may have affected prehistoric chert procurement. These are: 1) differences in accessibility, and 2) resource depletion by continued exploitation.

Seasonal factors probably had little effect, all major sources are available on a year round basis. Though dense forests and undergrowth partially obscure and block access to some chert deposits, especially those along slopes and ridges, surveys of various deposits indicate that even during the maximal growth period, deposits were relatively easy to locate and reach.

It is more difficult to assess the effects of culture on chert availability. Ideally, all deposits were available to all populations and were accorded a status of "neutral ground." In reality this is highly unlikely. Chert preferences and variation undoubtedly played some part in resource selection. Struever (1973) has suggested that changing assemblages and functional usages may have influenced chert type selection. Where changes in exploitation were impossible the use of heat alteration was instituted. Changes in seasonal round, increasingly sedentary lifestyles, the establishment of territorial boundaries may all have affected chert procurement.

It is especially difficult to assess the effects of resource depletion. It does not appear to have been a factor in chert selection in Georgia since abundant resources may be found in accessible areas of the Ridge and Valley and Coastal Plain. It seems unlikely that chert location would affect site location and depletion of resources utilized by the Wallace Reservoir populations.

This preliminary overview has suggested trends that appear to occur in chert utilization in the Wallace Reservoir. Trace elements analysis of chert artifacts will enable the quantitative identification of the materials analyzed allowing for a more specific definition of chert utilization. This coupled with the additional material gathered during extensive surveys and excavations since 1975 will enhance our knowledge of chert utilization, providing much additional information. Ongoing work concerning settlement patterning and social organization will provide additional insights and explanations concerning changing exploitative patterns.

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APPENDIX I

Geographic Source Location of Some Georgia Chert Deposits

Ridge and Valley Province

Conasauga

Bartow County

1. Adairsville. In ridges south and west of Adairsville (Spalvins 1969:49).

Floyd County

1. Rome. Cherty fragments and nodules may be found in the soils around Rome.
2. Rome. Chert may be found in the alluvial bottomland at Fosters Bend. (Charles Cressler. Personal Communication).

Knox Group

Bartow County

1. Kingston. 3 miles west of Dykes Creek (Spencer 1893:102).
2. Along the ridges surrounding Kingston in blocks and beds (Spencer 1893:103).
3. Two miles west of Ladds Mountain. Ridge tops are covered with chert (Spencer 1893:103).

Chattooga County

1. Summerville. 1 mile southwest (McCallie 1901:117-118).

Floyd County

1. Several bands of outcrops south of the Etowah River along the ridges (Spencer 1893:98).
2. Massive chert in the residuum adjacent to the Conasauga Formation shows that Copper Ridge Dolomite underlies southern

and eastern Floyd County and part of Polk County (Cressler 1970:14).

Gordon County

1. Sugar valley. At foot of ridges (McCallie 1901:116).

Murray County

1. Outcroppings in hills in northern part of the county (McCallie 1901:115).

Polk County

1. Oredell in beds near the town (Spencer 1893:80).
2. West of Hematite along the ridges (Spencer 1893:80).
3. Lime branch (McCallie 1901:122-123).
4. In northwest portion of county along hills and ridges (Spalvins:123).
5. Rockmart 1.5 miles west of the center of Rockmart (Cressler 1970:14).

Whitfield County

1. Flint nodules occur along Cedar Ridge (Spencer 1893:116).

Newala

Outcroppings of Newala abut the Ft. Payne deposits. These include deposits in the areas listed below.

Bartow County

1. Malbone. Chert shatter and nodules along railway cut between Malbone and Stilesboro.
2. Taylorsville. Along railway cut southeast of Taylorsville.

Catoosa County

1. Fort Oglethorpe. Along Route 1 south of Fort Oglethorpe.

Polk County

1. Aragon. Chert scatters to east of Aragon along railway cut.
2. Cedartown. South of the city.

Walker County

1. Kensington. Along railway cut southeast of Kensington.
2. Chickamauga. Along route 27 north and to the south and east.
3. In this county deposits may be found at the foot of McLemore Cove and along either side of Missionary Ridge.

Ordovician

Catoosa County

1. Hassler Mill. On U.S. 41 (Allen and Lester 1957:67).
2. Ringgold (Allen and Lester 1957:68).
3. McFarland Quarry. 2-1/2 miles west of Chickamauga National Military Park (Allen and Lester 1957:68).
4. Cedar Grove. Antioch Church 1/4 mile northwest of Cedar Grove (Allen and Lester 1957:68).
5. Rabbit Valley, Wood Station Valley, Chickamauga Valley (Cressler 1963:13).

Dade County

1. Trenton (Allen and Lester 1957:67-89).
2. Rising Fawn (Allen and Lester 1957:67-89).
3. Rabbit Valley (Allen and Lester 1957:67-89).

