GEORGIA
A VIEW FROM SPACE

An Atlas of Landsat-1 Imagery

Educational Series 1

Mosaic by U.S. Geological Survey

GEORGIA
A VIEW FROM SPACE

An Atlas of Landsat-1 Imagery

by

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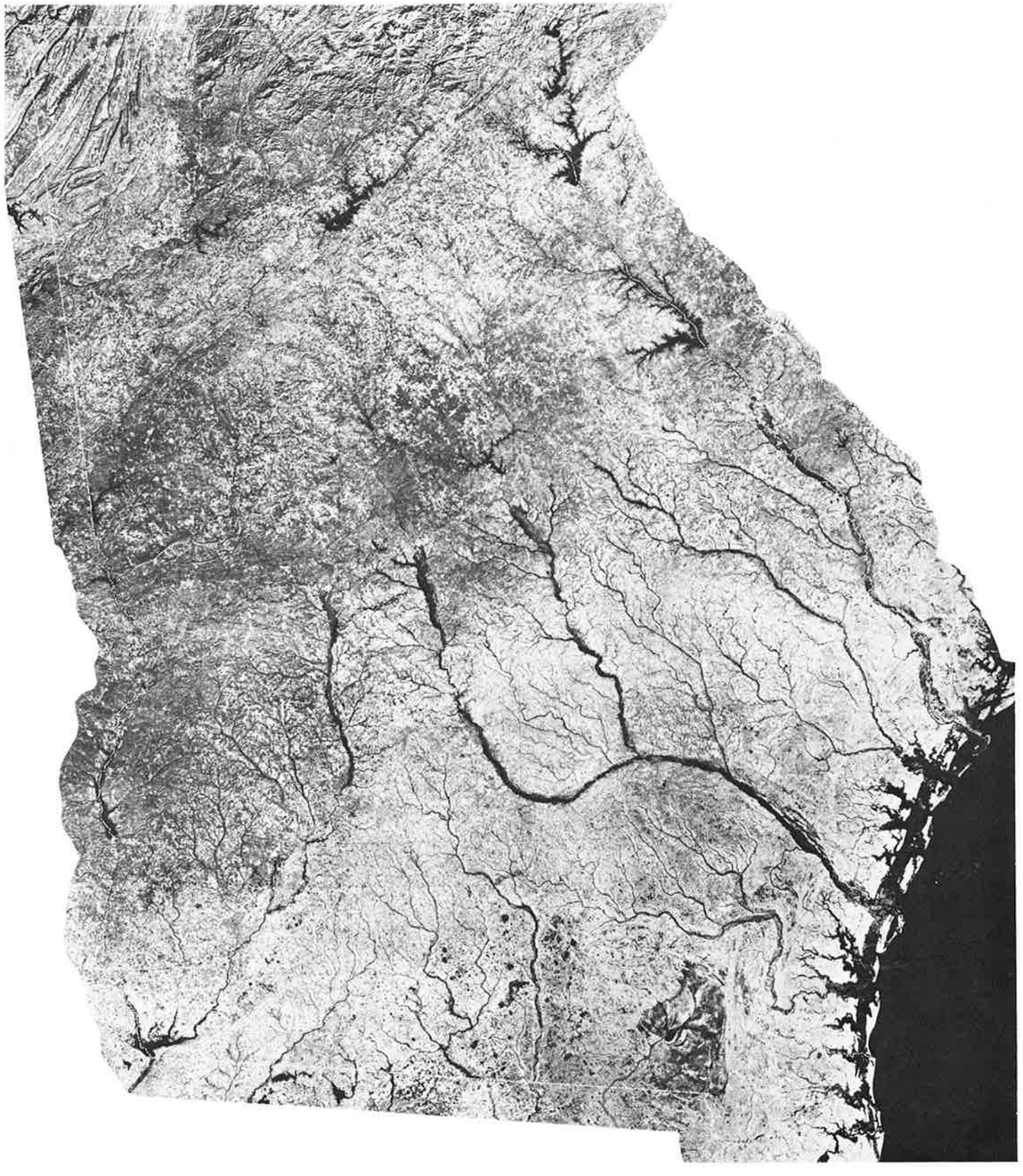
STATE OF GEORGIA
DEPARTMENT OF NATURAL RESOURCES
Joe D. Tanner, Commissioner

THE GEOLOGIC AND WATER RESOURCES DIVISION
Sam M. Pickering, Jr., State Geologist and Division Director

ATLANTA
1976



Mosaic by U.S. Geological Survey

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INTERPRETATION MAP SYMBOLS

State boundary . . . . .

Highways, interstate . . . . . 

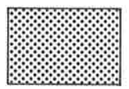
U. S. . . . . 

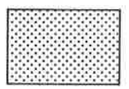
State . . . . . 

Rivers and streams . . . . . 

Water bodies . . . . . 

Freshwater marsh . . . . . 

Salt marsh . . . . . 

Floodplain . . . . . 

Mines and quarries . . . . . 

Cities and towns . . . . . 

Note: On all imagery and interpretations in this atlas, true north is approximately 10° left of vertical.

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INTRODUCTION

On July 23, 1972, the National Aeronautics and Space Administration (NASA) launched the first Earth Resources Technology Satellite (ERTS-1), now known as Landsat-1. The design life was one year, but the satellite has exceeded all expectations for reliability, longevity, and image quality, and at the time of this writing the satellite continues to function well. The spacecraft was designed to produce repetitive, small-scale, multispectral imagery of the earth and to determine the feasibility of using automated satellites to monitor environmental conditions and inventory the earth's resources. Landsat-2 has since been successfully launched, but images from the new spacecraft have not been used in this atlas.

Landsat-1 circles the earth every 103 minutes in a near polar orbit at an altitude of 920 kilometers (580 miles). As the satellite revolves about the earth, the planet rotates beneath it (Figs. 1 and 2). The result of these two motions enables the satellite to scan an advancing westward swath over the planet and to repeat its coverage of any given location every 18 days.

The satellite must pass over Georgia five times in order to record the entire state. The orbital paths shift slightly with time; however, the approximate coverage is shown in Figure 3. For classification purposes, the Georgia Geological Survey has designated each orbit over the state by a letter: G, H, I, J, and K, from east to west. The northernmost frame of each orbit within the state is designated

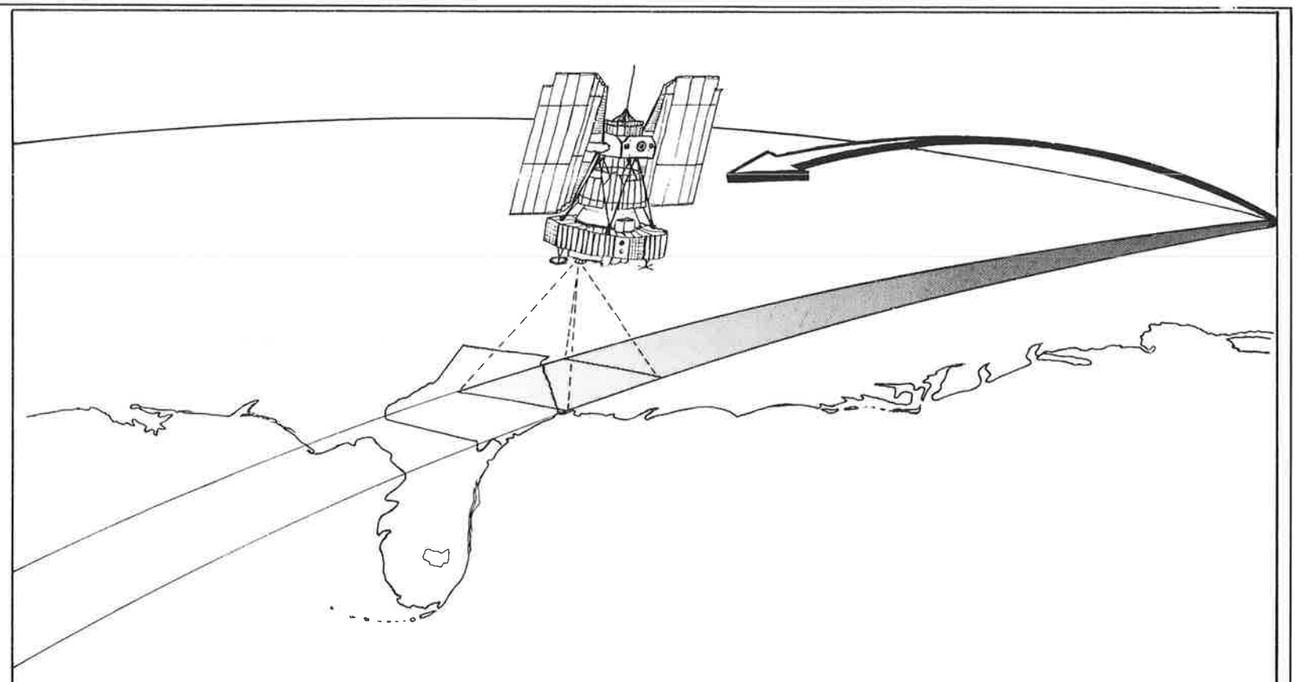


Figure 2

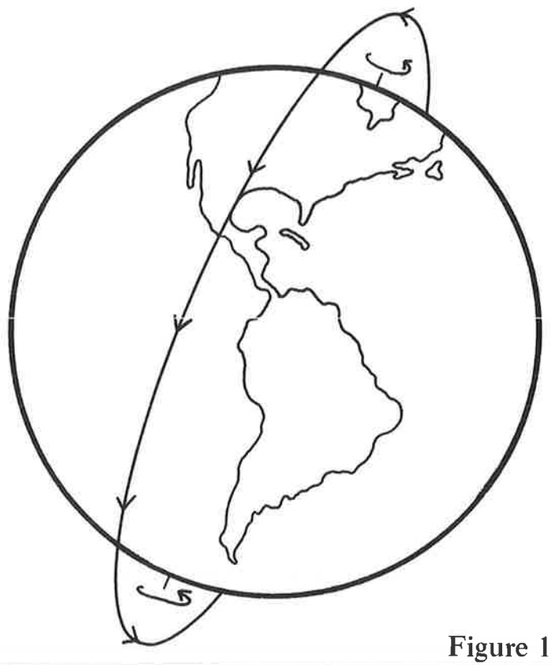


Figure 1

#1, the next frame south is #2, and so forth. This system is less complex than the comprehensive system used by NASA. Each of the 15 frames required to cover the state encompasses an area approximately 185 kilometers (115 miles) on a side, or 34,255 square kilometers (13,500 square miles).

The spacecraft's earth observatory imagery system includes three return-beam vidicon cameras (RBV), which are not being operated, and four multispectral scanners (MSS). The MSS is an optical-mechanical sensing system which simultaneously detects light energy in four spectral bands; band 4, 500-600 nanometers (nm), the green portion of the spectrum; band 5, 600-700 nm, the red portion of the spectrum; band 6, 700-800 nm, the red and near-infrared portion of the spectrum; and band 7, 800-1100 nm, the near-infrared portion of the spectrum. The MSS scans a swath of earth 185 kilometers (115 miles) wide across its orbital path. It senses increments of reflected energy intensity in each of the spectral bands and encodes this information which is transmitted to receiving stations on earth. The encoded messages from the satellite are stored on computer compatible tapes from which several display products can be produced. One form of display product available is the imagery presented in this atlas.

Although an image closely resembles a photograph, it is not an actual photograph of the earth's surface as is the conventional aerial photo which is the product of a film camera. Instead, the image is a computer-derived pictorial

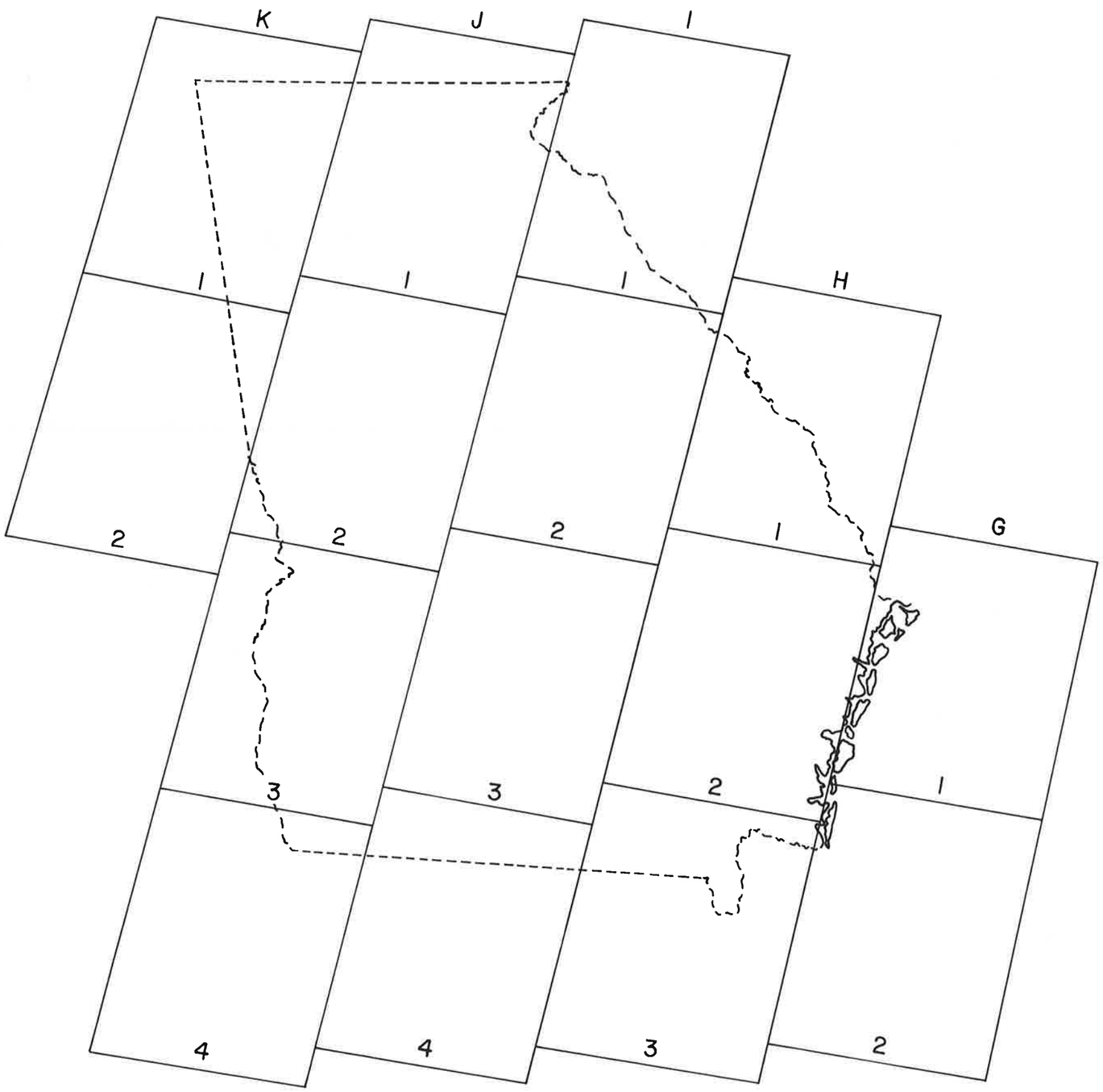


Figure 3

representation of an electronically scanned area. The scan lines (horizontal lines visible on the imagery) are evidence of this electronic detection.

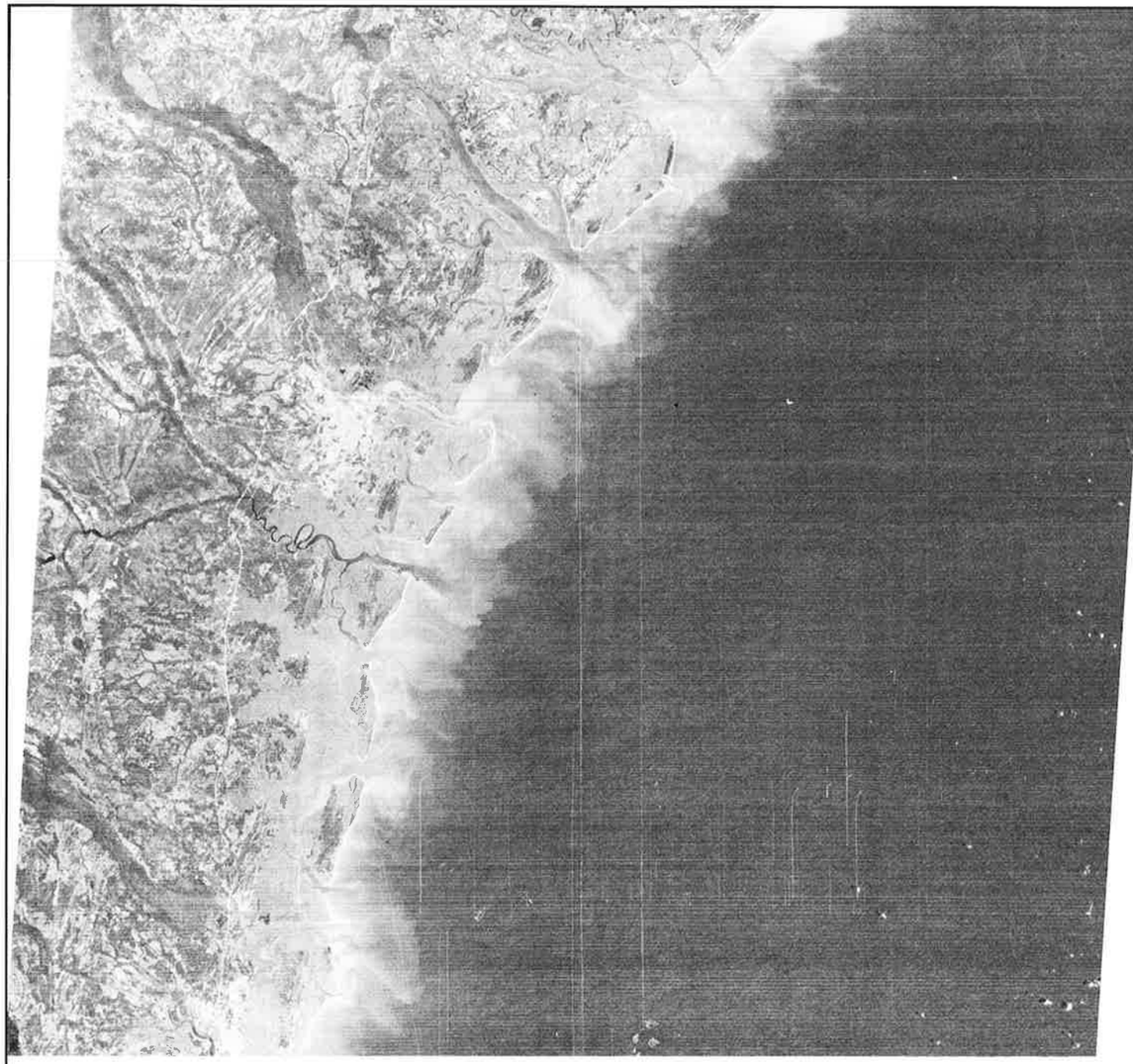
Copies of Landsat products may be obtained by the public at a modest cost from:

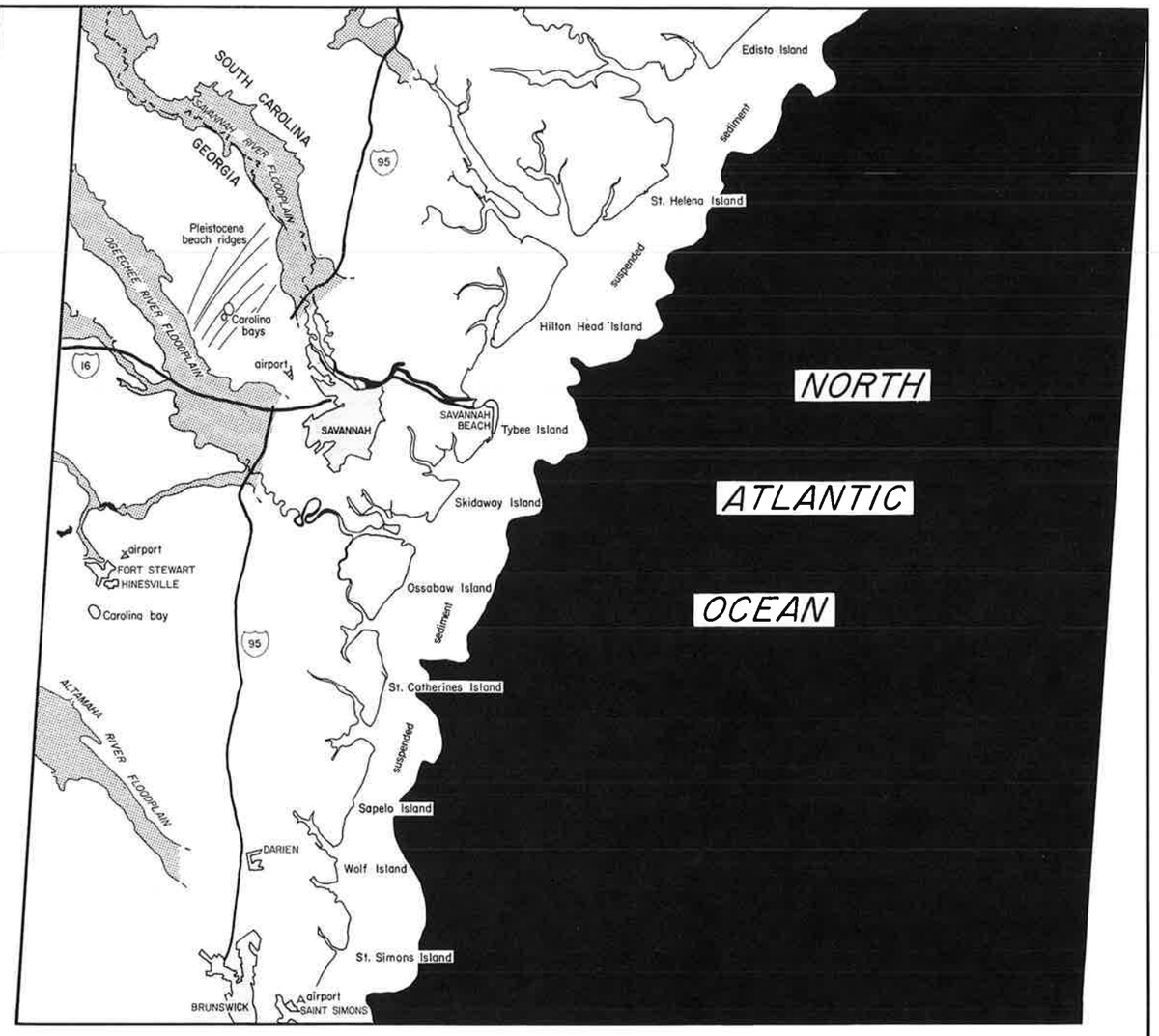
EROS Data Center
Data Management Center
Sioux Falls, South Dakota 57198 .

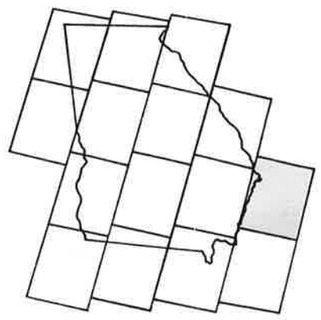
Some of the better Landsat-1 imagery of Georgia is displayed within this atlas. Each scene is represented by two different frames: the MSS bands 5 and 7 and their respective interpretations illustrating the most prominent features. From band 5 imagery, land use and cultural features may be distinguished as lines and patterns contrasting with the natural terrain. On these band 5 reproductions, surface mines, barren land, beaches, and highways appear white; urban areas, cleared land, and muddy water appear gray; and woodland, clear water, and landform shadows are black.

Most physical features of the land are more apparent on band 7 imagery. On the band 7 images, open water and shadows appear black; swampy areas, and dense green vegetation are grey; and fresh excavations appear white.

As there is some loss of resolution in the printing process, only prominent features and general trends are delineated. Not all features visible on the imagery have been interpreted here.







G-1
MSS-5
10 APR. 73

1 inch equals approximately 16 miles

10 0 10 20 30 40 miles

10 0 10 20 30 40 50 kilometers

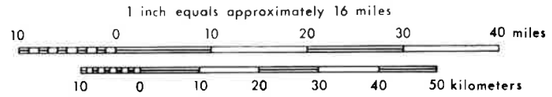
This scene shows a portion of Georgia's and South Carolina's Sea Islands. Past geologic processes acting in this area have had a substantial impact on present land use patterns. During the Pleistocene Epoch sea level fluctuated to levels both higher and lower than the present shoreline. Remnants of former beaches can be observed on the imagery as slightly curved, linear features, especially in the region northwest of Savannah. These beach ridges are distinguishable from the surrounding area by their differences in land use on band 5. The beach ridges are relatively well drained and are used for farming and transportation. The areas between the former beach ridges are swampy and covered with forest and thick brush. The infrared image, band 7, primarily distinguishes differences in moisture

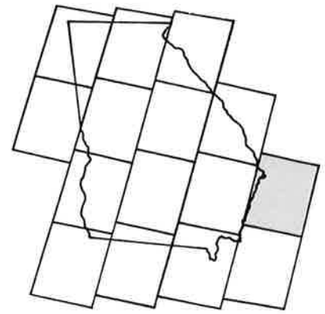
rather than vegetation. Marshlands are dark, while drier sandy uplands appear lighter in tone.

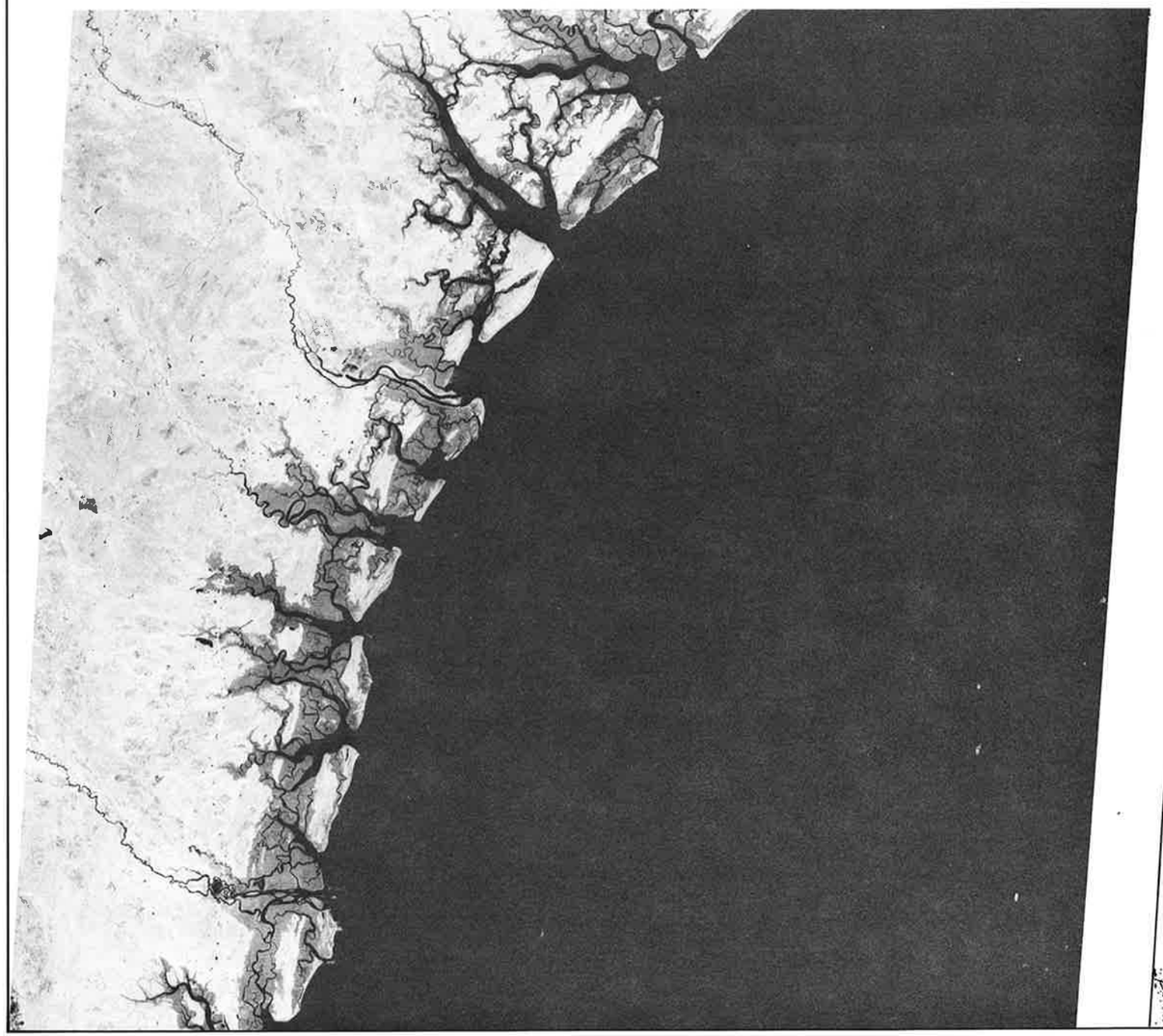
On band 5, the light gray plumes around the Sea Islands represent sediment suspended in the ocean. Rich in decomposed marsh grass and other nutrients, these sediment plumes may have a direct influence upon Georgia's fishing, shrimp, and shellfish industry. The sediment is principally derived from the marshlands and is washed out by tidal currents and storm waves.

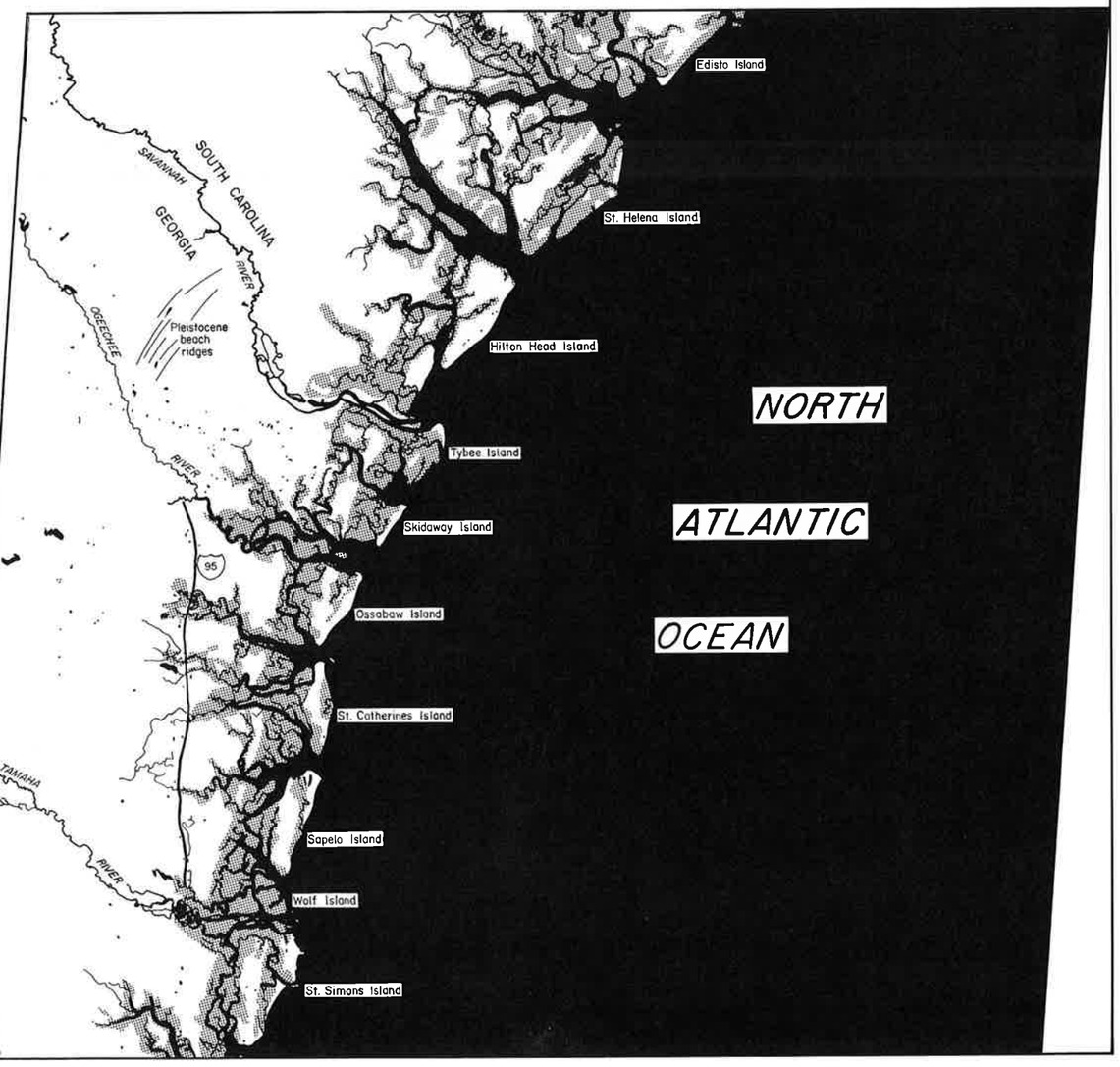
The small ponds adjacent to Interstate 95 are borrow pits from which sand and gravel were extracted for fill during the highway's construction. The ponds are best seen on band 7, whereas the highway is best seen on the band 5 image.

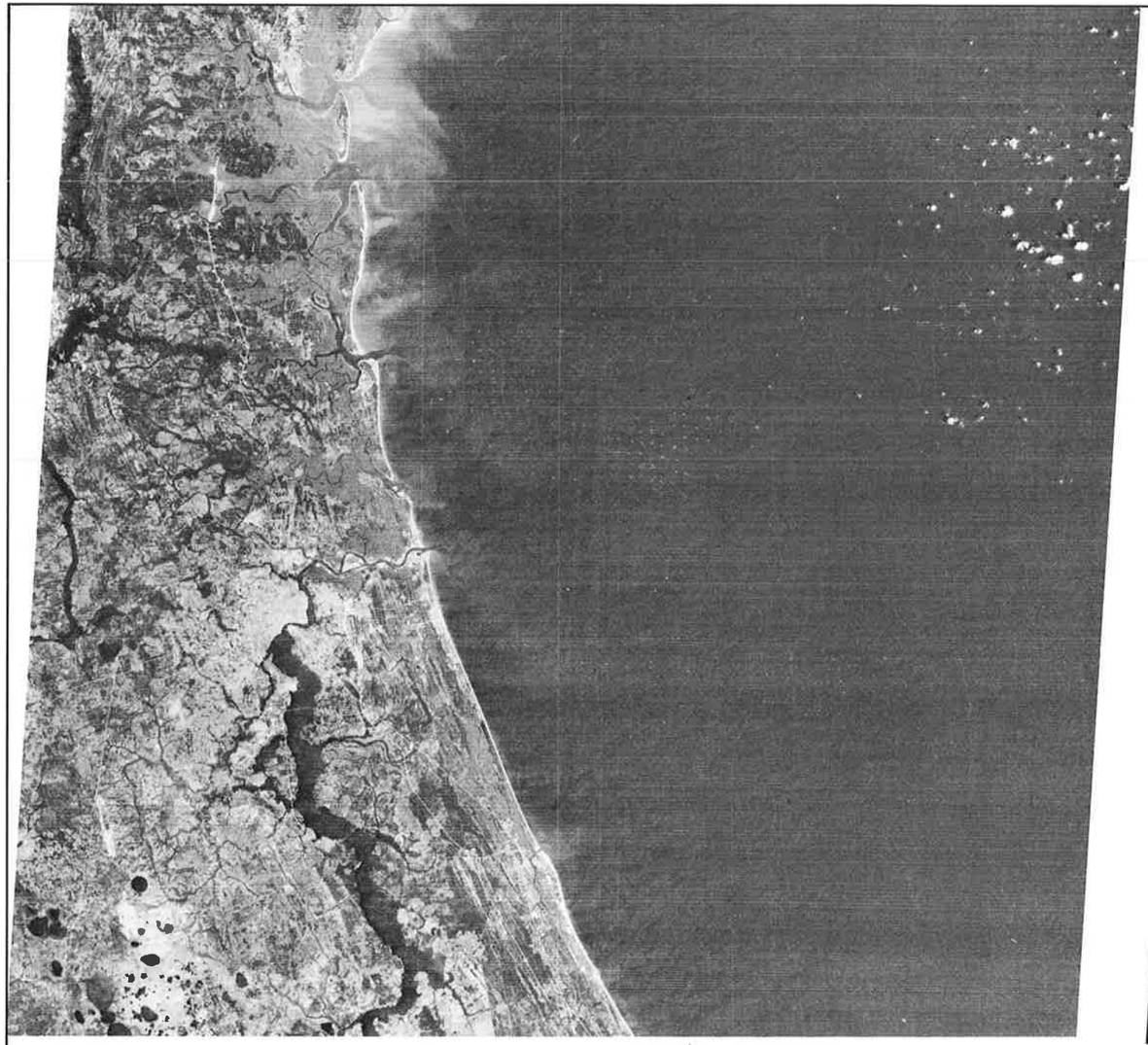
G-1
MSS-7
10 APR. 73

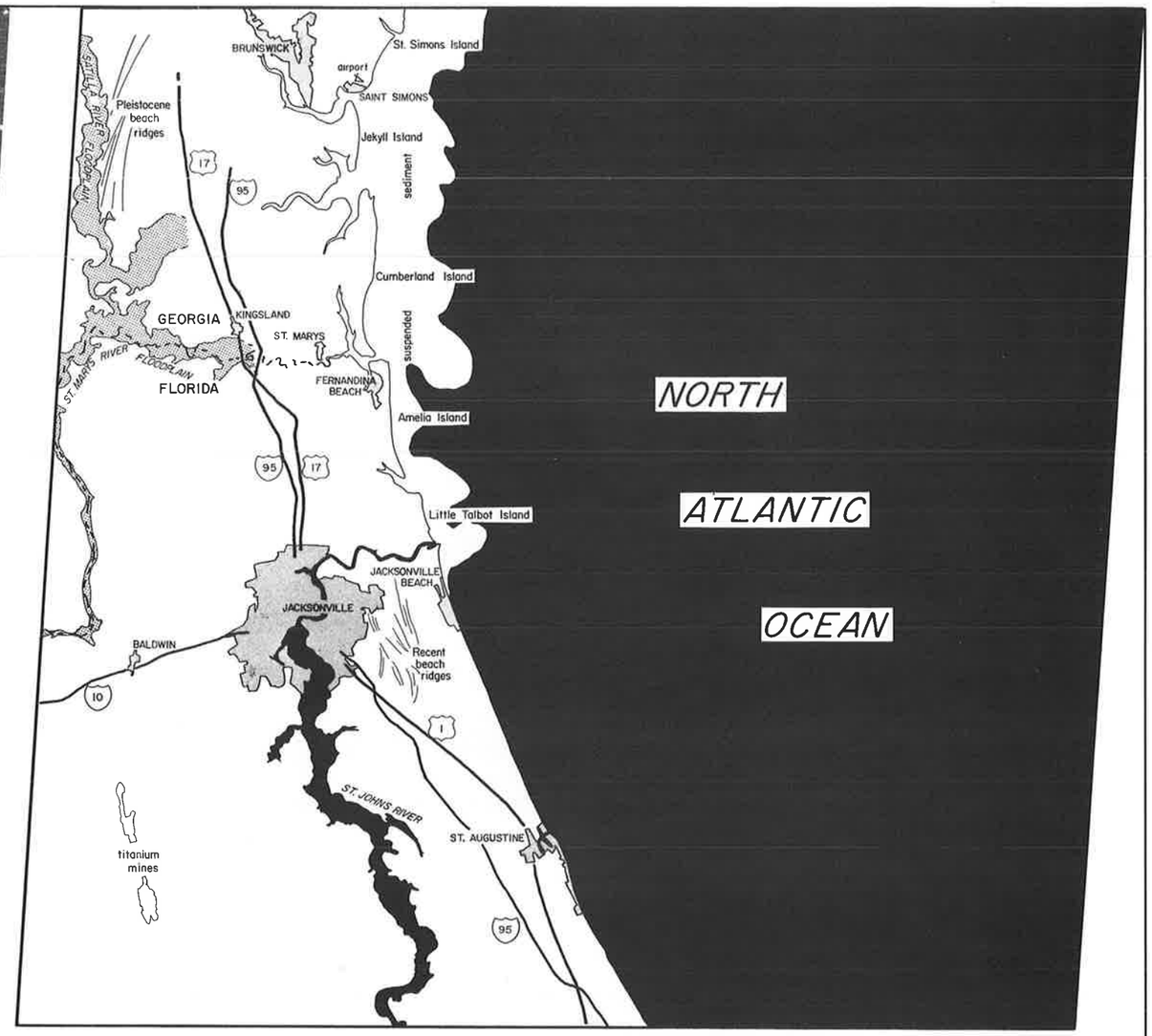


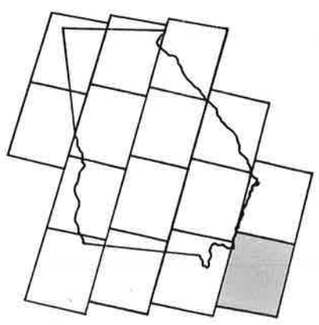












G-2
MSS-5
10 APR. 73

1 inch equals approximately 16 miles

10 0 10 20 30 40 miles

10 0 10 20 30 40 50 kilometers

The Sea Islands and their associated salt marsh extend from South Carolina to Florida. The entire Georgia coast is characterized by this marshland-island environment.

Notice on band 7 that the salt marsh narrows in Florida, and on band 5 the sediment plumes are almost absent south of Little Talbot Island. This apparent association of sediment plumes and salt marsh suggests a marshland sediment-source for the plumes.

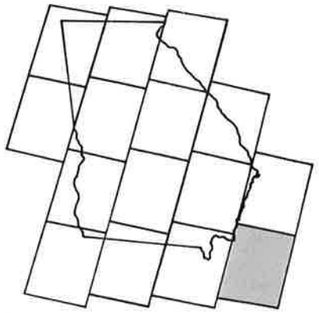
Pleistocene beach ridges are present west of Brunswick and east of Jacksonville. These ridges, like those near Savannah, are identifiable by land use patterns and differences in drainage characteristics. Present day beaches are quite prominent on the band 5 image as bright narrow strips adjacent to the coastline.

Marshland and open water are best observed on the infrared band 7 imagery.

Note the small ponds distributed in a linear pattern along Interstate 95. These ponds are water-filled borrow pits. Under ideal circumstances ponds as small as 0.5 hectare (1.3 acres) may be seen on the imagery; however, under normal conditions the smallest distinguishable water body is likely to be about 1.6 hectares (4 acres).

The Landsat imagery provides us with the first comprehensive view of Georgia's intricate salt marsh system. Through remote sensing techniques, it is now possible to map a consistent, generalized wetland boundary and observe patterns of plant distribution and vigor. Repetitive coverage at close intervals, as provided by Landsat, allows timely recognition of man's encroachment on the marshlands, and hopefully, this will assist in the enforcement of the 1971 Georgia Marshland Law.