Armuchee Chert

Floyd County

1. Northern extent of Horseleg Mountain (Cressler 1970:39).
2. Turkey Mountain, east of Armuchee, Georgia (Cressler 1970:39).

Polk County

1. Elders Lake. On ridges to the north and east (Cressler 1970:36).
2. Cupps Pond. Westward toward Esom Hill (Cressler 1970:37).
3. Oremont. East and north of Oremont. 1/2 mile southwest of Oremont. 1 mile west-southwest of Oremont (Cressler 1970:37).
4. Etna and Indian Mountains (Cressler 1970:37).

Ft. Payne

Ft. Payne occupies narrow belts in the western portion of the Appalachian valley. Wider outcrops occur along the east side of Horn, John, and Chattoogata Mountains. Two parallel belts run along the east and west sides of the valley of Lookout Creek. Other deposits occur on the east side of Lookout Mountain to Tennessee; the southern end of McLemore Cove (Walker County) and northeasterly around Pigeon Mountain (Maynard 1912:103).

Catoosa County

1. East of Taylor's Ridge on the tops of adjacent ridges (Spencer 1893:51).
2. West of Chickamauga Valley they form chert covered ridges (Spencer 1893:51).
3. See Cressler 1963:16.

Chattooge County

1. Base of Taylor's Ridge on U. S. Highway 27 (Spencer 1893: 127; Cressler 1964:12).
2. Along the foot of Lookout Mountain (Spencer 1893:127).
3. On western slopes of Shinbone Ridge (Spencer 1893:127).

Dade County

1. Cherty fragments along ridges of Red Mountain (Spencer 1893: 142).
2. Near Rising Fawn (Spencer 1893:143).
3. Just east of New England City (Spencer 1893:143).

Floyd County

1. Texas Valley. On flanks of ridges bounding the valley (Spencer 1893:96).
2. Horseleg Mountain. On west side and north end of the mountain (Spencer 1893:96).
3. Horn Mountain. On slopes (Spencer 1893:96).
4. Lavender Mountain. On slopes (Spencer 1893:96).
5. Huffmaker Station (Maynard 1912:103).
6. Southern Railway quarry. 1 mile north of Rome (Hurst 1953: 227).
7. Rome. 1 mile south of West Rome on the west slope of Mt. Alto (Hurst 1953:218).

8. Gore. U. S. 127, 1 mile west of Gore (Hurst 1953:218).
9. U. S. Highway 27 at Crystal Springs (Cressler 1970:42).
10. Armuchee. 1 mile south along U. S. 27 (Cressler 1970:42).

Gordon County

1. Horn Mountain. South end (Spencer 1893:110).
2. Calhoun. Along ridges immediately to west (McCallie 1902: 116).

Polk County

1. Between Young and Essom Hills lie several ridges covered with blocks and fragments (Spencer 1893:86).
2. South of Cedartown (Spencer 1893:86).
3. Aragon. East of Aragon (Cressler 1970:42).
4. Rockmart. On caps of nearby ridges (Cressler 1970:42).
5. Cedartown. Along ridges south and southwest of Cedartown (Cressler 1970:42).

Walker County

1. Along the ridges of Horn Mountain (Spencer 1893:135).
2. Bands and nodules of chert along Pigeon Mountain (Spencer 1893:136).
3. Along Red Mountain at the head of McLamore's Cove (Spencer 1893:136).

Coastal Plain Province

Paleocene Epoch

Macon County

1. Montezuma. Residual chert in soils east and south of Montezuma (Cooke 1943:41).

Quitman County

1. Georgetown. Beds of chert 2 miles east of the town (Cooke 1943:39).
2. Georgetown. 3-1/2 miles southeast of Georgetown on Ft. Gaines Road (Cooke 1943:42).

3. Georgetown. 4 miles east northeast of Georgetown on Lumpkin Road (Cooke 1943:42).

Stewart County

1. Outcrops of chert outcrops in a number of places in the southern part of the county as far south as Hodchodkee Creek (Cooke 1943:43).
2. Lumpkin. 6 miles to the southwest on the Lower Eufaula Road (Cooke 1943:43).

Sumter County

1. Sweetwater Creek. 3/4 miles south southeast of Andersonville along the creek (Cooke 1943:45).

Eocene Epoch

Claiborne Group

Bibb County

1. Browns Mountain. Beds of chert occur at this mountain, 9 miles southeast of Macon (Veatch and Stephenson 1911:298).
2. Ocmulgee River. West side of I16 on the top and sides of hills above the river (Huddlestun 1974:2-15).
3. Macon. Abundant in clay southeast of Macon (Huddlestun 1974: 2-15).