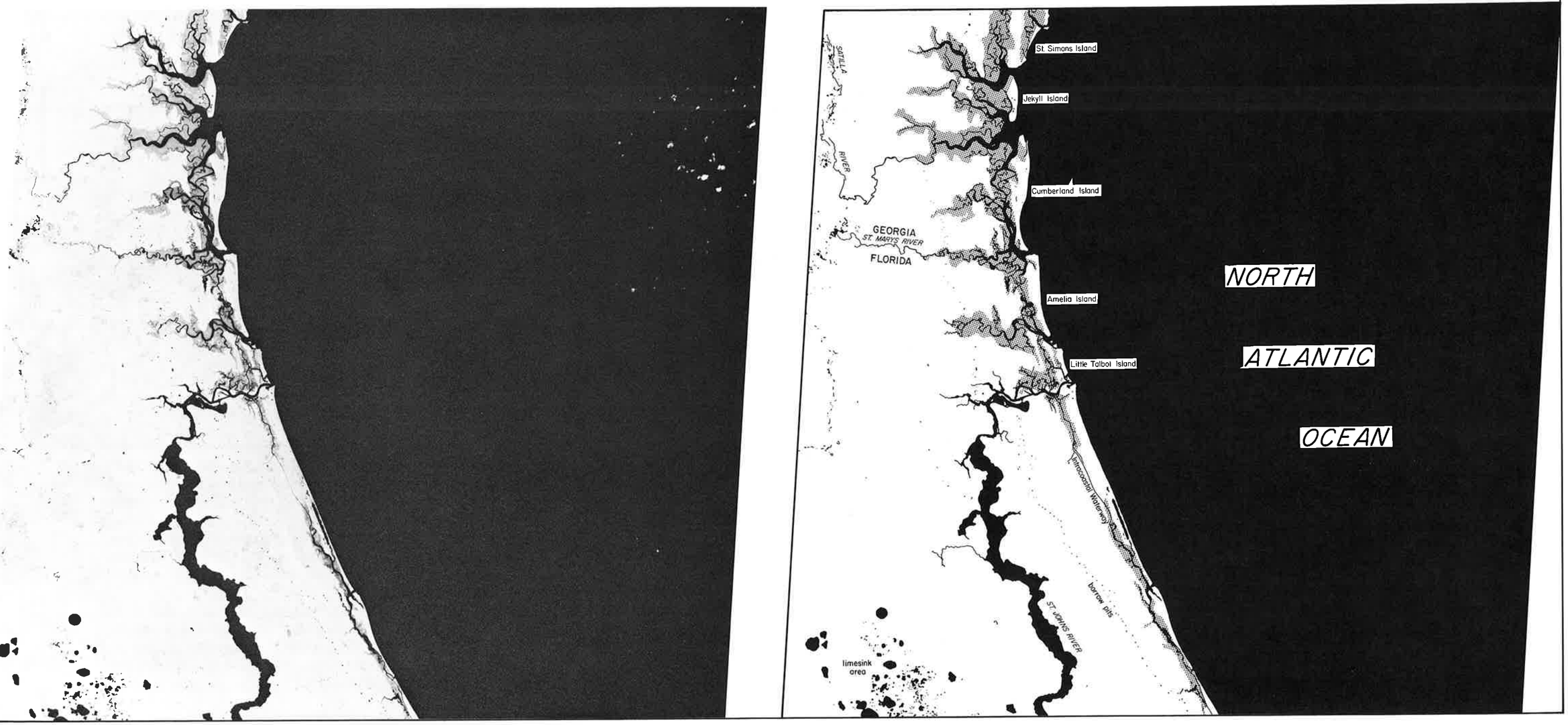
G-2
MSS-7
10 APR. 73

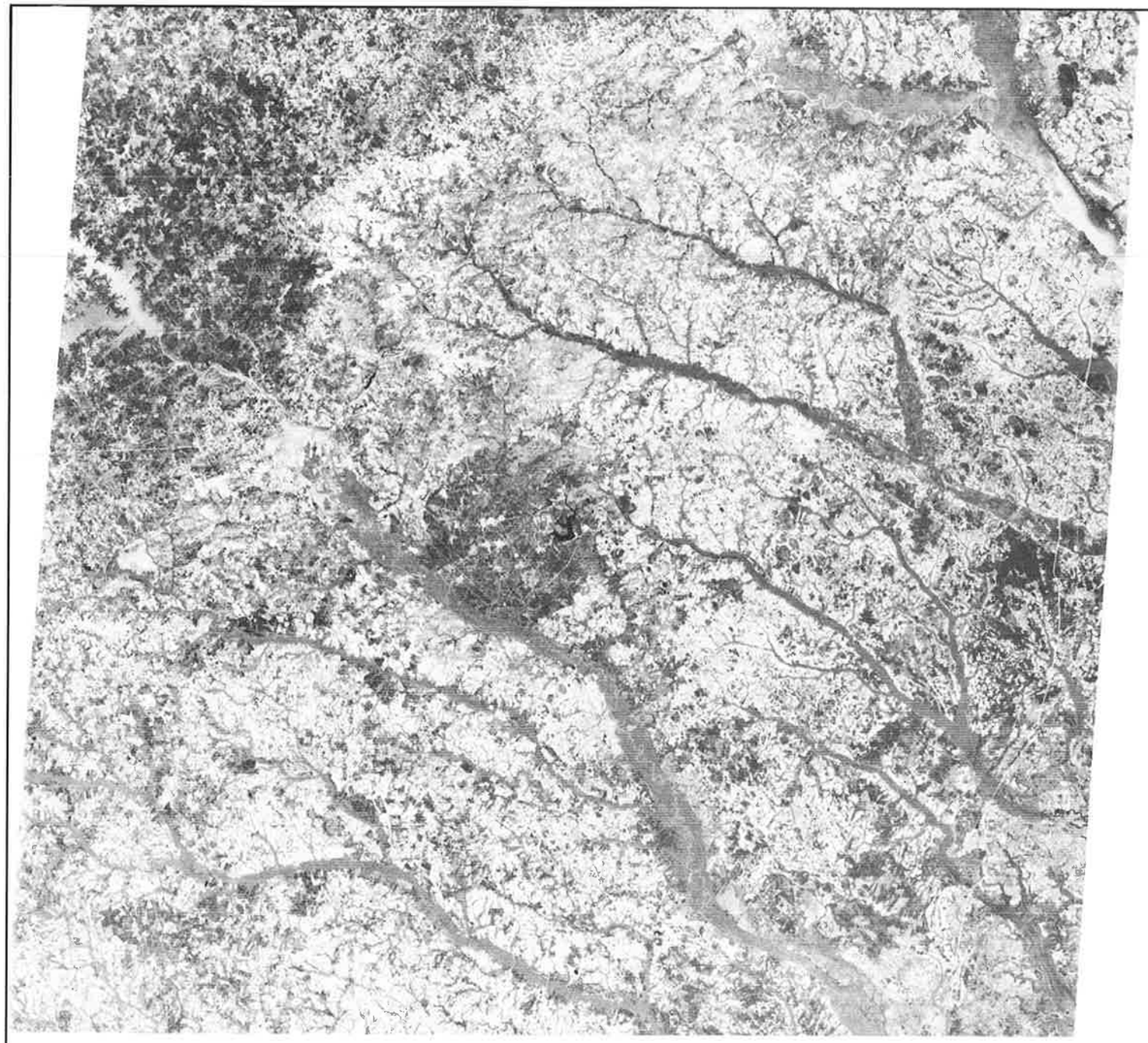


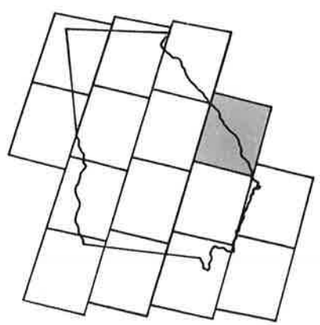
1 inch equals approximately 16 miles

10 0 10 20 30 40 miles

10 0 10 20 30 40 50 kilometers







H-1
MSS-5
11 FEB. 74

1 inch equals approximately 16 miles

10 0 10 20 30 40 miles

10 0 10 20 30 40 50 kilometers

The "H" orbit imagery is immediately west of the coastal orbit ("G" orbit). Because there is some north-south overlap of frames in the same orbit and some east-west overlap between orbits, some features from one orbit may be viewed again in an adjacent orbit.

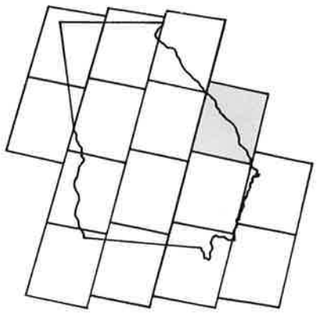
This scene centers near the Atomic Energy Commission's Savannah River Nuclear Laboratory recognizable as a dark circular feature in the center. The area is dark because the government land is dominantly forested in contrast to the lighter tone of the surrounding agricultural land.

The major rivers in this scene help to point out the differing nature of the rocks of the Piedmont and those of the Coastal Plain. As these rivers flow across the hard crystalline rocks of the Piedmont their courses are relatively straight and their floodplains extremely narrow. However, when they come into contact with the less resistant sediments of the Coastal Plain they begin to meander in broad, forested floodplains.

Two interesting features within the Savannah River floodplain are the oxbow lakes and river terraces shown on the band 7 image. The oxbow lakes are former meanders in the river that have been cut off as the river straightened its course. The river terraces are sediment deposits parallel to the river's course that are the result of normal fluvial processes. Compare these terraces to the sand dunes in "H-2".

A number of elliptical features, known as Carolina bays, may also be seen in this frame. They are shallow depressions usually filled with fine material and covered with water or swampy vegetation. They occur on the Coastal Plain from Texas to Maryland and number in the thousands. One popular theory explains the bays as a result of numerous meteorite-type impacts. The question of origin is still a matter of debate among scientists.

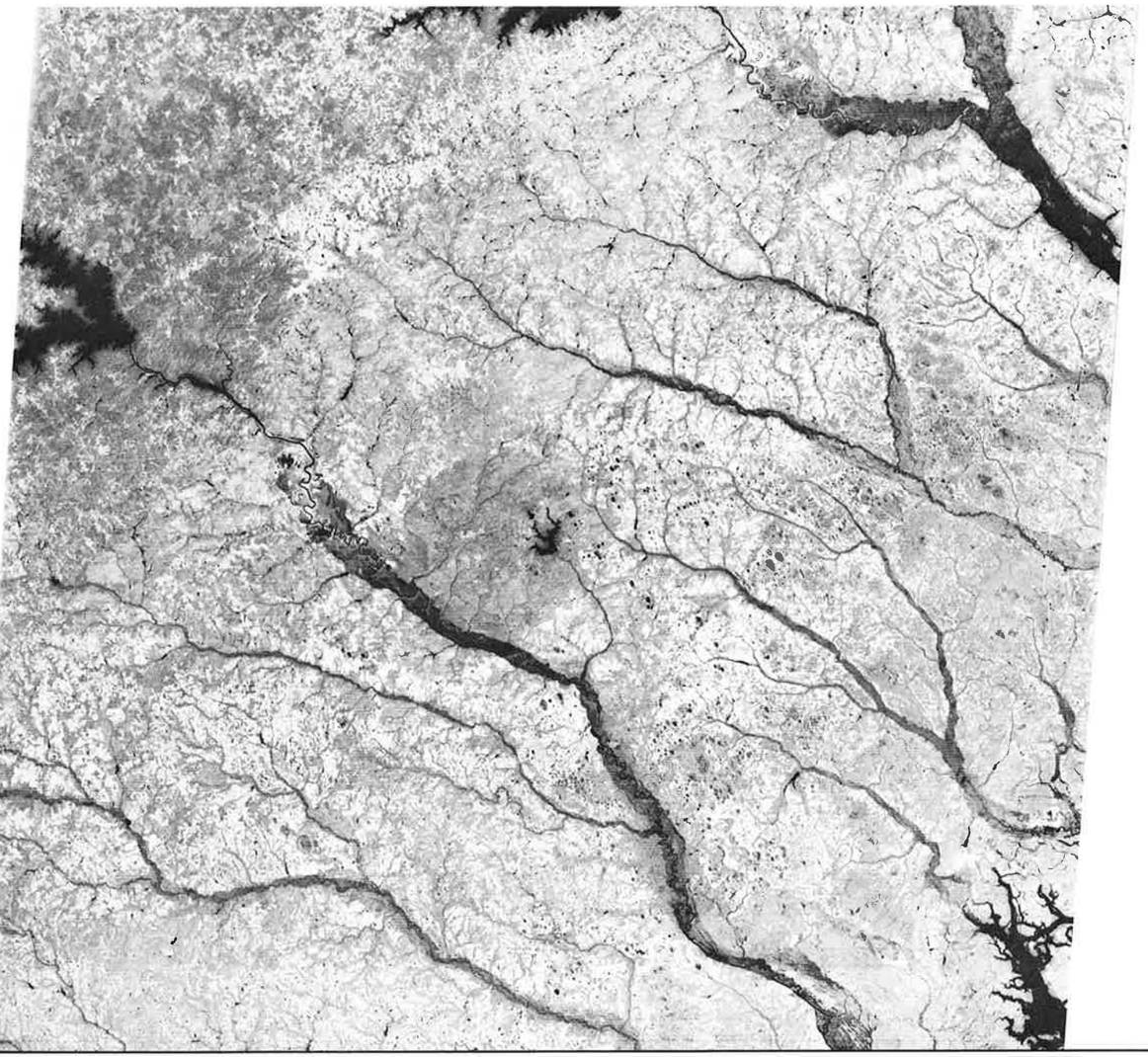
H-1
MSS-7
11 FEB. 74

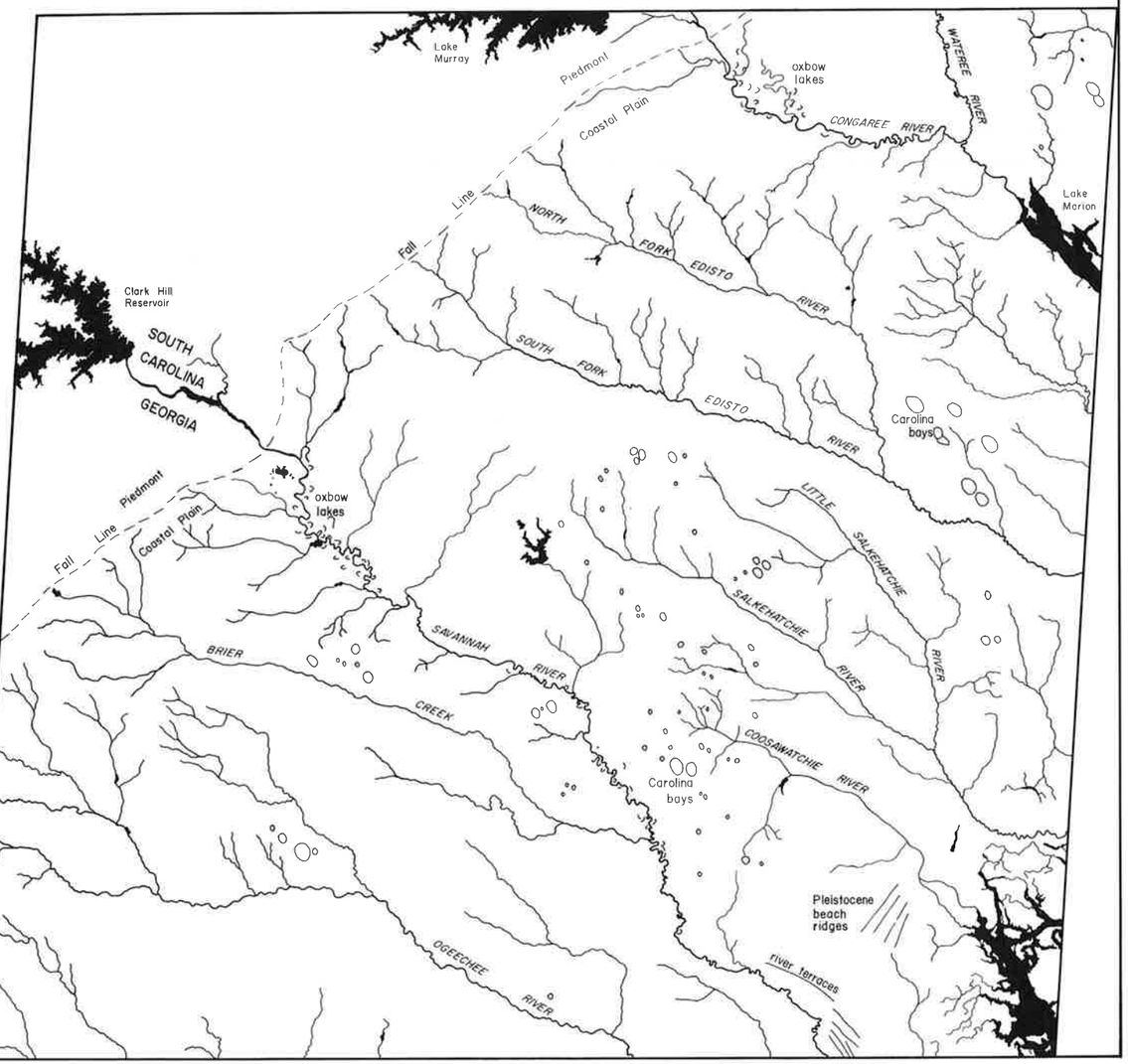


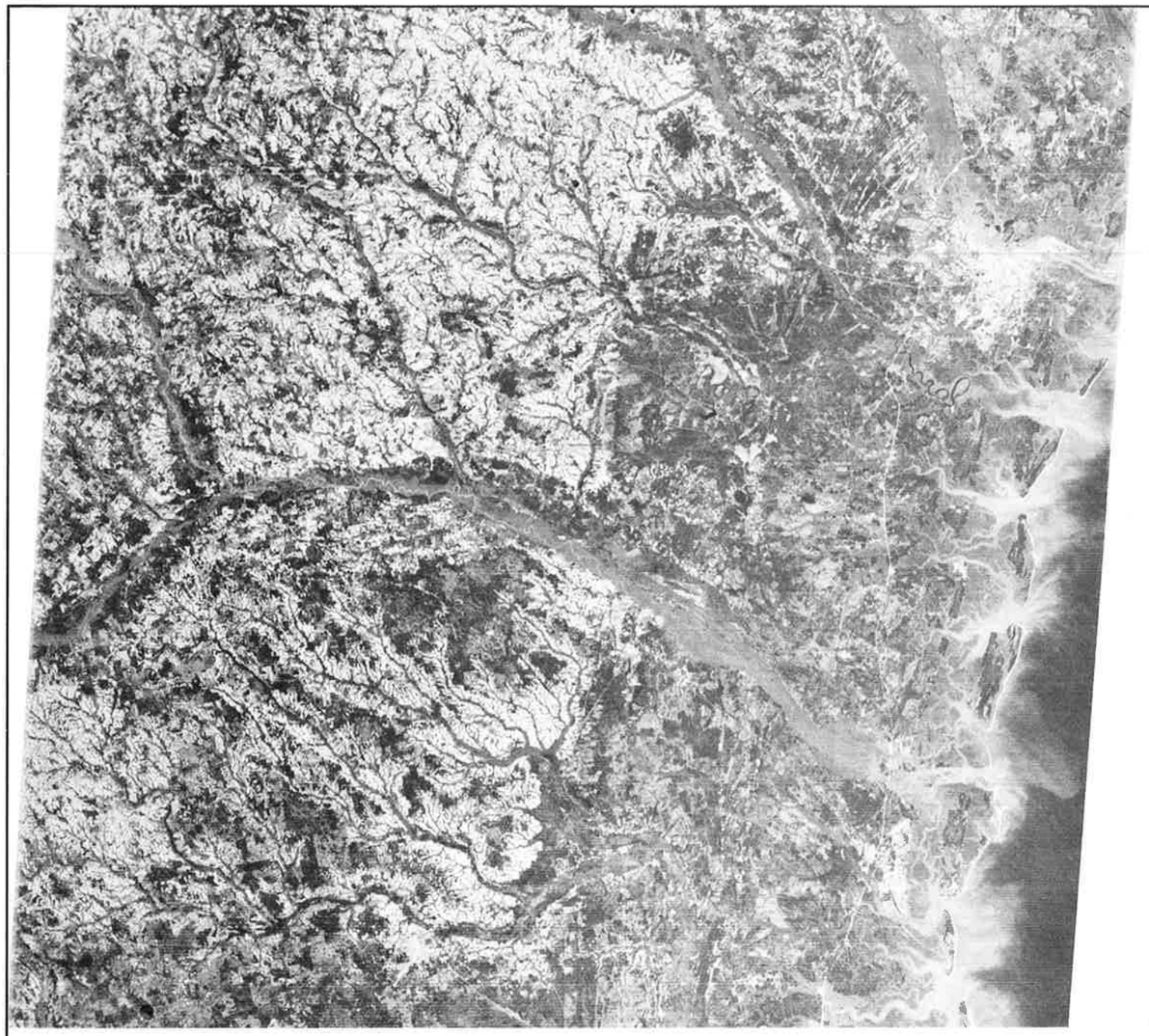
1 inch equals approximately 16 miles

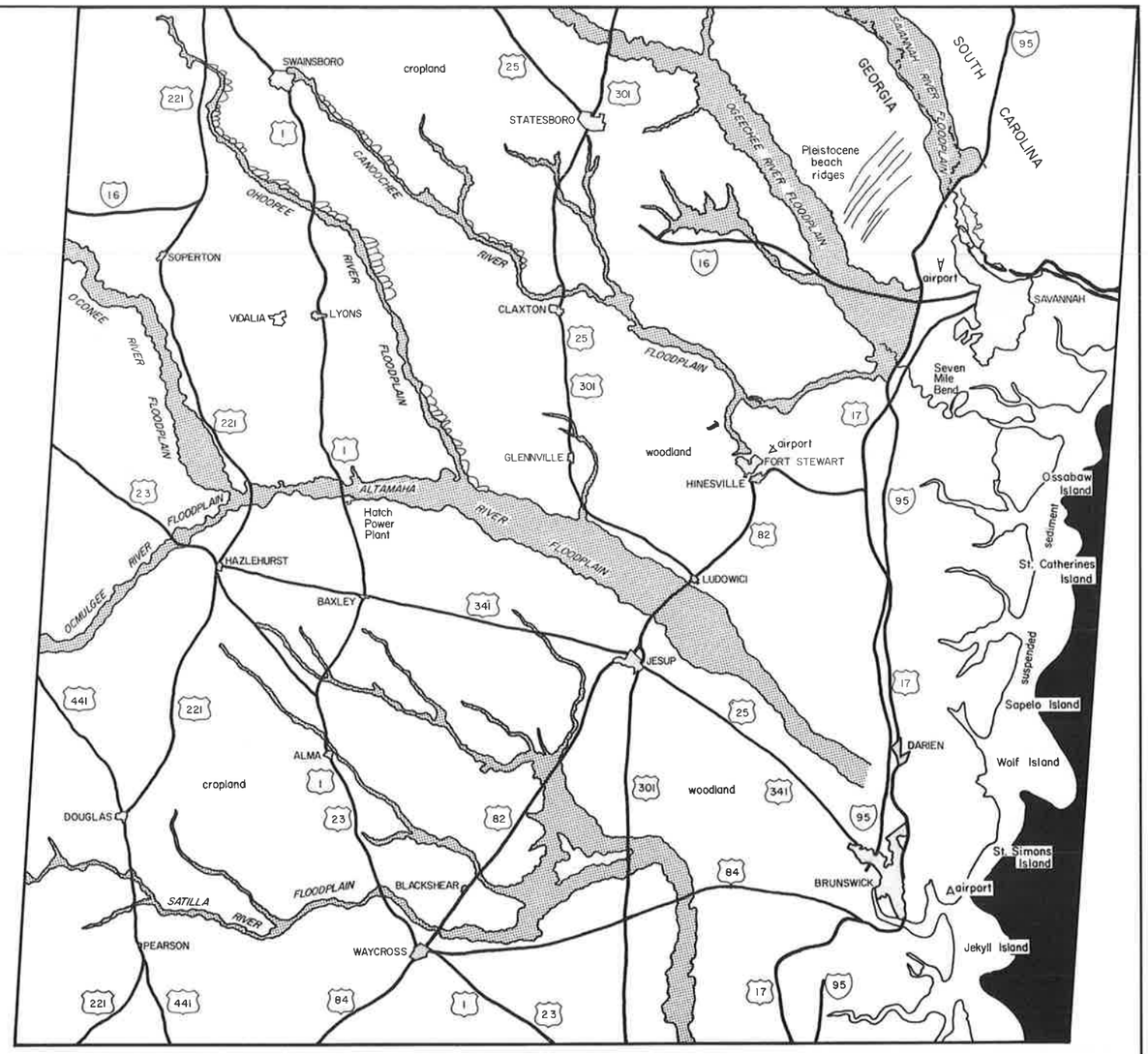
10 0 10 20 30 40 miles

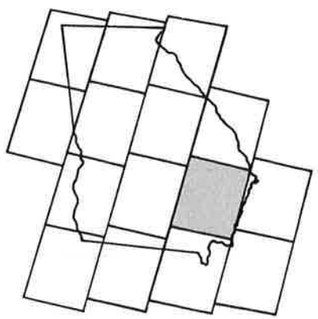
10 0 10 20 30 40 50 kilometers











H-2
MSS-5
11 FEB. 74

1 inch equals approximately 16 miles

10 0 10 20 30 40 miles

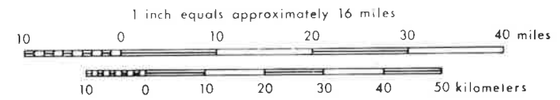
10 0 10 20 30 40 50 kilometers

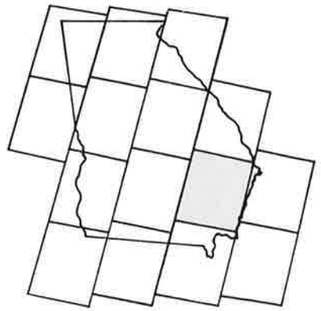
Perhaps the most striking feature seen here is the coastal terrace scarp visible as the boundary of the dark forested area on the east side of the imagery. The coastal scarp marks the westward extent of the encroachment of the Pleistocene sea. The band 5 image shows a significant change in land use along this line. East of the escarpment, the area is generally underlain by fine-grained sand. This particular area is not well suited for farming and hence is used extensively for pulpwood and forest products. The more clayey sediments west of the scarp have lower infiltration rates which contribute to a well developed dendritic network of small streams. This Landsat image helps us to realize the scarp as a major physiographic, hydrologic, geologic, and land use boundary.

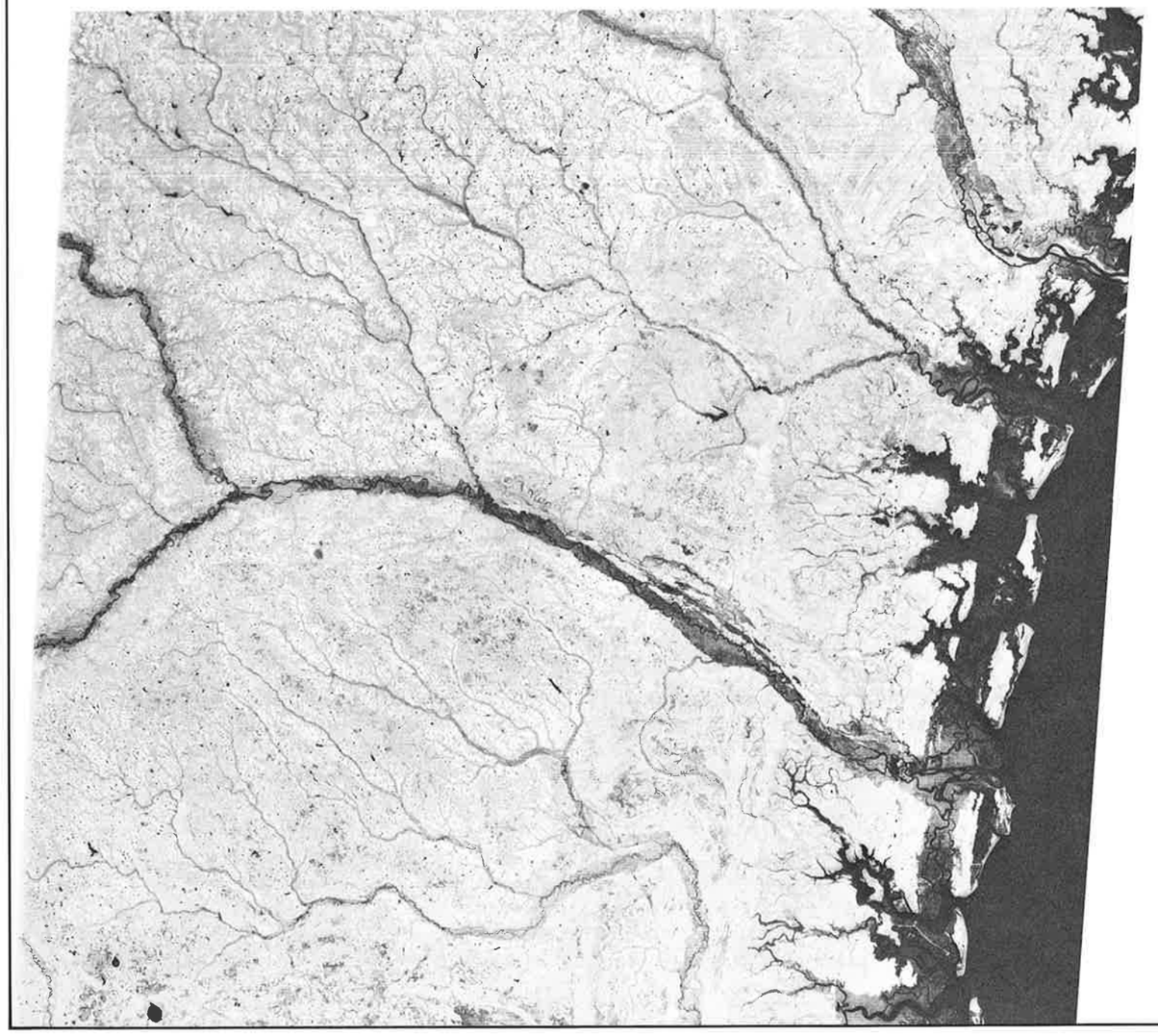
The Ogeechee River, south of Savannah, has a very prominent meander named Seven Mile Bend. This meander is in the process of being cut off as the Ogeechee River straightens its course. After the meander is cut off it will become an oxbow lake similar to, but much larger than, those oxbow lakes shown along the Altamaha River.

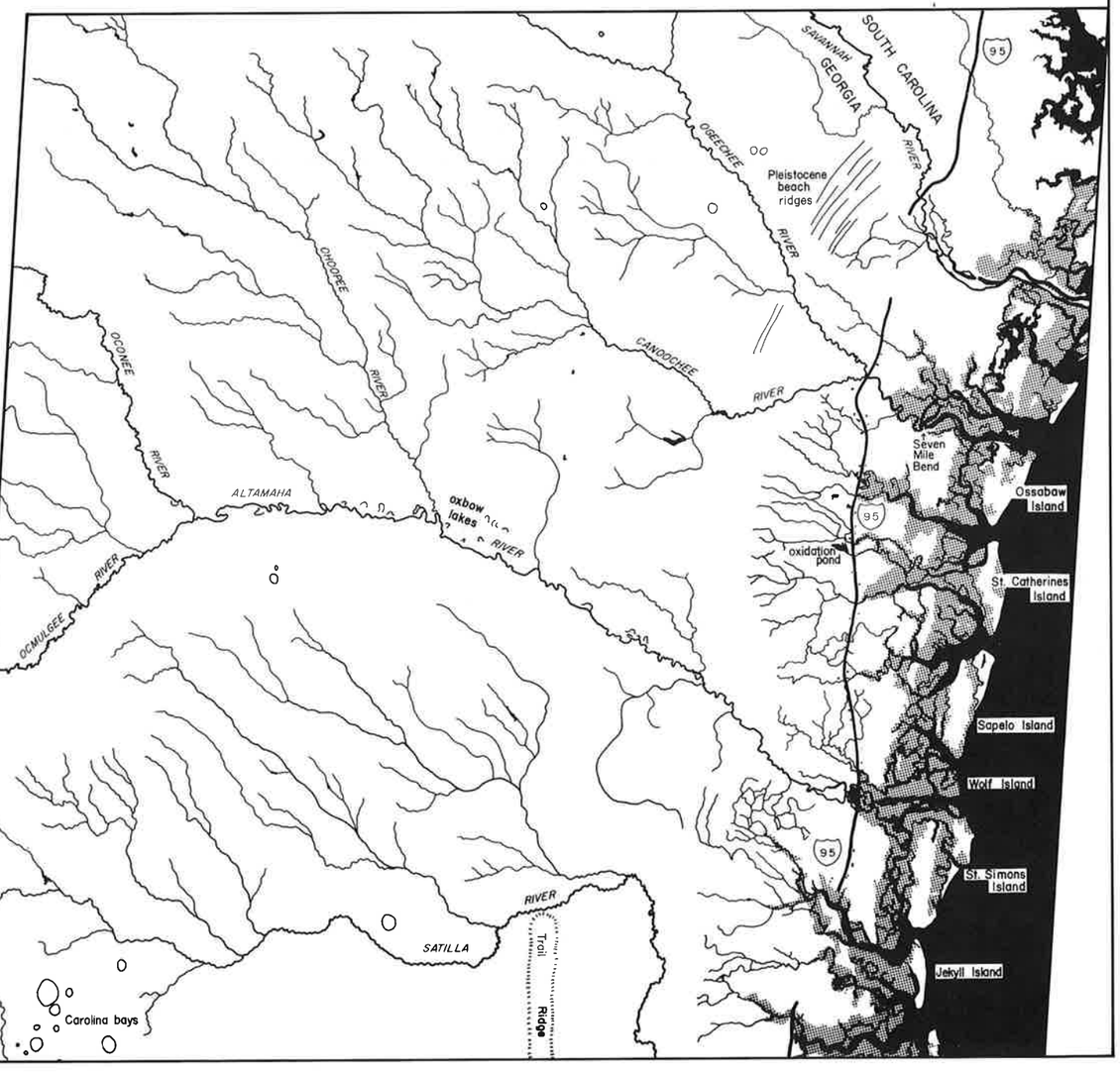
Several major rivers display light-colored parabolic features on their eastern banks. First recognized on Landsat imagery, they seem to be an unusual type of sand dune not previously described in Georgia. The extent of these dunes has yet to be mapped, and only typical ones along the Ohoopee and Canoochee Rivers are indicated here.

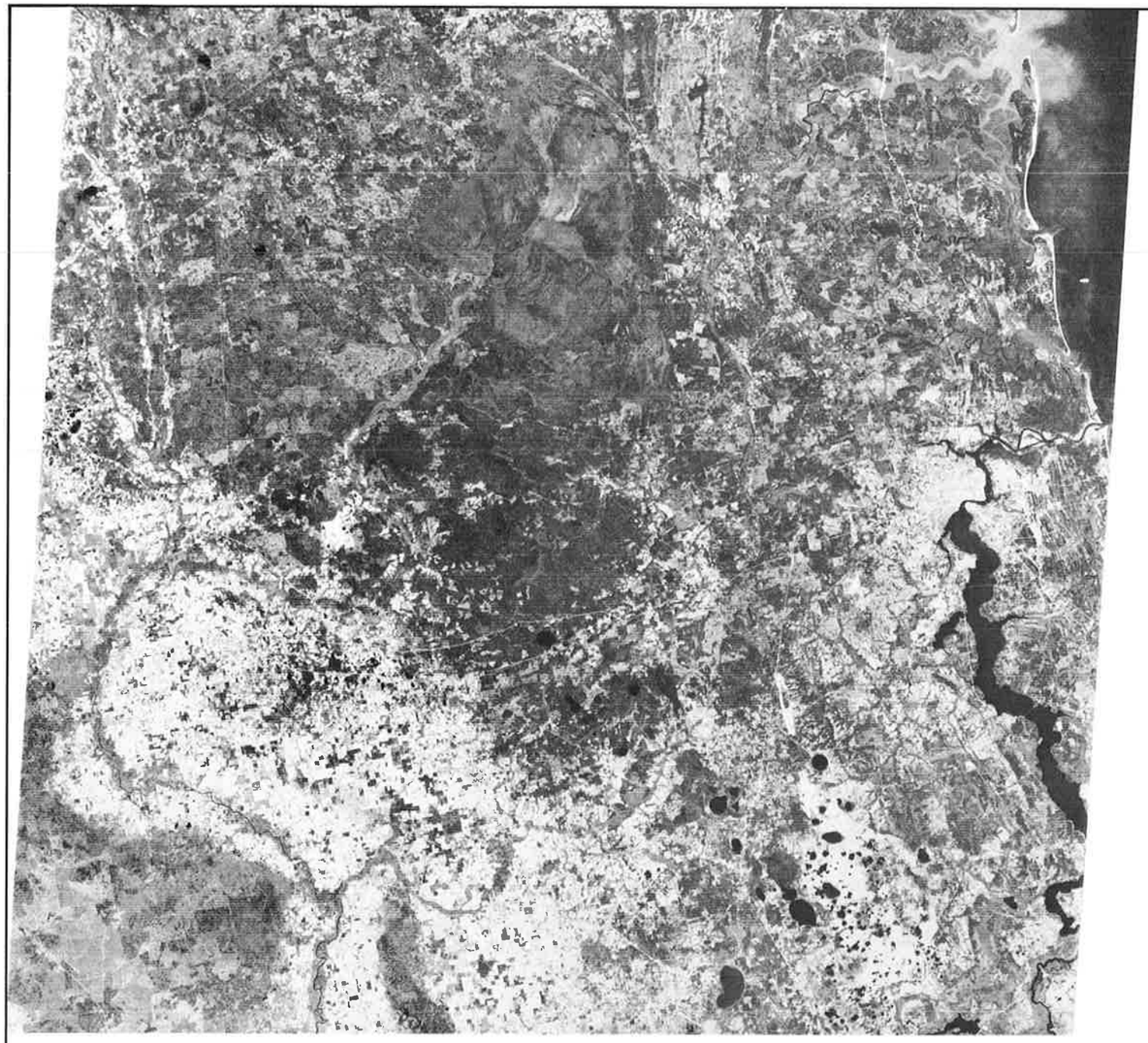
H-2
MSS-7
11 FEB. 74

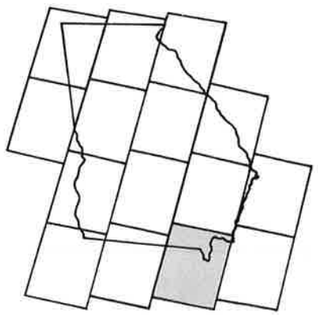












H-3
MSS-5
11 FEB. 74

1 inch equals approximately 16 miles

10 0 10 20 30 40 miles

10 0 10 20 30 40 50 kilometers

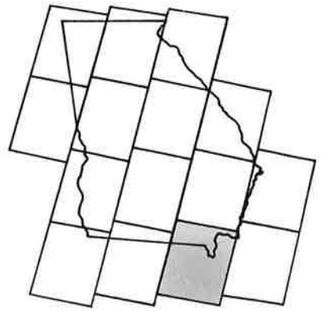
This frame includes most of the Okefenokee Basin District and the entire Okefenokee Swamp. The basin is covered with a mantle of medium- to fine-grained sand underlain by relatively impermeable Pliocene and Miocene clay units. Most of the rainfall soaks into the sand and, unable to penetrate the clay strata, travels down dip and reappears as springs within the swamp. The Okefenokee Swamp is thought to have been formed when a marine bay was cut off from the ocean by the development of a longshore barrier island, the present Trail Ridge visible on the band 7 image. As sea level dropped, this ridge acted as a dam, trapping remnant salt water and impounding the east-flowing drainage. The salt water was soon drained by the Suwannee and St. Marys Rivers and replaced by run off and fresh ground water from the Okefenokee Basin. Using satellite

imagery, water circulation patterns and gross morphology of the swamp may be studied on a repetitive basis for the first time.

Northeast of Folkston was a large titanium and rare earth metals mine. The larger gray area is land reclaimed under the provision of the Georgia Surface Mining Act of 1968. Note that comparable mining operations in Florida, such as the phosphate mine southeast of Jasper and the titanium mines east of Starke, where reclamation was not required to meet the same standards as Georgia's, show no signs of such reclamation.

The water-filled limesinks of central Florida, oriented north-south, trend along the axis of the Peninsular Arch. This trend marks the area where limestones have been brought near the surface by regional arching.

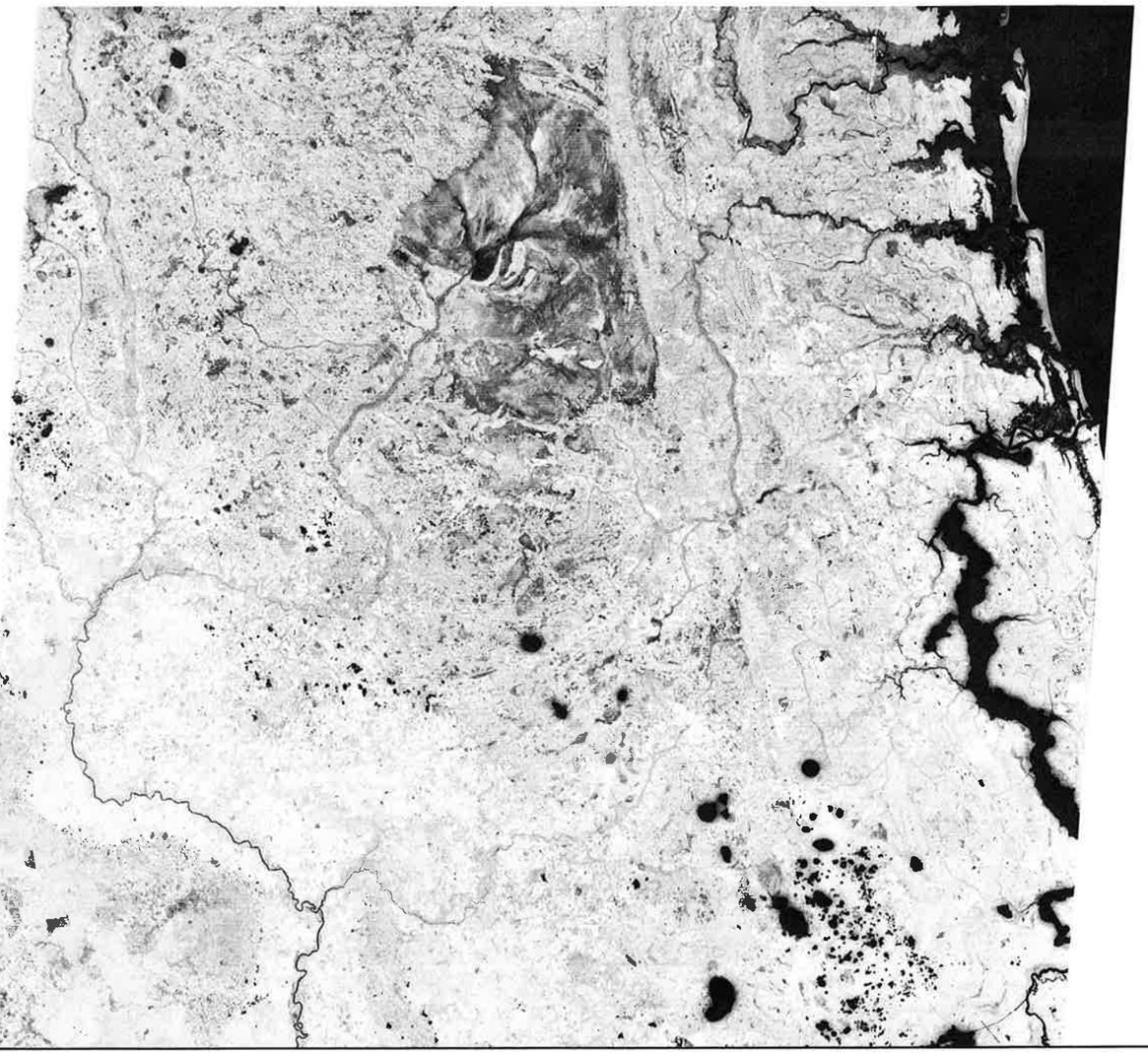
H-3
MSS-7
11 FEB. 74

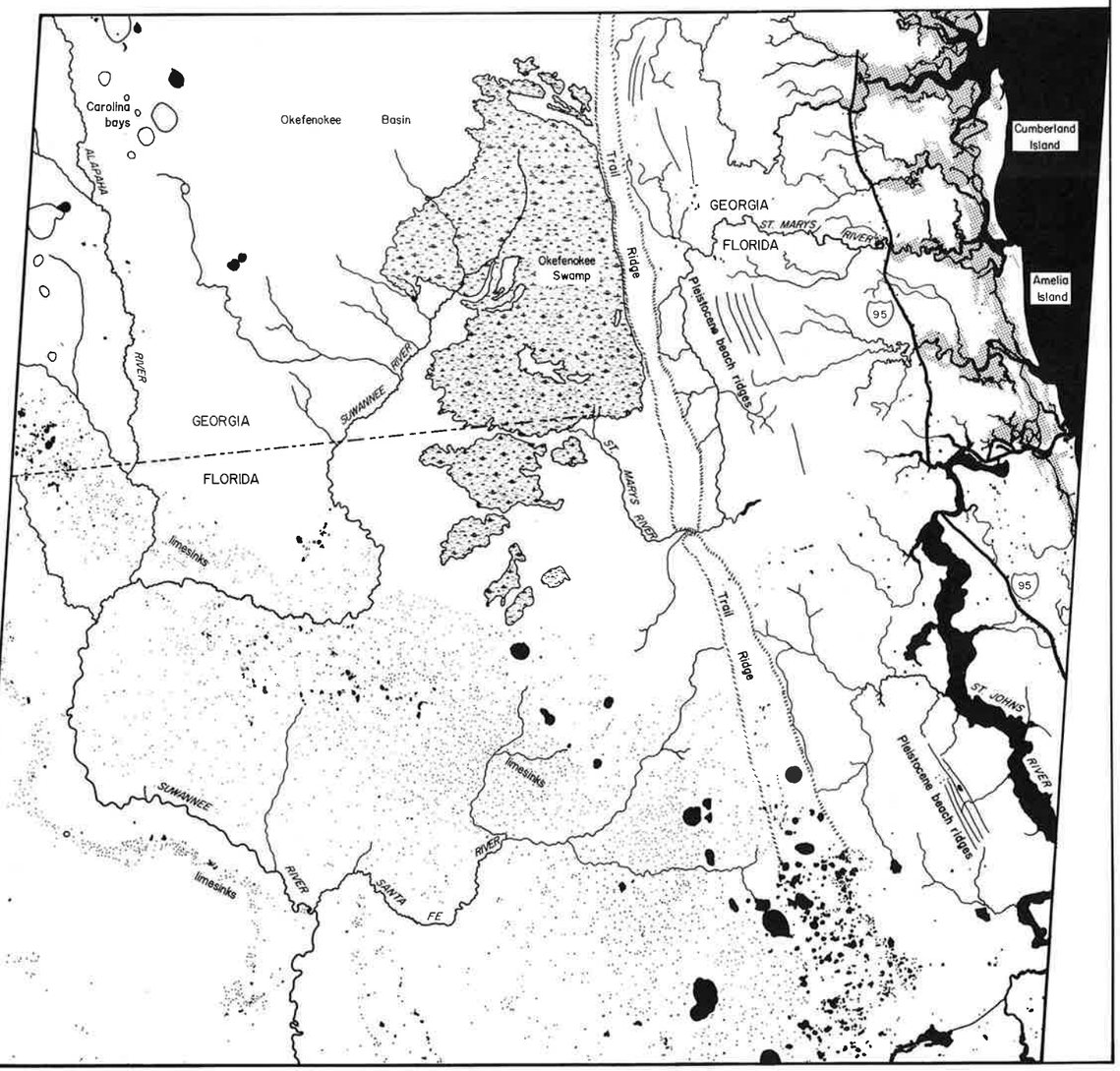


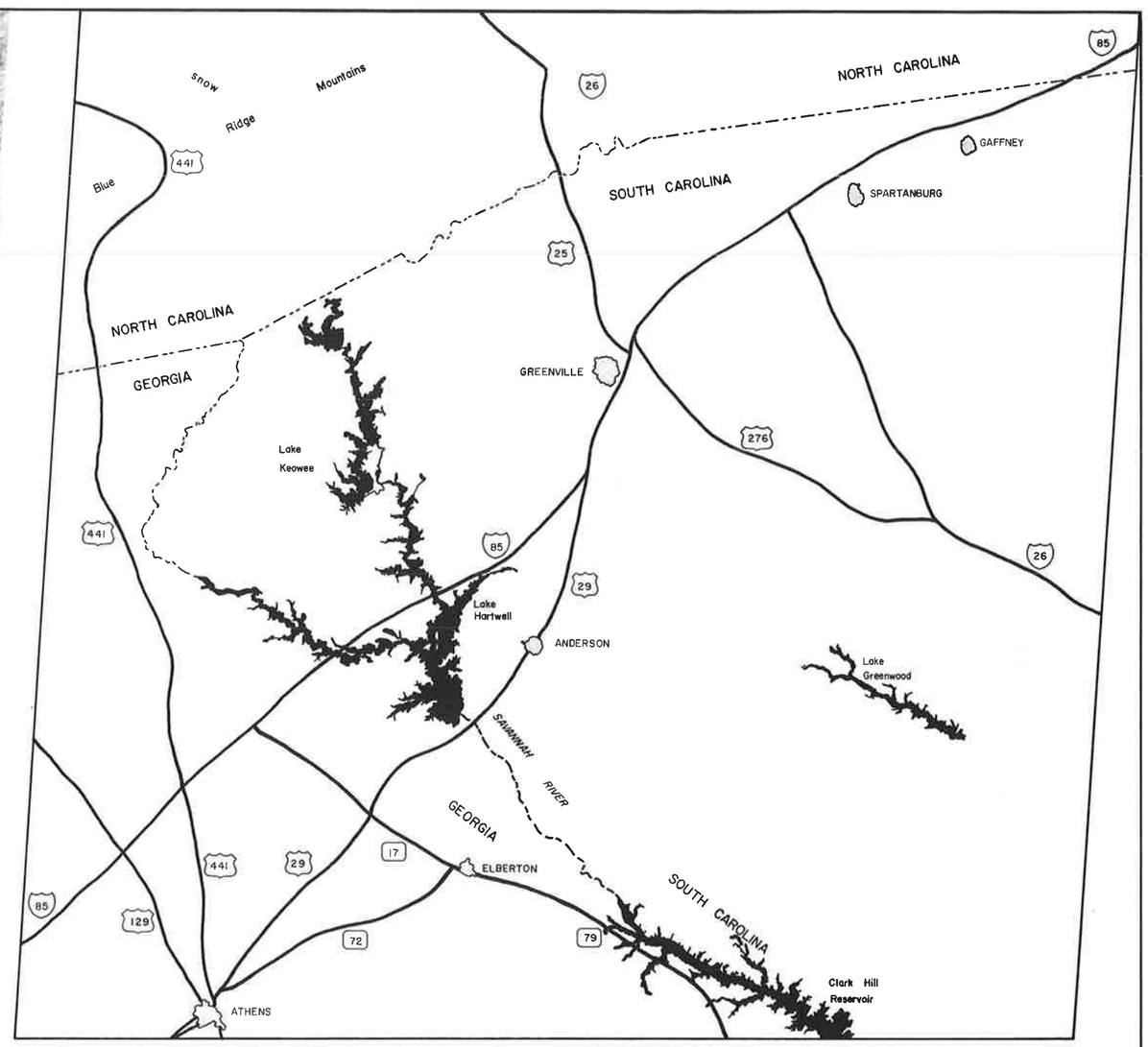
1 inch equals approximately 16 miles

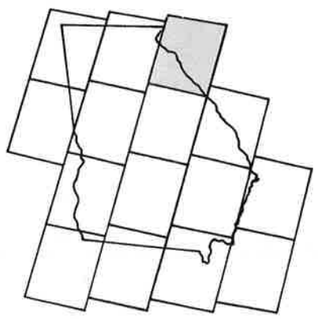
10 0 10 20 30 40 miles

10 0 10 20 30 40 50 kilometers









I-1
MSS-5
30 JAN. 73

1 inch equals approximately 16 miles

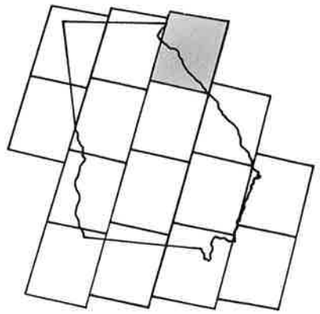
10 0 10 20 30 40 miles

10 0 10 20 30 40 50 kilometers

This winter imagery illustrates the contrast of light-toned agricultural areas of the Piedmont with the darker, forested Blue Ridge Mountains. Higher areas of the Blue Ridge are covered with snow. The sheared rock of the Brevard Fault Zone has been eroded into long, low, linear ridges and valleys, which are discernible by their shadows from the low sun angle of winter. These structural lineaments are best viewed on the band 7 image.