Burke and Richmond Counties

1. McBean Station. 6 miles southeast along road cut (Veatch and Stephenson 1911:243).
2. Spirit Creek. On north bank (Sandy et al. 1966:8).

Burke County

1. Several outcrops are listed in the Guidebook to Field Trip No. 3 (Sandy et al. 1966:8010).
2. Cox Spring. Three-quarters of a mile below this Spring are thin layers of flint in what appears to be Barnwell Sand (Veatch and Stephenson 1911:286).
3. Mobley Bluff. About one mile below Cox Spring are fragmental layers of flint in Barnwell Sand (Veatch and Stephenson 1911:288).

4. Waynesboro. Railroad cut 2 miles north of Waynesboro (Veatch and Stephenson 1911:288).
5. Midville. 5 miles north of Jones Mill is a 6 foot thick exposure of chert (Veatch and Stephenson 1911:299).
6. Boyd Farm. 4-1/2 miles west of Handcock Landing on the Savannah River are beds of chert in Barnwell Sand (Veatch and Stephenson 1911:289).

Jefferson County

1. Wadley. Railway cut 3/4 mile south of Wadley (Veatch and Stephenson 1911:292).
2. Chert appears in beds and as residual fragments throughout the southern portion of the county (Veatch and Stephenson 1911:292).
3. At Burke/Jefferson County Line (Sandy et al. 1966:10).

Twiggs County

1. Rocky Hill. One mile southwest of Gallernore are siliceous flint nodules bedded in Barnwell Sand (Veatch and Stephenson 1911:257).
2. Warner Robbins. Southeast of the city (Huddlestun 1974: 2-17).

Washington County

1. Fossiliferous flint is exposed on hills throughout the north central portion of the county (Bantly 1916:57).
2. Rocky Branch Bridge about 2 miles northwest of Sandersville contains thin layers of chert (Veatch and Stephenson 1911:253).
3. Sunhill. The area nearby contains surface deposits of vitreous chert (Veatch and Stephenson 1911:255).
4. Davisboro. Two miles southeast of the town on a small tributary of Williamson's Swamp Creek are large, residual chert boulders (Veatch and Stephenson 1911:255).

Jackson Formation

Baker County

1. The greater part of the county is covered by residual sands and chert (Brantly 1916:169).
2. Ichawaynochaway Creek. 2 miles above the mouth on the second terrace flint boulders continue for several miles (Brantly 1916:170).

3. Chichasawhatchie Creek. 3 miles northwest of DeLeary on the second terrace chert boulders outcrop for several miles (Brantly 1916:170).

Bibb County

1. Big Indian Creek. North of the creek between the railway cut and the Ocmulgee River (Brantly 1916:84-85).
2. Kathleen. 4 miles south southeast flint occurs along the bluffs and ridgetops (Brantly 1916:88).
3. Perry. South of Perry along low knolls (Brantly 1916:89).

Crisp County

1. Limestone Bluff. Flint nodules may be found on the Armstrong Place and elsewhere along the bluff (Brantly 1916:154).

Dooly County

1. Continuous outcroppings along the bluffs of the Flint River (Brantly 1916:111).

Early County

1. Spring Creek. Flint is exposed along the creek (Brantly 1916:170).

Houston County

1. Bonaire. Residual chert boulders on the hills 1-1/2 miles north of Bonaire (Veatch and Stephenson 1911:300-301).
2. Perry. 5 miles southwest of Perry along the Perry/Henderson Road flint fragments occur (Veatch and Stephenson 1911: 301).

Miller County

1. Nodules and fragments are found along the creeks of this county (Brantly 1916:170).

Pulaski County

1. Hawkinsville. 5-1/2 miles above Hawkinsville along bluffs (Brantly 1916:105).

Oligocene Epoch

Baker County

1. Newton. Along the bluffs of Cooleewahee Creek (Veatch and Stephenson 1911:319-320).

Calhoun County

1. Arlington. 2 miles west of Arlington in railway cut (Veatch and Stephenson 1911:313).

Crisp County

1. Residual Oligocene cherts occur throughout the county (Brantly 1916:152).

Decatur County

1. Bainbridge. Red Bluff along the western bluffs of the Flint River 7 miles north of Bainbridge (Veatch and Stephenson 1911:313).
2. Bainbridge. 3 miles below Bainbridge along Cherry Shoot Creek on the west bank of the Flint River (Veatch and Stephenson 1911:330).
3. Bainbridge. 4 miles south along Little Horse Shoe Bend (Veatch and Stephenson 1911:330).
4. Hutchensons Ferry. 7-1/2 miles east northeast of the mouth of Spring Creek, large boulders of chert (Cooke 1943:80).
5. Hales Landing. 6-1/4 miles southwest of bridge at Bainbridge, large blocks of chert (Cooke 1943:80).
6. Brison. Large chert boulders along west side of Spring Creek (Veatch and Stephenson 1911:322).