The Brevard Fault Zone extends from North Carolina to Alabama where the onlap of Coastal Plain sediments obscures the structure. North of the Brevard another series of lineaments strike east-northeastwards, then turn abruptly to join the northeast trending Brevard Zone. The northernmost of these lineaments, more prominent than suggested by previous detailed mapping, is the Warwoman Shear.

I-1
MSS-7
30 JAN. 73

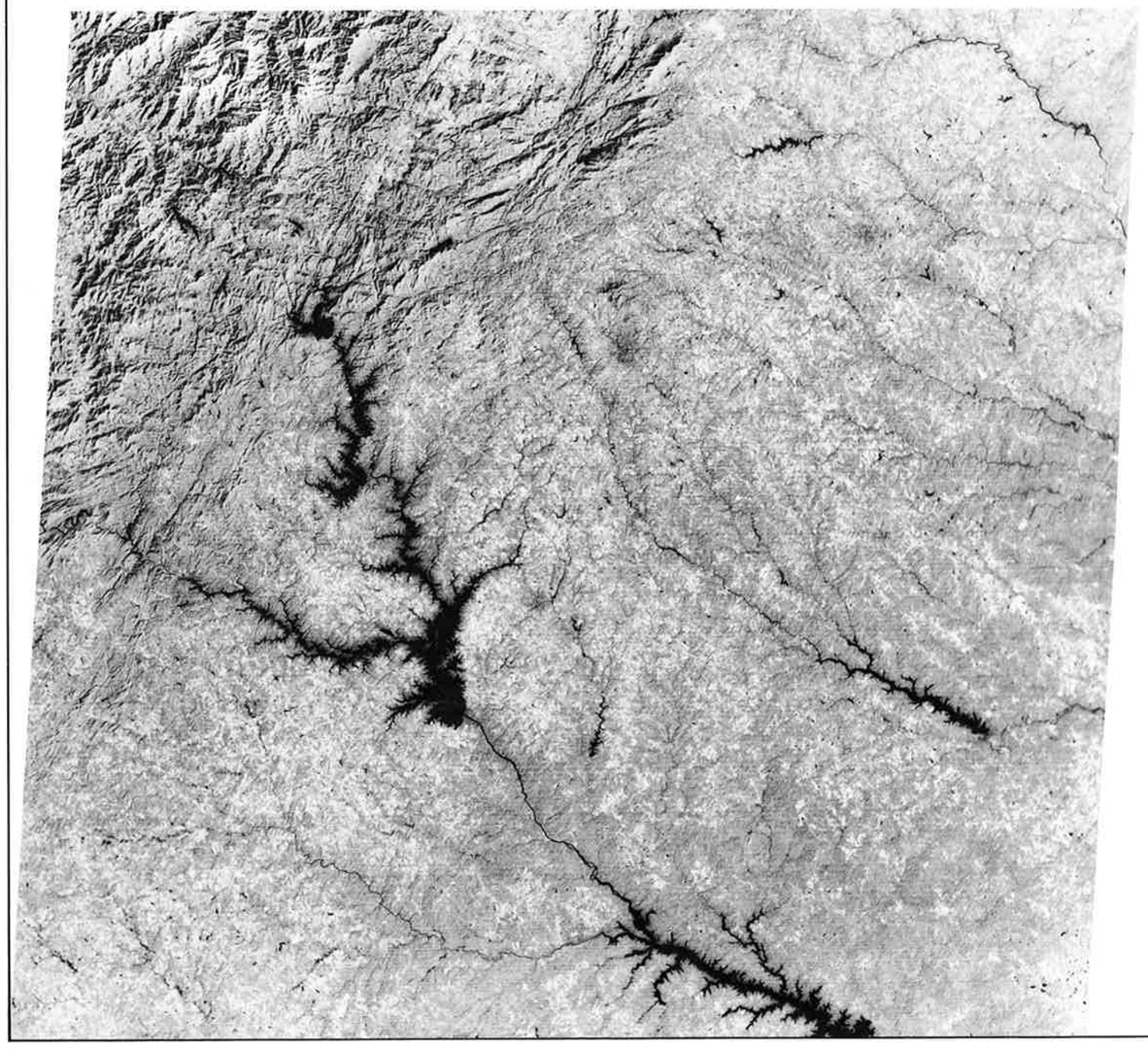


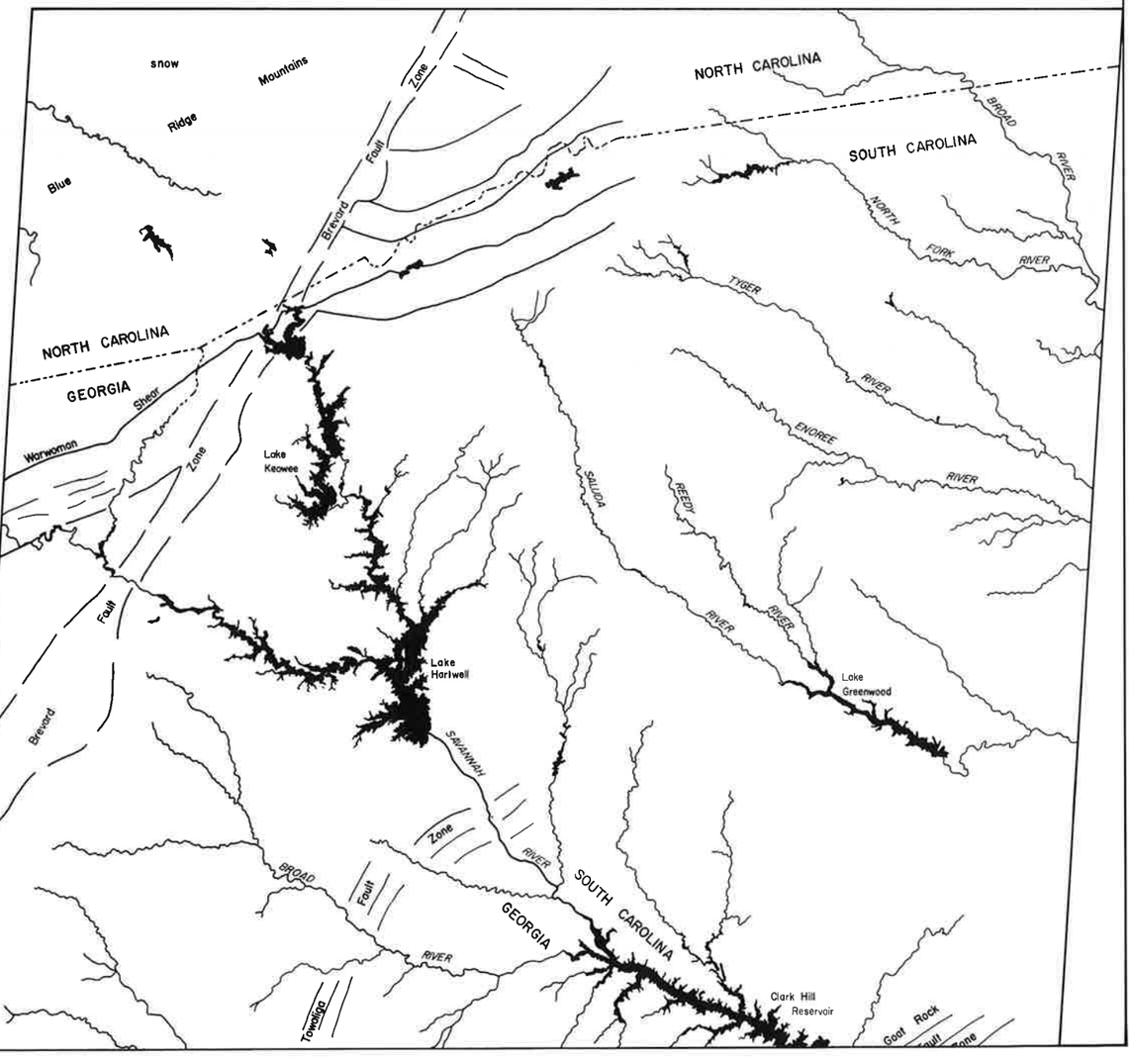
1 inch equals approximately 16 miles

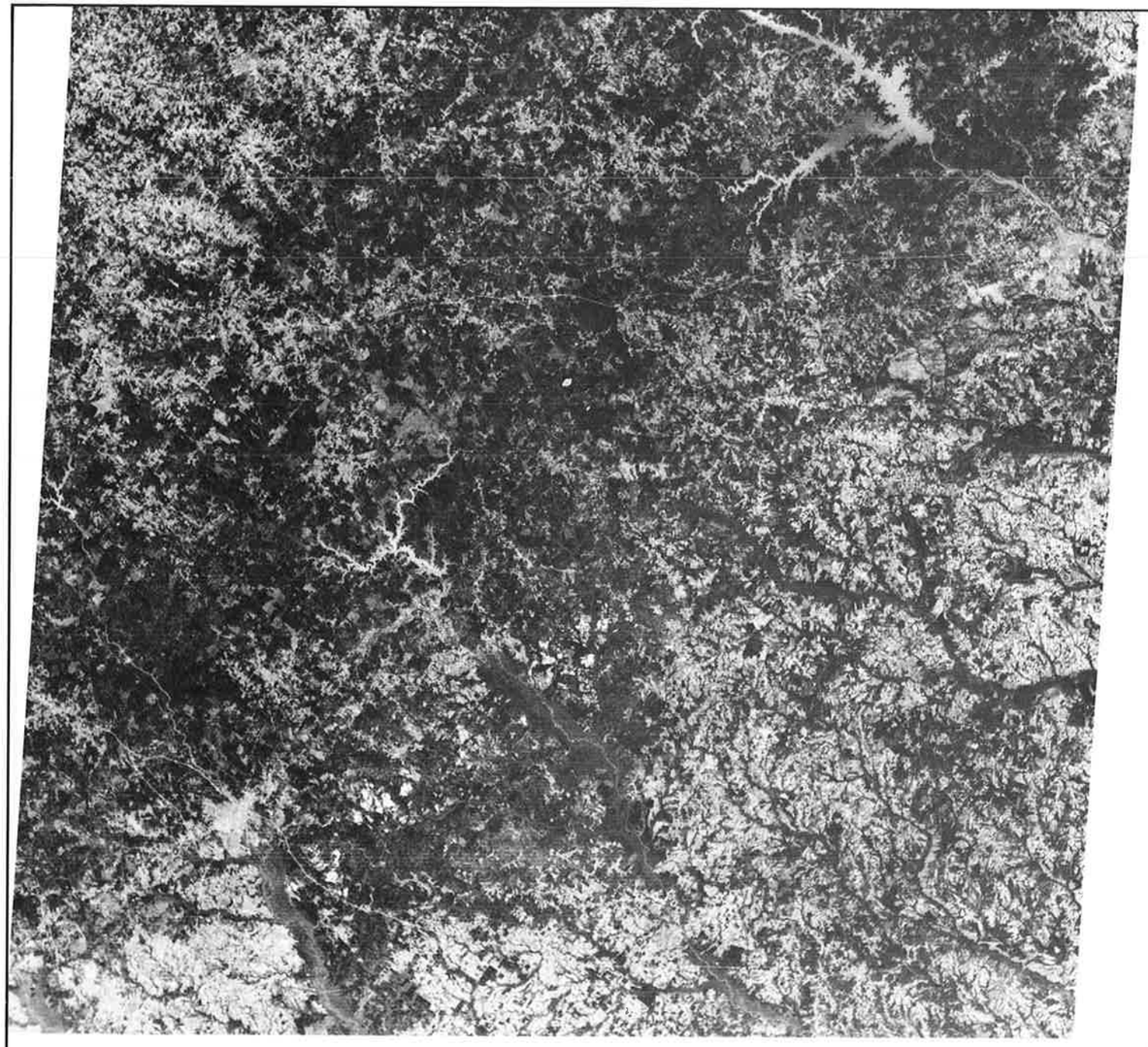
10 0 10 20 30 40 miles

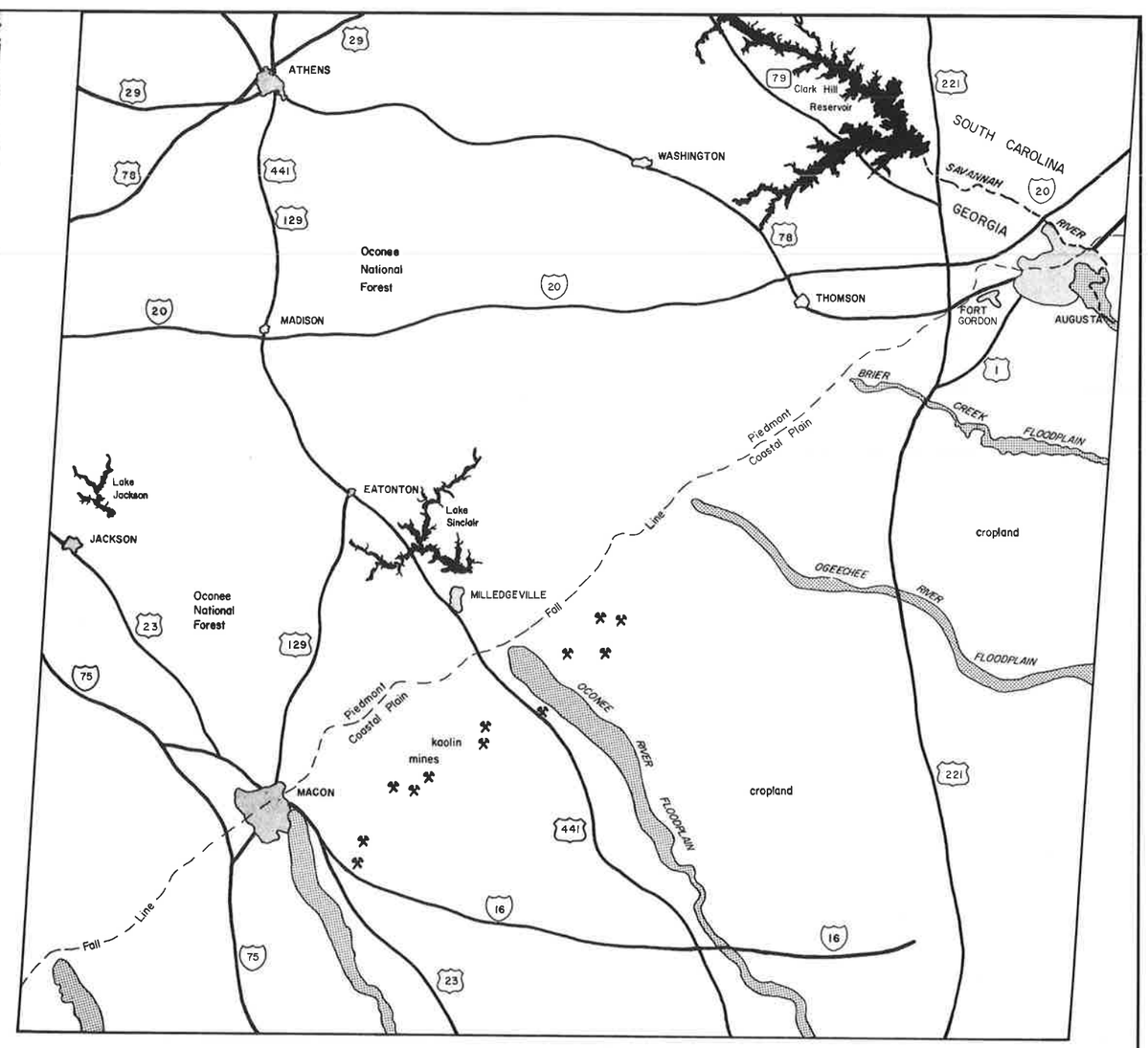
10 0 10 20 30 40 50 kilometers

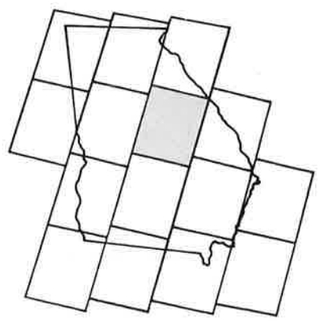
The Savannah River provides an interesting example of man's activity on the landscape. The construction of dams near Augusta and Hartwell has changed the Savannah River into an almost continuous lake from the Blue Ridge Mountains to the Clark Hill Dam. Small farm ponds, so prevalent on the Coastal Plain, are not as plentiful within the Piedmont and are almost absent in the highland areas. Compare this frame to I-3.











I-2
MSS-5
30 JAN. 73

1 inch equals approximately 16 miles

10 0 10 20 30 40 miles

10 0 10 20 30 40 50 kilometers

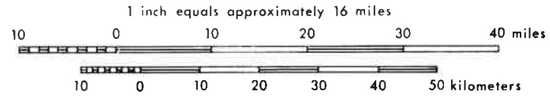
This frame exhibits the marked differences in land use patterns that exist in the Piedmont and the Coastal Plain. On the band 5 image the area north of the Fall Line appears dark as it is predominantly pine forest. The Coastal Plain, on the other hand, has a lighter tone because it is mainly land cleared for agriculture. The Fall Line cities, Macon and Augusta, are located where early settlers and traders first encountered shoals, rapids or waterfalls which impeded further transportation upstream.

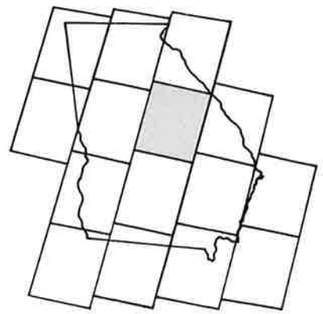
The numerous bright white areas just south of the Fall Line represent Georgia's kaolin mining district. Kaolin was first recognized in the area in 1741 and mined briefly. In 1900 active mining began again, and today, Georgia produces over 150 million dollars worth of this industrial clay each year.

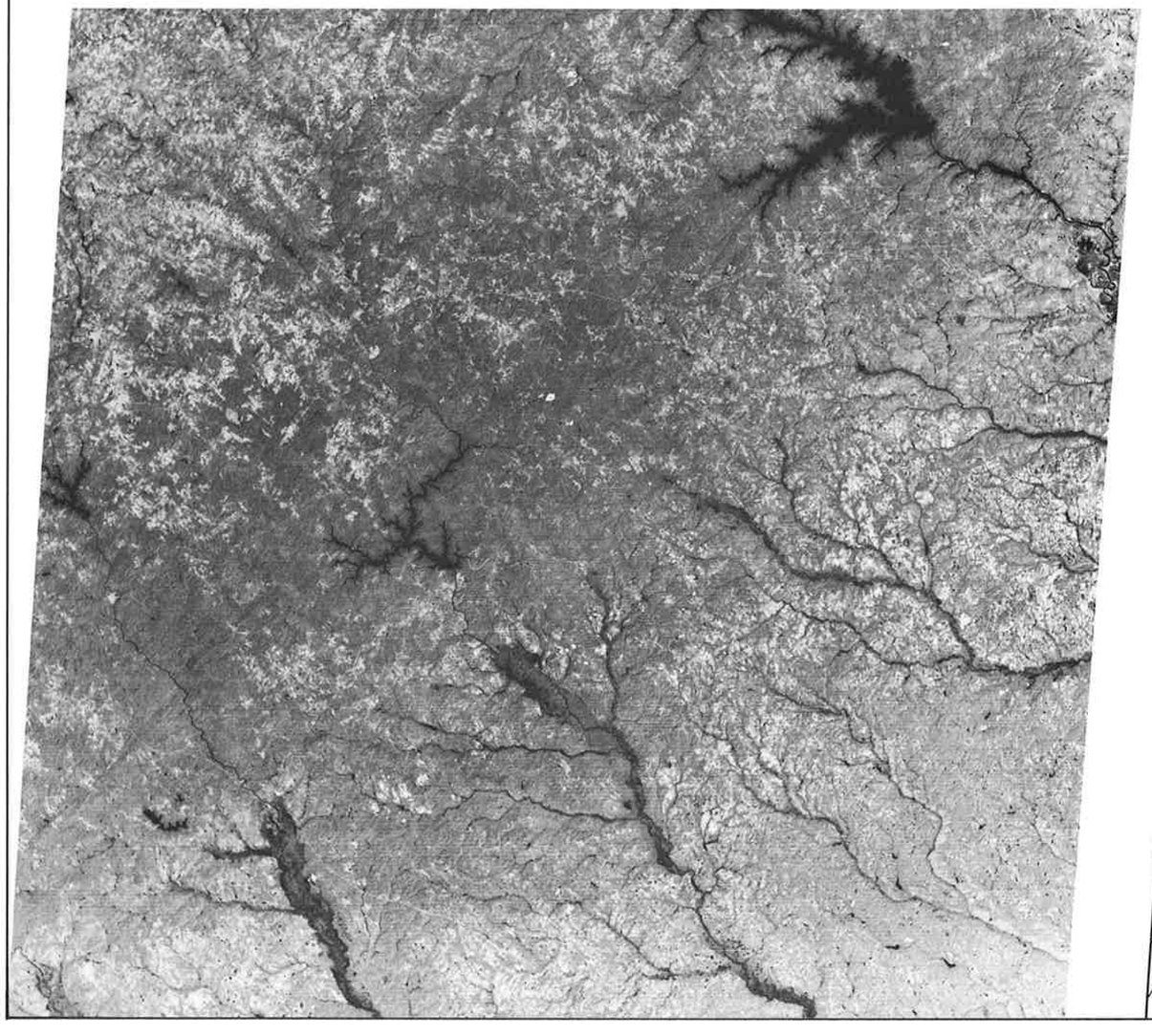
The rivers of the Coastal Plain are characterized by wide, swampy floodplains seen on the band 5 image as dark, forested networks appearing to terminate near the Fall Line. Although floodplains of the major rivers and streams exist north of the Fall Line, they are too narrow to be seen at such a small scale.

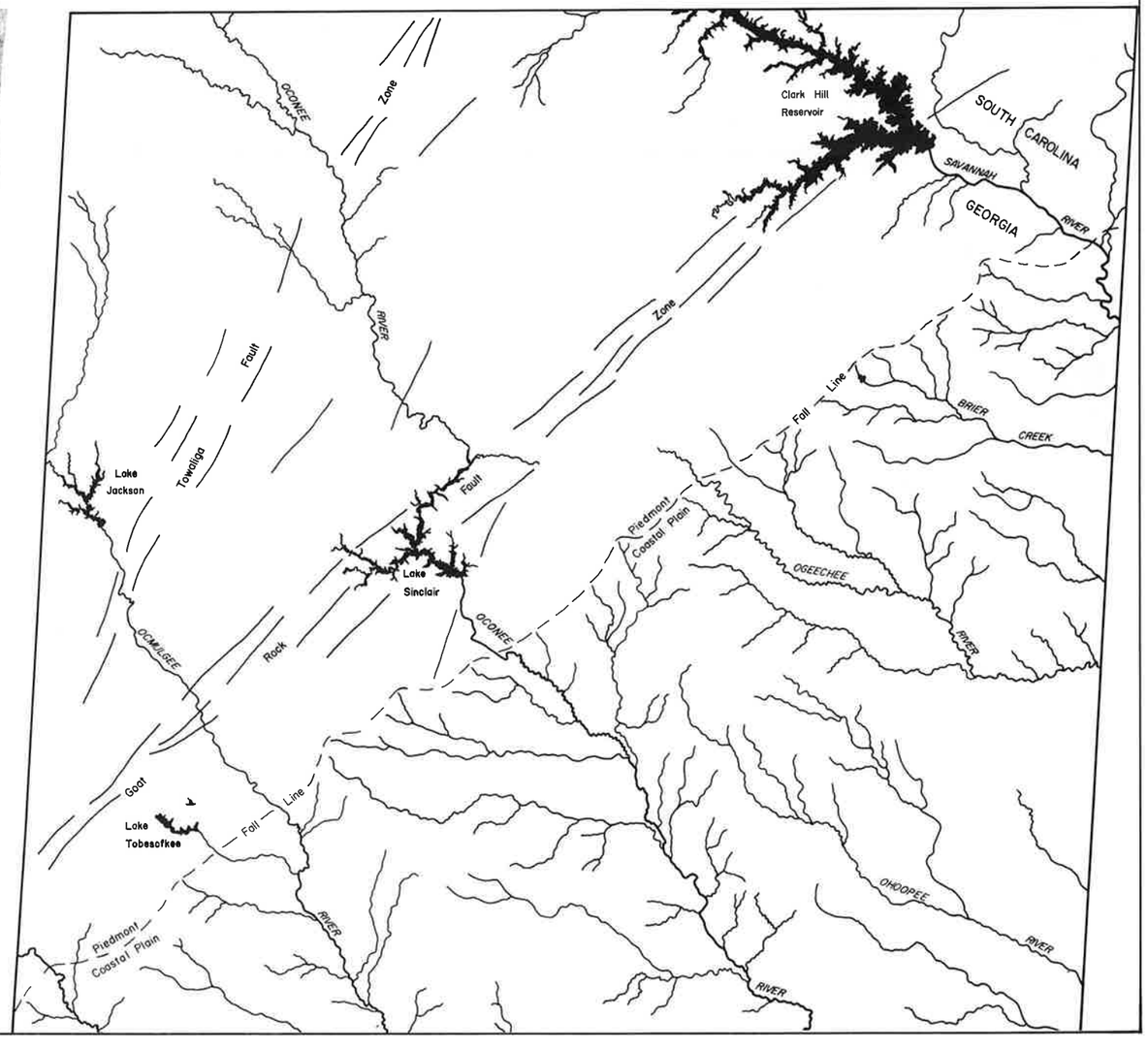
The band 7 image shows a series of lineaments that run northeast-southwest across the frame. These lineaments mark the Towaliga and Goat Rock Fault systems and can be traced from Pine Mountain, Georgia, toward South Carolina.

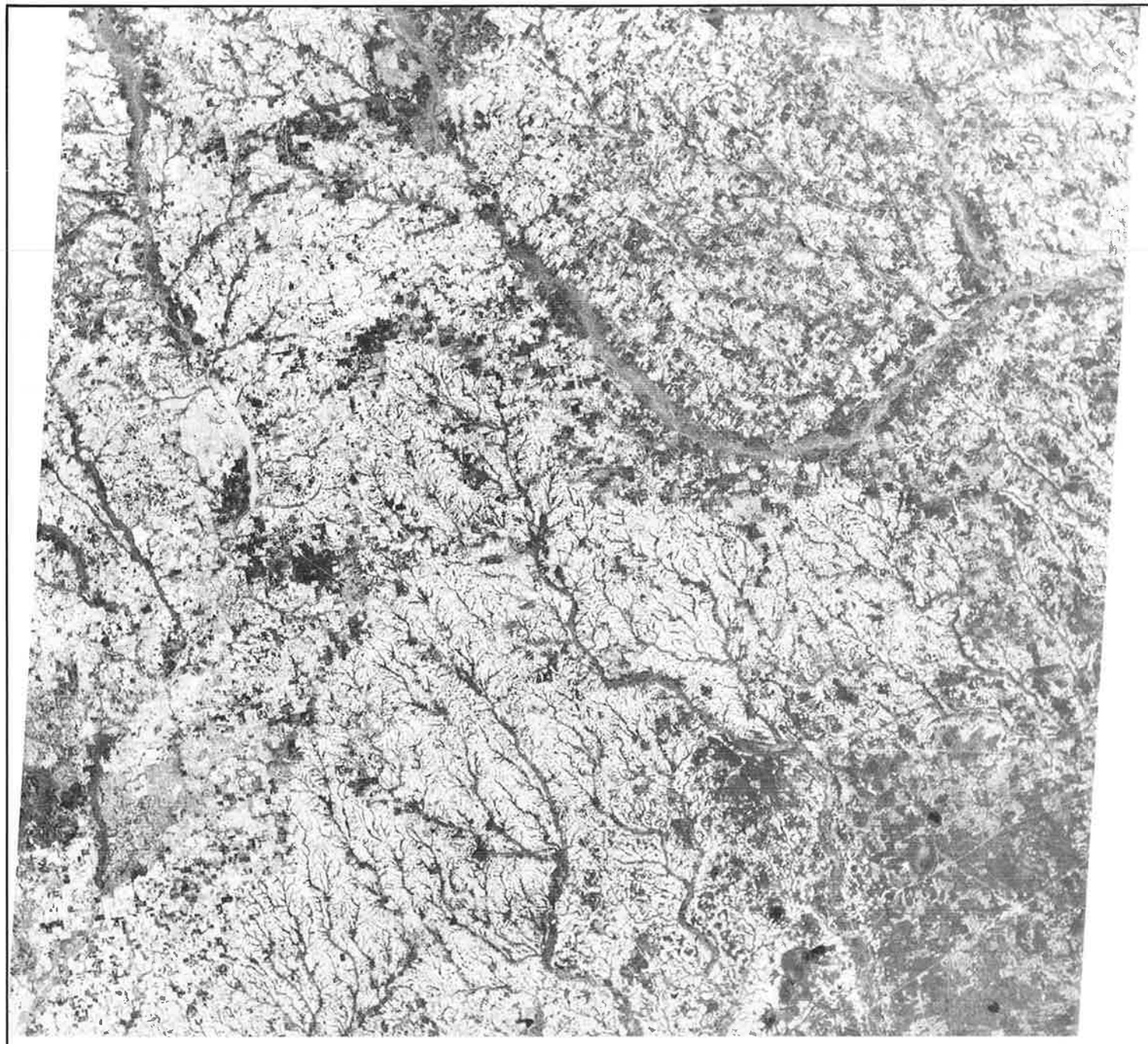
I-2
MSS-7
30 JAN. 73

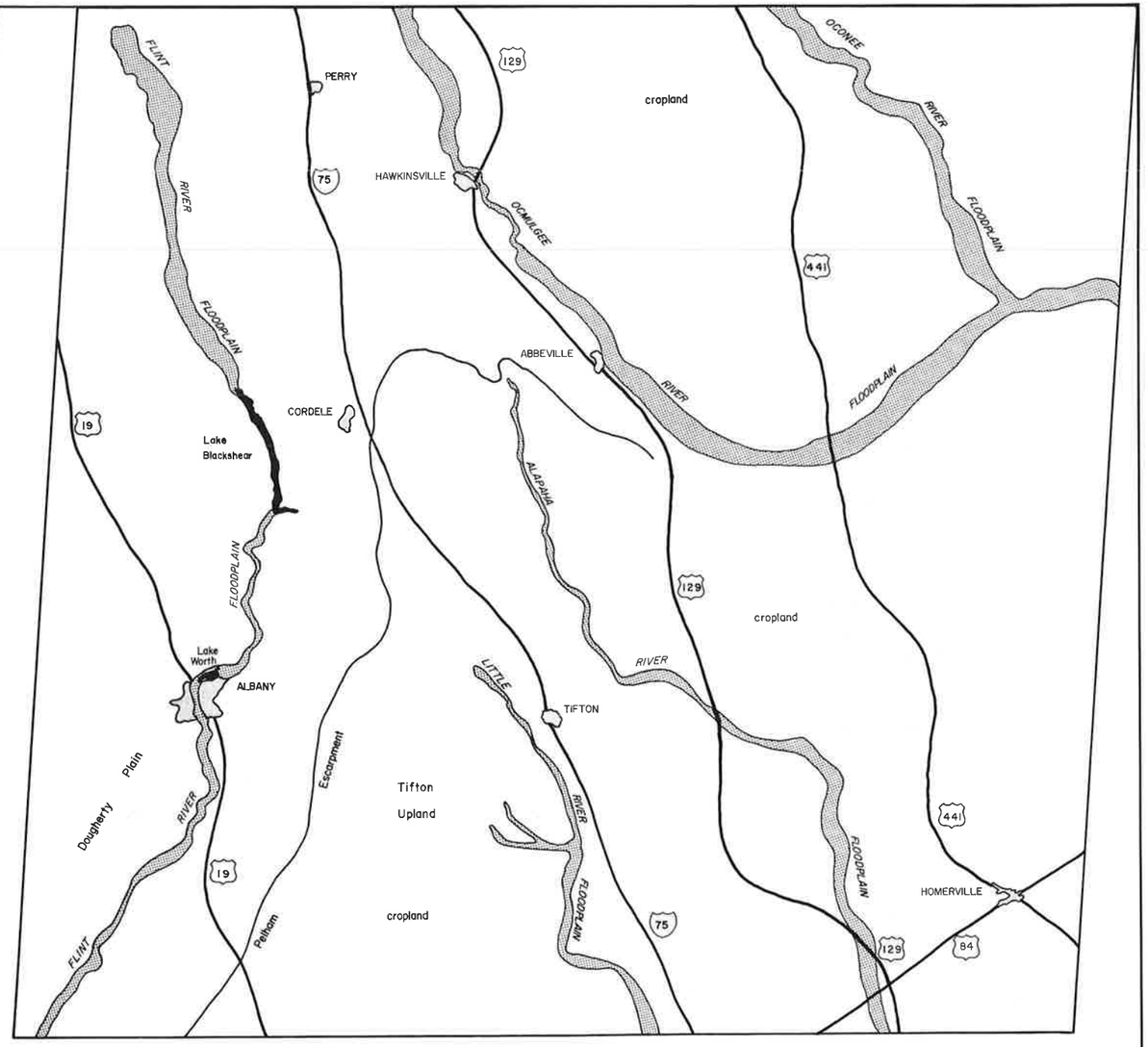


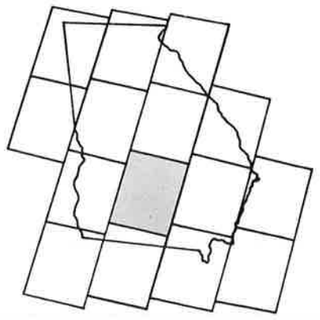












I-3
MSS-5
30 JAN. 73

1 inch equals approximately 16 miles

10 0 10 20 30 40 miles

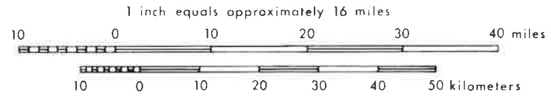
10 0 10 20 30 40 50 kilometers

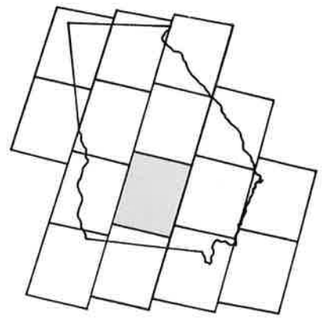
Cultivated land, the predominant land use in the area, is observable on band 5 as light patches. Very little surface stream drainage is visible on the Dougherty Plain. The band 7 image shows numerous water-filled limesinks which drain surface water directly into the subsurface limestone aquifer. On the other hand, a well developed dendritic drainage pattern is found on the Tifton Upland where the limestone is overlain by clays which have low infiltration rates. East of the Alapaha River, the forested area of the Okefenokee Basin has a much darker tone.

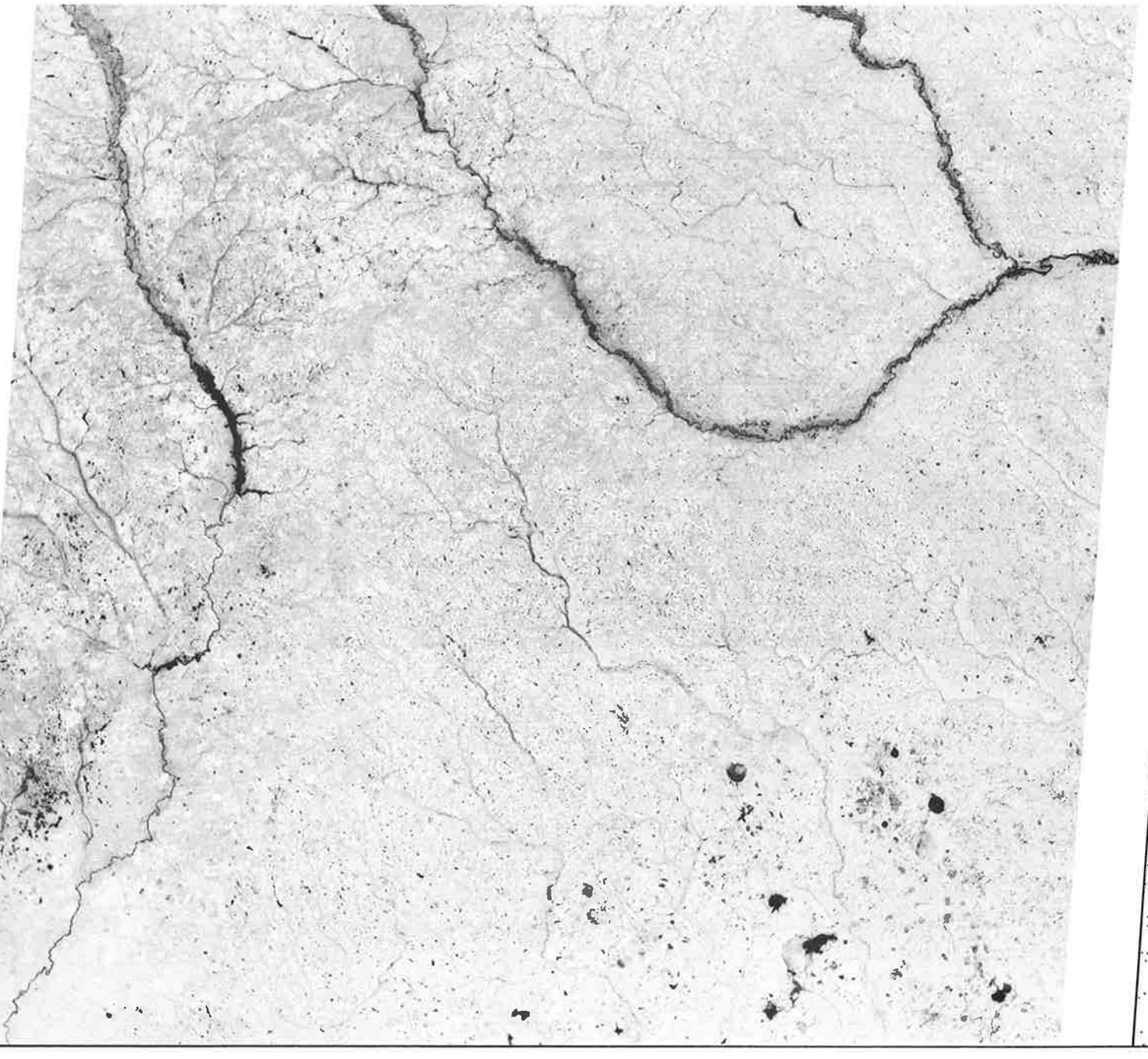
The band 7 image indicates the presence of many small ponds and lakes throughout the entire scene. The Pelham Escarpment, which marks the boundary between the Dougherty Plain and the Tifton Upland, also separates the generally natural water bodies from the man-made ones. With the exception of Lake

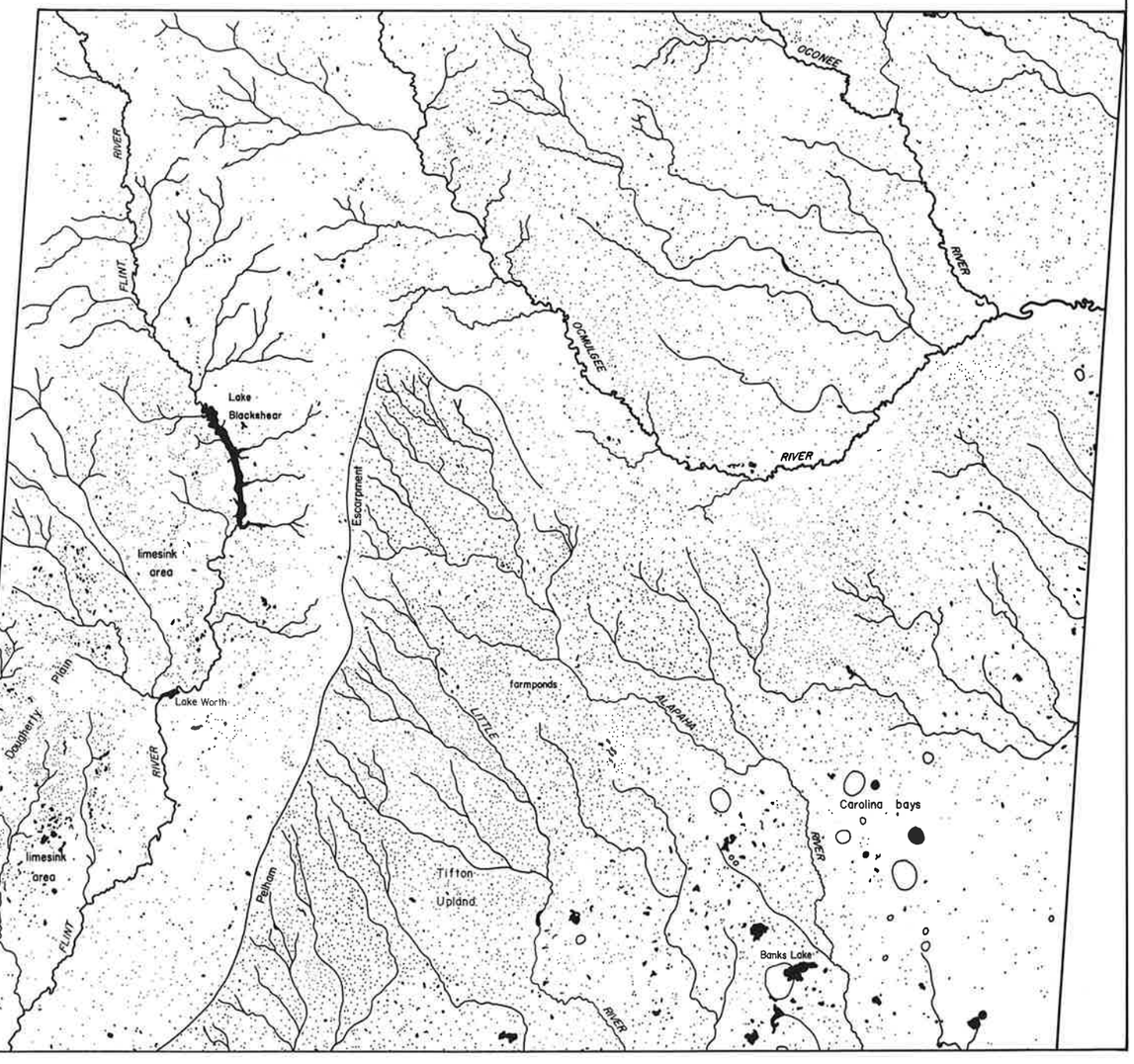
Blackshear, most water bodies west of the escarpment are natural limesinks formed by the solution of limestones underlying the Dougherty Plain. To the east of the escarpment, the surprising abundance of water bodies are mainly man-made farm ponds. Adjacent to the Alapaha River is a heavy concentration of Carolina bays. The Alapaha Carolina bay field contains some of the larger Carolina bays in Georgia, the largest being approximately 6.4 kilometers (3.8 miles) in diameter.