Dougherty County

1. Albany. 2 miles north of Muckafoonee Creek (Brantly 1916: 134).
2. Kinchafoonee Creek. 2 miles north of Albany, chert nodules and fragments along the bluffs (Veatch and Stephenson 1911: 316).

Early County

1. Blakely. Boulders of chert outcrop around Blakely (Veatch and Stephenson 1911:311-312).

Houston County

1. Ross Hill. Flint fragments occur in soils (Veatch and Stephenson 1911:301).
2. Perry. 5 miles south along Perry/Henderson Road, residual chert in top beds (Veatch and Stephenson 1911:300). (They also list Eocene formations for this area.)
3. Tivola. 1-1/2 miles south of Tivola in railway cut (Veatch and Stephenson 1911:303).
4. Elko. 1 mile south of Elko in roadway cut. Jasper. (Veatch and Stephenson 1911:303).
5. Taylor's Ford. 4 miles south of Elko on the Unadilla Road (Veatch and Stephenson 1911:322).
6. Pulaski/Houston County border in road cuts near Klondike (Huddlestun 1974:2-27).

Laurens County

1. Dublin. Chert deposits occur to the south of Dublin (Veatch and Stephenson 1911:323).
2. Dudley. 1-1/2 miles northeast of Dudley along Turkey Creek (Cooke 1943:83).

Lee County

1. Armena. 11 miles northwest of Albany along bluffs of Fowltown Creek (Veatch and Stephenson 1911:314).

Miller County

1. Colquitt. Boulders near Spring Creek, 1/2 mile to west (Veatch and Stephenson 1911:313).
2. Colquitt. 2-1/2 miles north of Colquitt along Long Branch (Veatch and Stephenson 1911:313).

Mitchell County

1. DeWitt. Boulders of chert along the Flint River (Veatch and Stephenson 1911:319).

Pulaski County

1. Chert boulders occur between Hogcrawl Creek and Hawkinsville (Cooke 1943:82).
2. Hawkinsville. Massive chert pinnacles below Hawkinsville (Huddlestun 1974:2-29).

Randolph County

1. Fossiliferous and residual chert occur in the county (Brantly 1916:125).
2. Cuthbert. Residual chert boulders on the surface west and southwest of the city (Veatch and Stephenson 1911:311).
3. Cuthbert. 2-1/2 miles east, near railroad overpass (Cooke 1943:82).

Seminole County

1. Fairfield Landing (Cooke 1943:80).

Sumter County

1. Andersonville. Boulders along knolls (Veatch and Stephenson 1911:313).
2. Chert boulders on knolls from Americus to Oglethorpe (Veatch and Stephenson 1911:313).
3. Americus. Abundant in soils in Americus (Veatch and Stephenson 1911:314).
4. Americus to Plains. Large lumps of chert (Cooke 1943:82).

Terrel County

1. Dawson. 1/2 mile east of railway station in railway cut (Veatch and Stephenson 1911:312).
2. Bronwood. Flint fragments are abundant in fields around Bronwood (Veatch and Stephenson 1911:312).

Thomas County

1. Boston. Along hills outside Boston (Veatch and Stephenson 1911:338).

Although Veatch and Stephenson give the following as Oligocene Epoch they are more likely of Barnwell Formation, Eocene Epoch.

Burke County

1. Girard and Flint Branches (Veatch and Stephenson 1911:323-324).
2. Buxtons Mill. 2-1/2 miles from Girard (Veatch and Stephenson 1911:323-324).
3. Millhaven Road. 2-1/4 miles south of Girard (Veatch and Stephenson 1911:324).

4. Ellison's Bridge. 3 miles southwest Girard on a high bluff on the west side of Briar Creek (Veatch and Stephenson 1911: 323-324).
5. Stony Bluff. Fragmentary outcroppings along Flint Creek (Veatch and Stephenson 1911:324).
6. Johnson's Landing. Chert outcrops along the bluffs of the Savannah River (Veatch and Stephenson 1911:324).

Eocene/Oligocene Epoch

Screven County

1. Hershman Lake. Large boulders of chert outcrop around lake (Veatch and Stephenson 1911:324).
2. Milhaven. Chert occurs along Briar Creek (Veatch and Stephenson 1911:324; Cooke 1943:84).

Miocene Epoch

Grady County

1. Hadley Creek. 2 miles southeast of Hadley Bridge and on roads crossing Bryants Mill Creek (Cooke 1943:89).

Mitchell County

1. Pelham. Located in road cuts near Pelham (Cooke 1943:89).

Worth County

1. Sylvester. Outcroppings along road cuts (Cooke 1943:89).