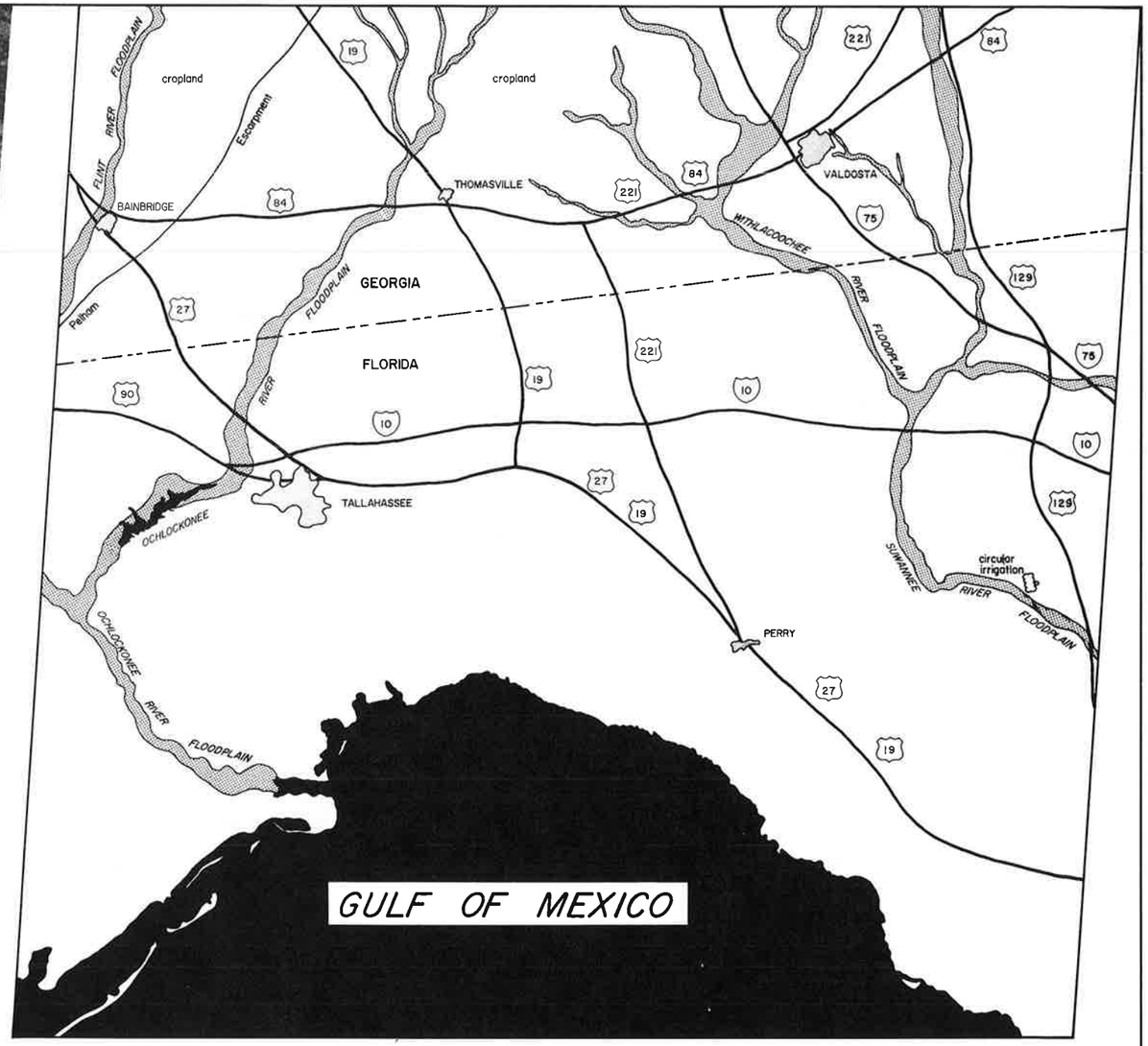
I-3
MSS-7
30 JAN. 73

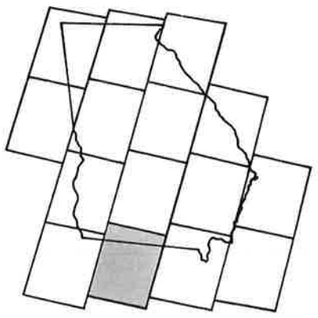












I-4
MSS-5
30 JAN. 73

1 inch equals approximately 16 miles

10 0 10 20 30 40 miles

10 0 10 20 30 40 50 kilometers

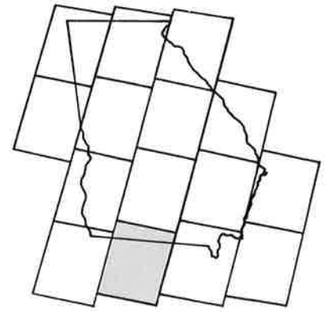
A contrast in land use patterns exists in the area near the Georgia-Florida border. The area north of I-10 is predominantly cleared cropland while the area to the south is mainly pine forest. Again, the contrasts in land use and surface drainage are apparent between the Dougherty Plain and the Tifton Upland.

In Florida, near the point where U.S. 129 crosses the Suwannee River, nine white circles are arranged in a nearly rectangular manner. This pattern represents crops which are being irrigated by large, upright sprinklers that rotate a full 360 degrees thus creating the circular shapes observable on the band 5 image.

The area in Florida marked by closely spaced northwest trending limesinks is of considerable hydrologic and geologic interest. This trend marks the area where limestone has been brought near the surface by subsurface regional arching.

The Alapaha River, a relatively small stream which has almost no flow during the dry season, appears to have a very wide floodplain. It is unlikely that a small stream would have such a large floodplain. It has been suggested that the Ocmulgee River, which sharply alters its southeastern course to almost due east (see I-3) may at one time have flowed south through this channel creating the wide Alapaha floodplain.

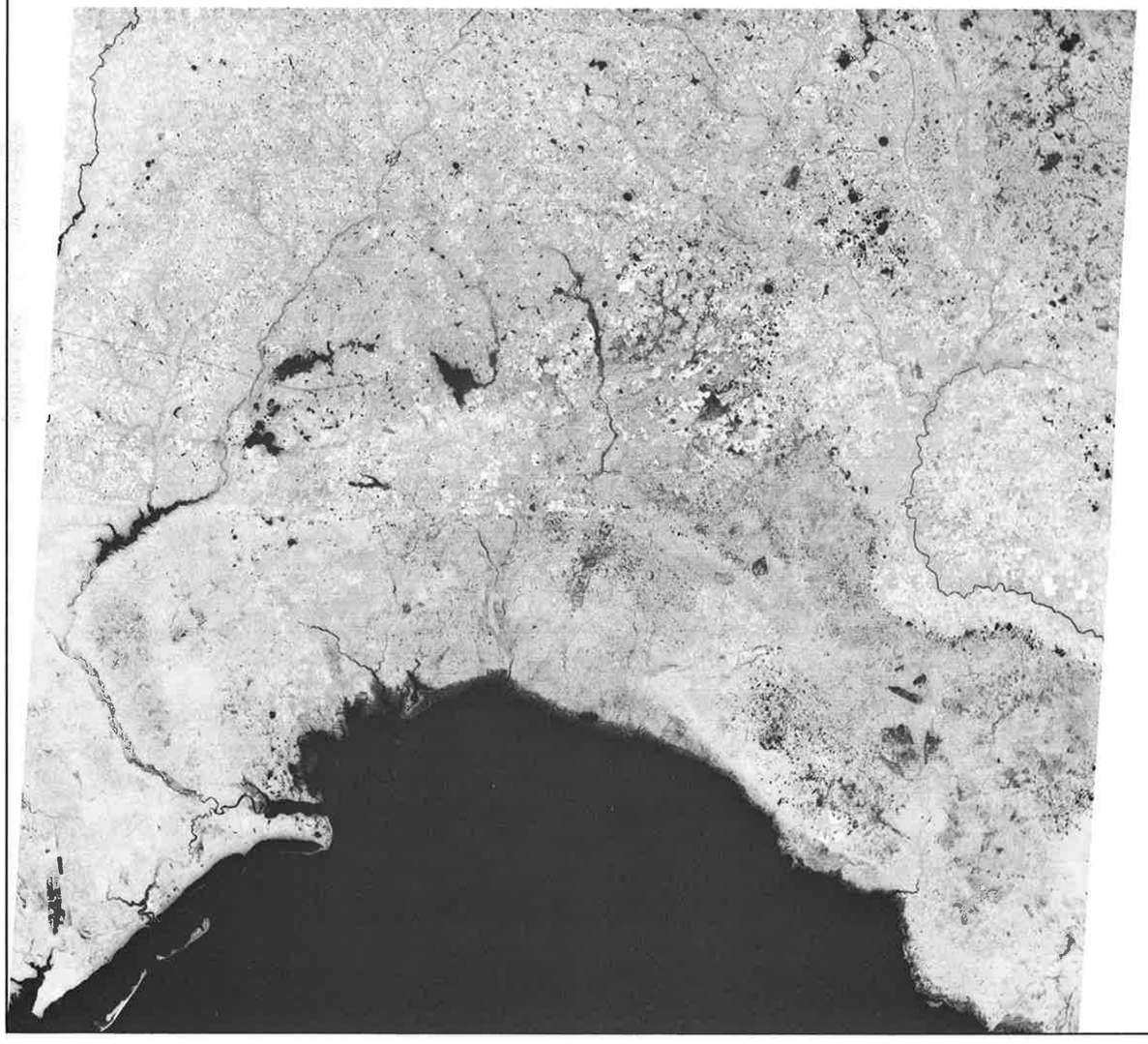
I-4
MSS-7
30 JAN. 73

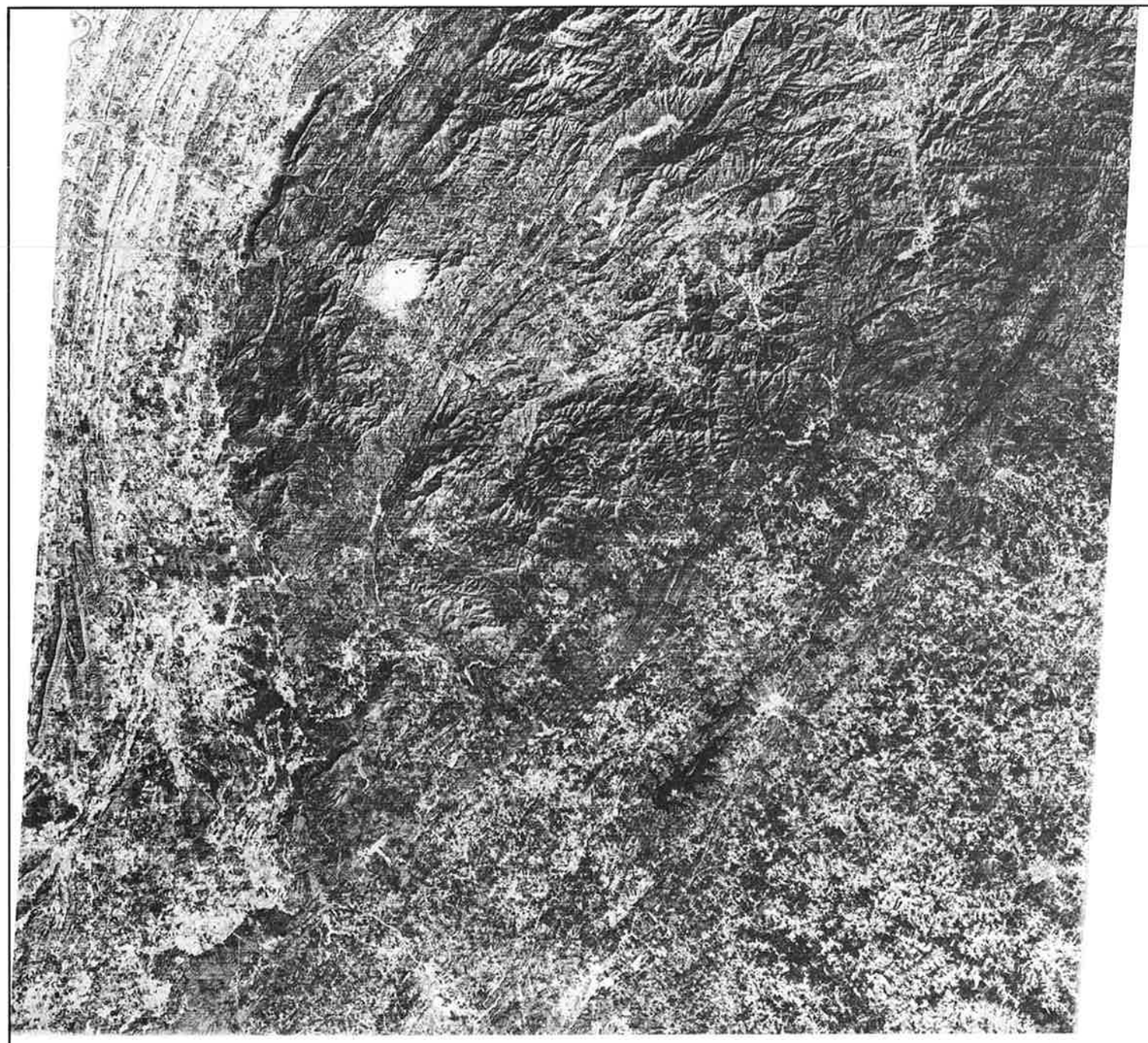


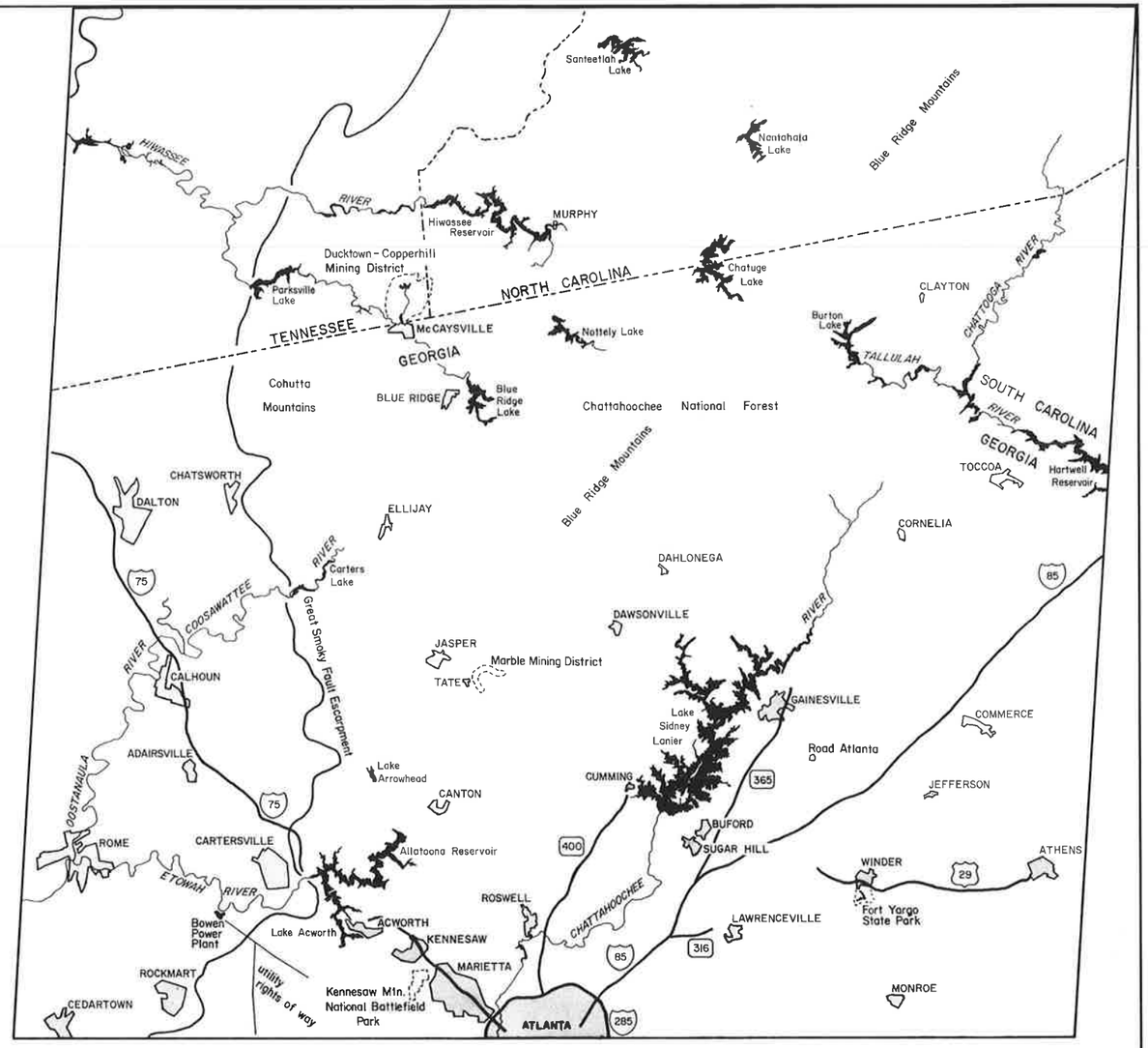
1 inch equals approximately 16 miles

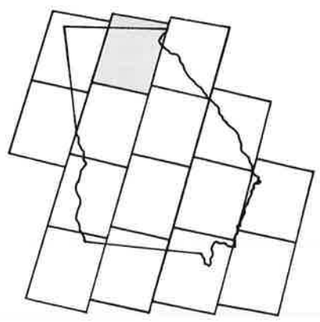
10 0 10 20 30 40 miles

10 0 10 20 30 40 50 kilometers









J-1
MSS-5
28 NOV. 74

1 inch equals approximately 16 miles

10 0 10 20 30 40 miles

10 0 10 20 30 40 50 kilometers

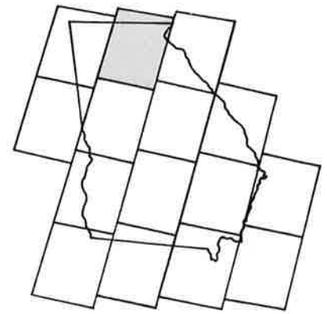
The southern extension of the Great Smoky-Cartersville Fault-line Escarpment cuts across the western edge of this scene separating sedimentary rocks of the Ridge and Valley Province from metamorphic and igneous crystalline rocks of the Piedmont and the Blue Ridge Provinces. The sedimentary rocks west of this escarpment are less resistant to erosion than the crystalline rocks to the east, and therefore form the broad, fertile Great Valley. In addition, the escarpment serves as a divider between the cultivated Great Valley and the thickly forested Blue Ridge Mountains (band 5 image). In the vicinity of Cartersville the escarpment is not apparent.

Between the Cohutta Mountains and the Blue Ridge Mountains are a series of narrow, parallel, linear ridges called the Jasper Ridges, best seen on the band 7

image. Just southwest of the town of Jasper, a lighter tone, horseshoe-shaped area is visible on both the band 5 and band 7 images. This pattern, a surface expression of the Salem Church Anticline, is an area of favorable topography for clearing and cultivation because the rocks are less resistant to weathering and erosion.

A very small, hook-shaped, light grey pattern, just to the east of Tate is most of Georgia's marble mining district. In the northwestern portion of the band 5 image, a prominent white spot represents the Ducktown-Copperhill mining district of Tennessee. Here, smelter fumes and timbering had killed the vegetation and left an area of barren land. Reclamation has been slow, but the light gray zone around the white spot represents a large area of already reclaimed land.

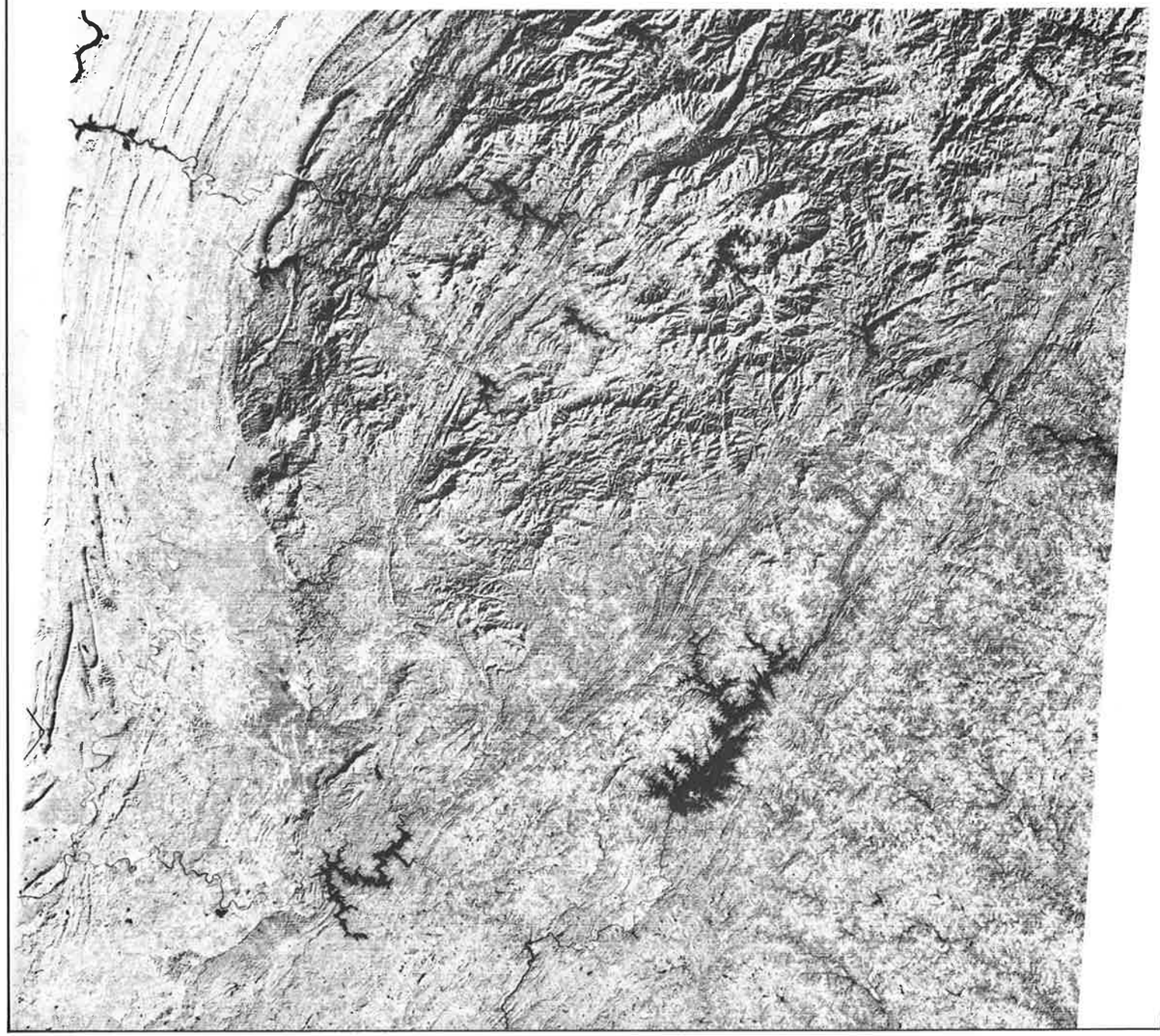
J-1
MSS-7
28 NOV. 74

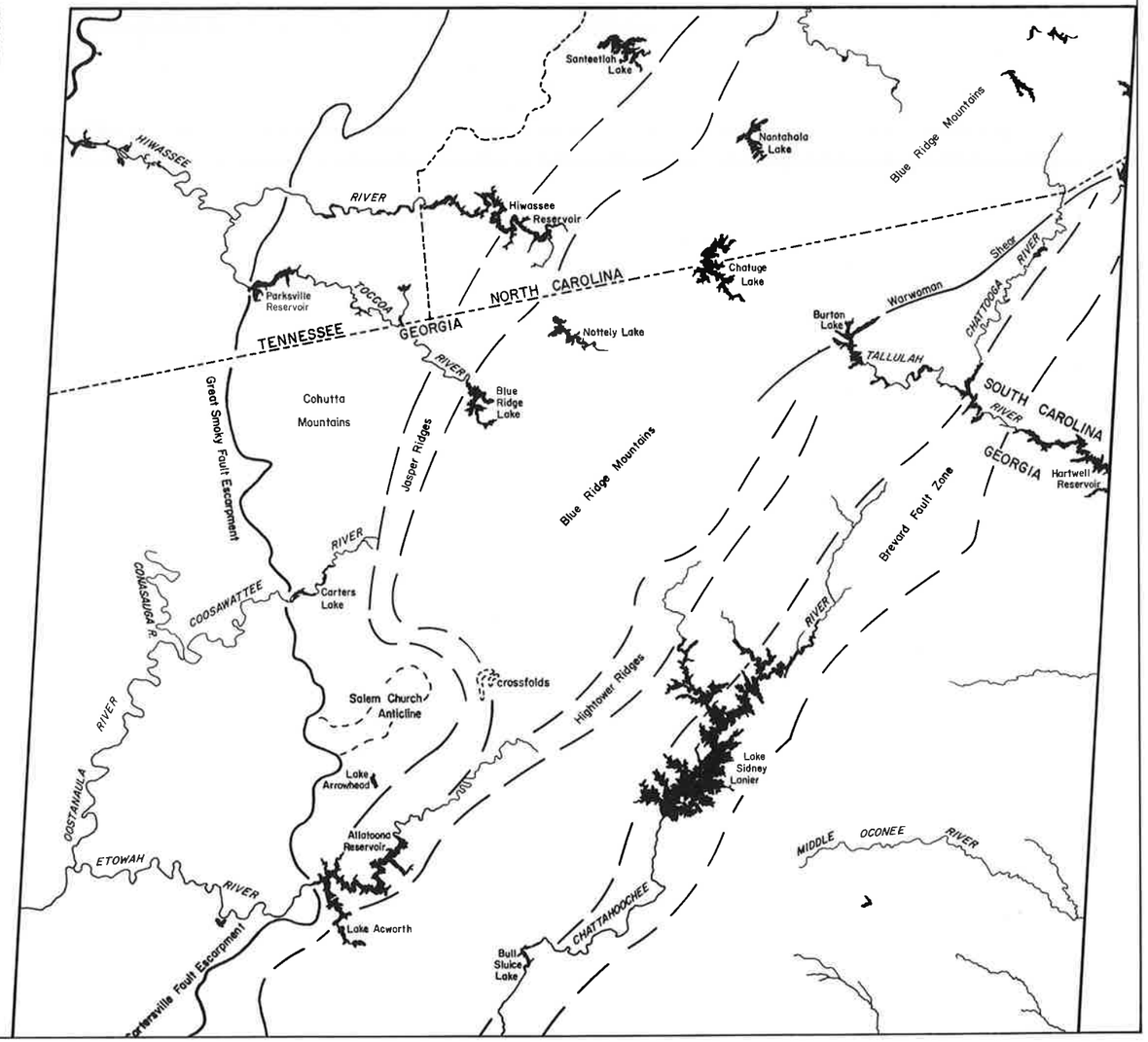


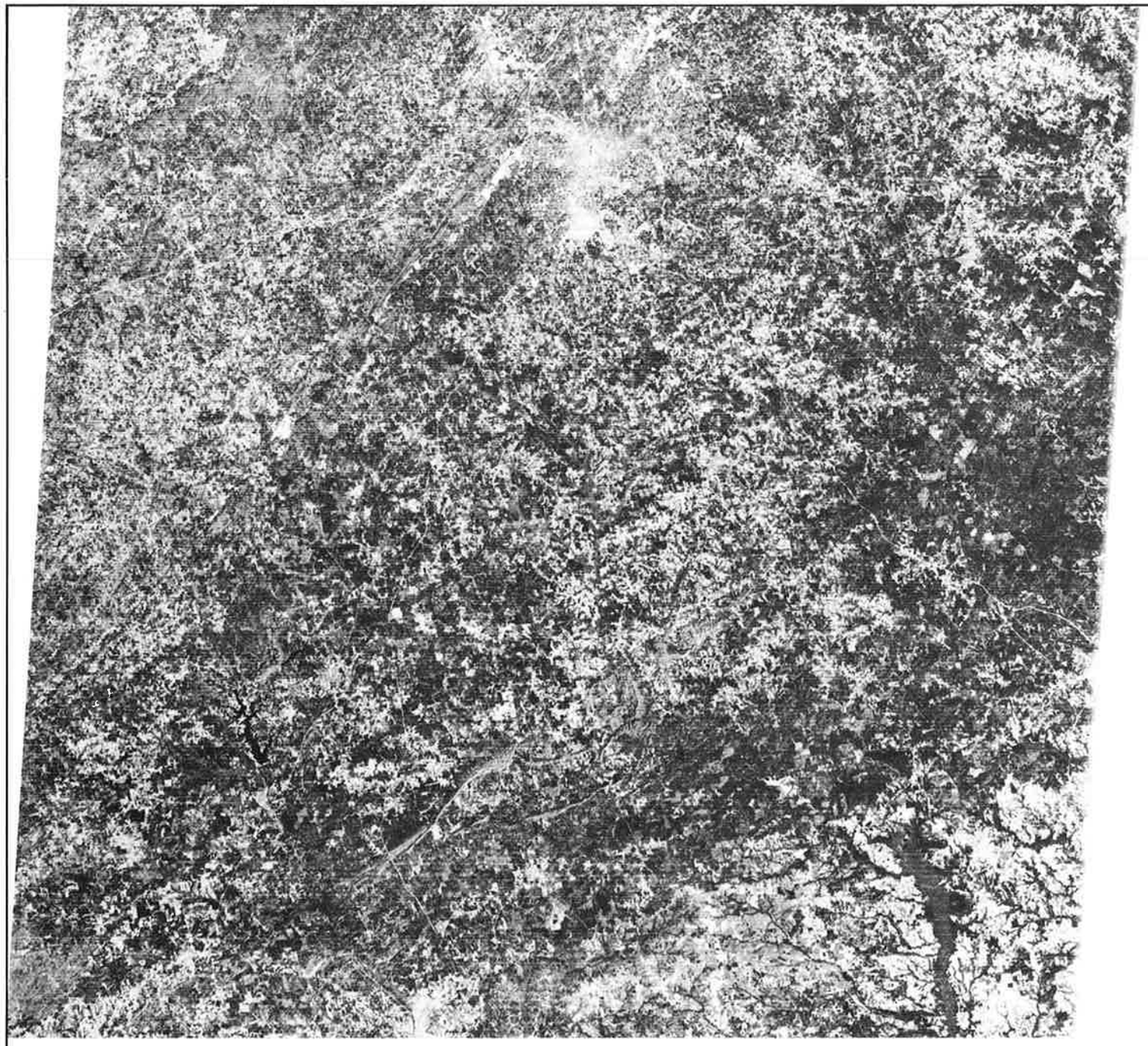
1 inch equals approximately 16 miles

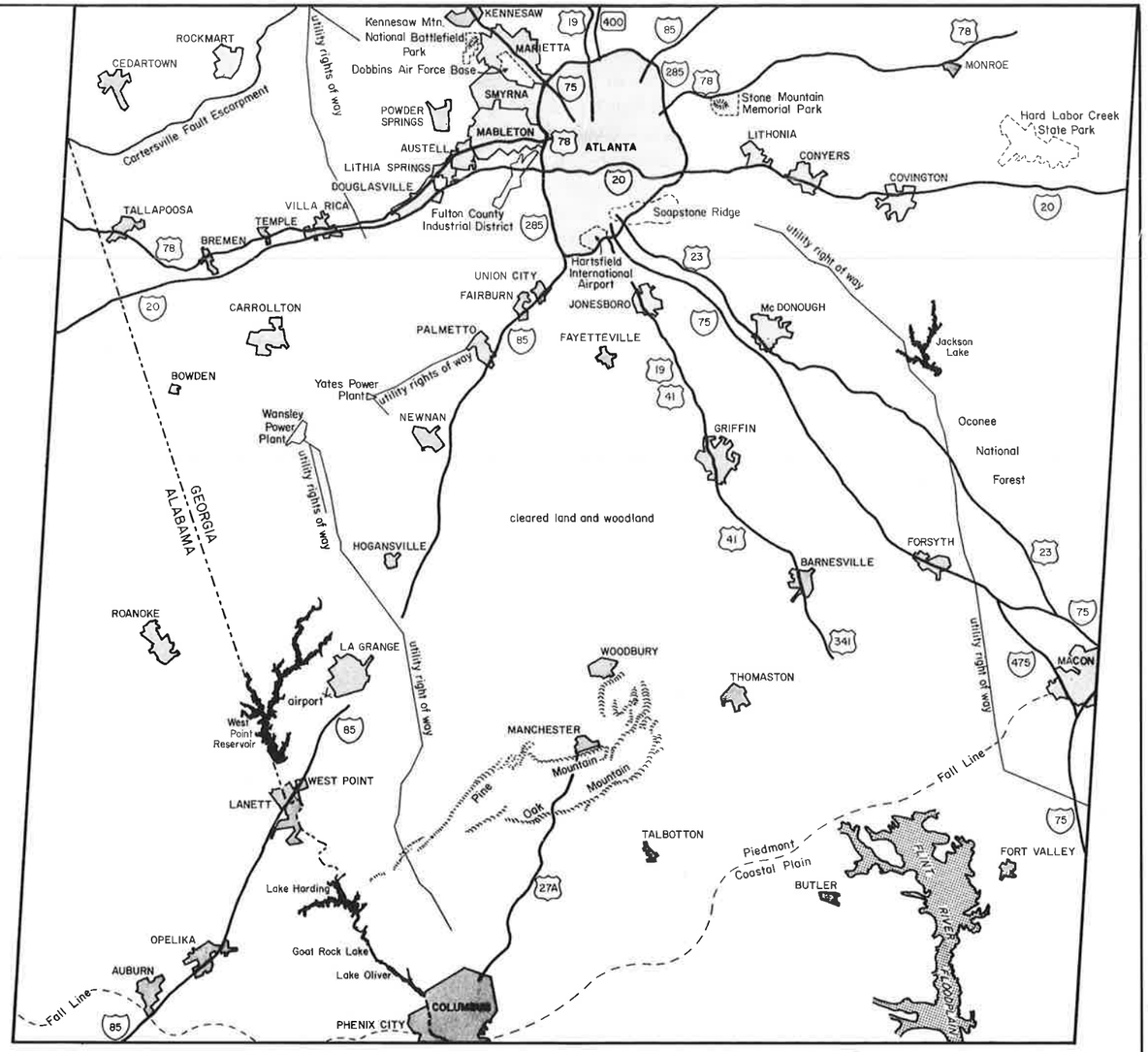
10 0 10 20 30 40 miles

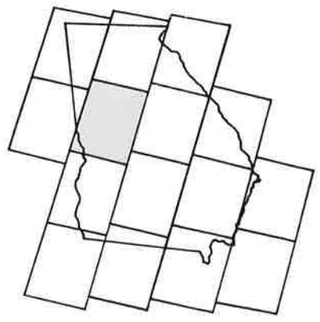
10 0 10 20 30 40 50 kilometers











J-2
MSS-5
28 NOV. 74

1 inch equals approximately 16 miles

10 0 10 20 30 40 miles

10 0 10 20 30 40 50 kilometers

The Brevard Fault Zone and a mafic, intrusive feature known as Soapstone Ridge are two geologic factors influencing development in the Atlanta area. In southwest Atlanta, the Fulton County Industrial Park is developing along the strike of the Brevard Fault Zone. The highly sheared and weathered rocks of the fault zone along with the floodplain material of the Chattahoochee River are more practical for industrial site development than the adjacent areas of higher slope and near surface bedrock.

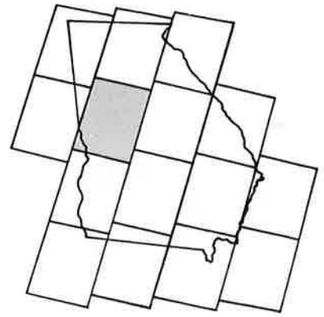
Soapstone Ridge is seen on this image as a dark, wooded area crossed by I-285 between I-20 East and Hartsfield Airport. The mafic rock of the ridge weathers to a boulder-strewn soil with high slopes and poor engineering characteristics for

construction. Hence, Atlanta's growth has avoided this feature leaving much of the ridge in woodland.

Notice that the Chattahoochee River flows southwest along the strike of the Brevard Fault Zone and then departs from this structure to flow south, forming the western boundary of Georgia.

The Pine Mountain-Oak Mountain complex is visible on the band 7 image as a series of light-colored ridges striking to the east-northeast. These ridges are composed of quartzite, a rock which is usually very resistant to erosion. Thunder Dome, the nearly circular feature northeast of Pine Mountain, is a structural dome with a quartzite rim.

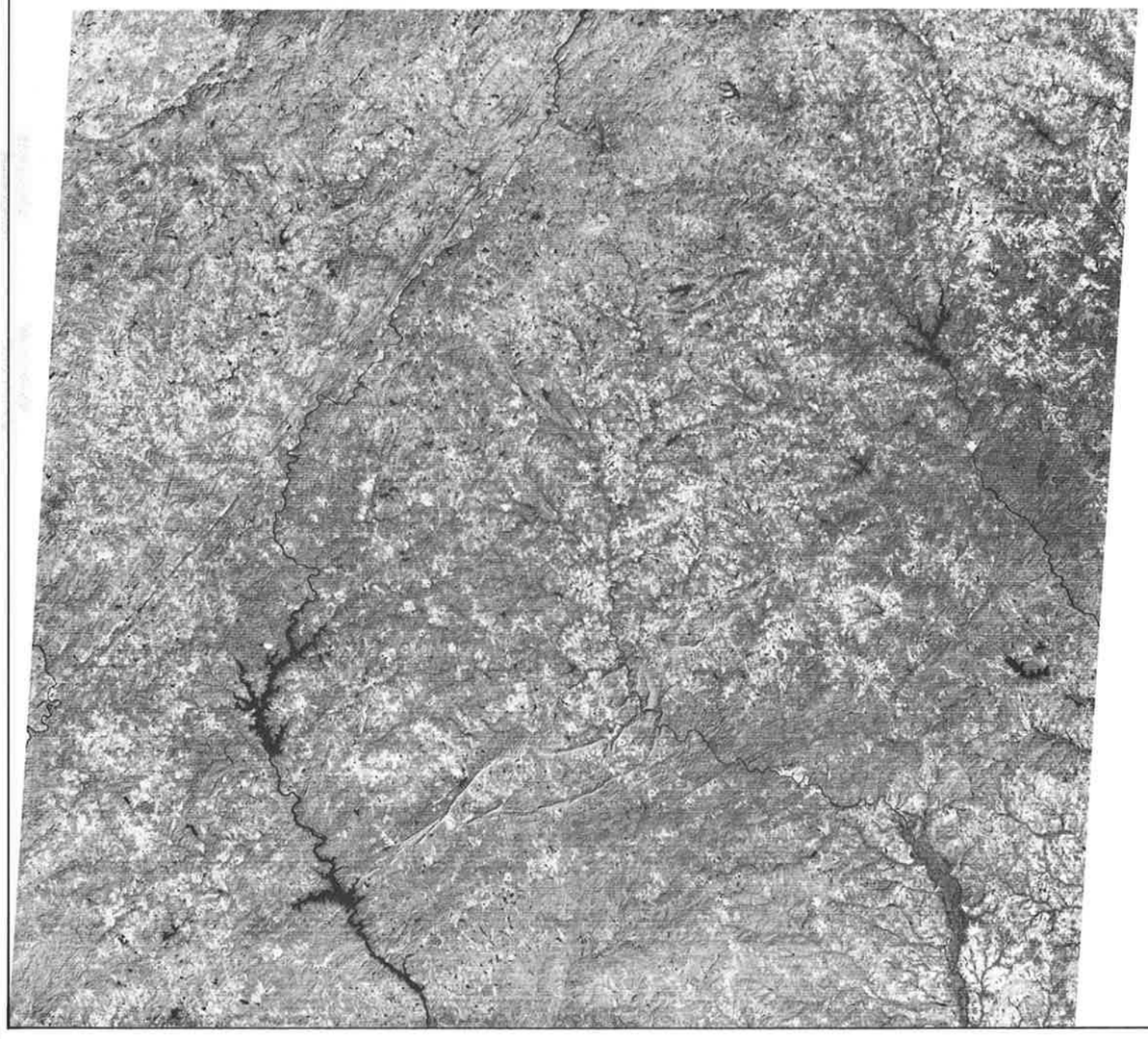
J-2
MSS-7
28 NOV. 74

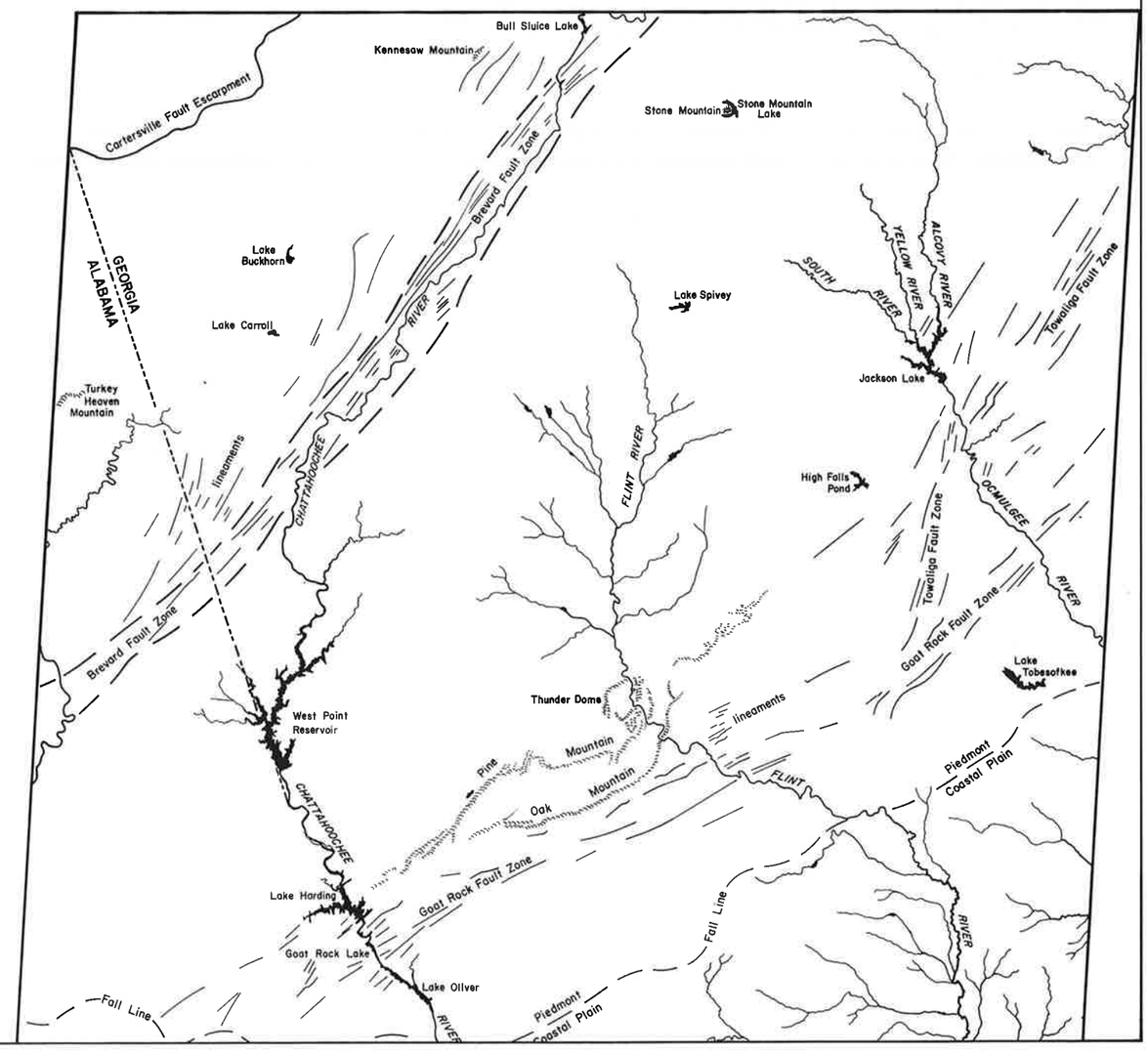


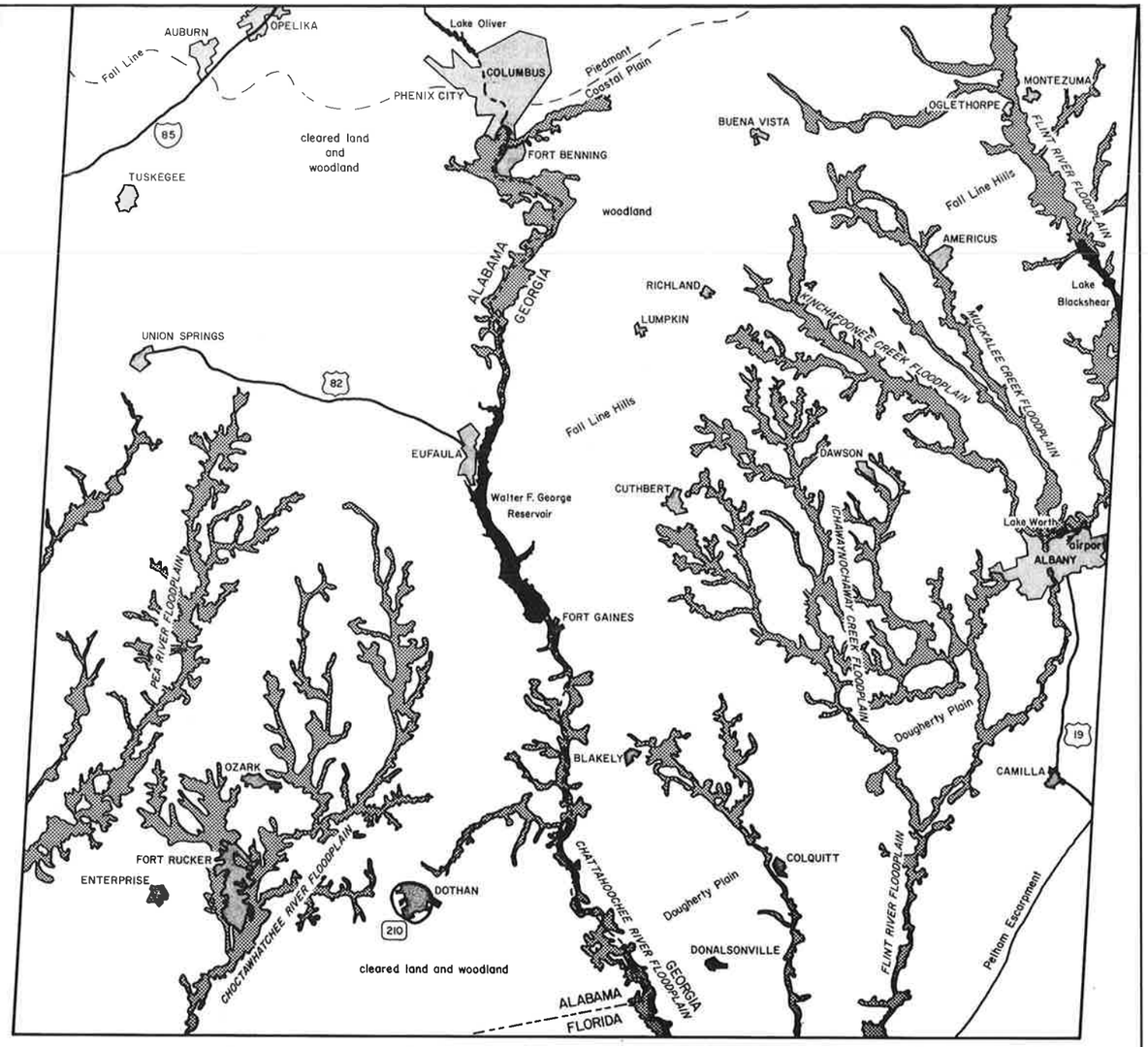
1 inch equals approximately 16 miles

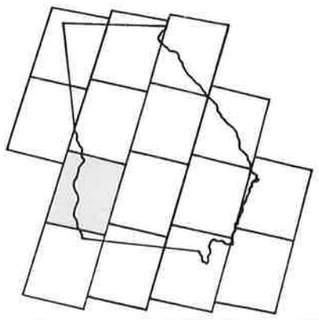
10 0 10 20 30 40 miles

10 0 10 20 30 40 50 kilometers









J-3
MSS-5
28 NOV. 74

1 inch equals approximately 16 miles

10 0 10 20 30 40 miles

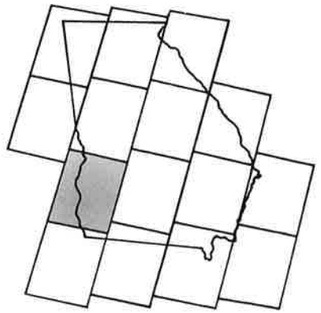
10 0 10 20 30 40 50 kilometers

The Fall Line Hills is an area of highly dissected topography that lies immediately south of the Fall Line and is continuous across the state of Georgia. The rather steep slopes of this physiographic region are generally heavily wooded.

The Dougherty Plain is an area of low relief where floodplains frequently merge with nearby limesinks making floodplain demarcation especially difficult. The extent of these water-filled limesinks is observable in the southeast portion of the band 7 image. The Dougherty Plain is a region of karst topography that

extends from northwest Florida and southeast Alabama into southwest Georgia. Subterranean drainage generally dominates in areas of karst topography with very few surface streams present. Compared to the Fall Line Hills, there are fewer surface streams in the Dougherty Plain.

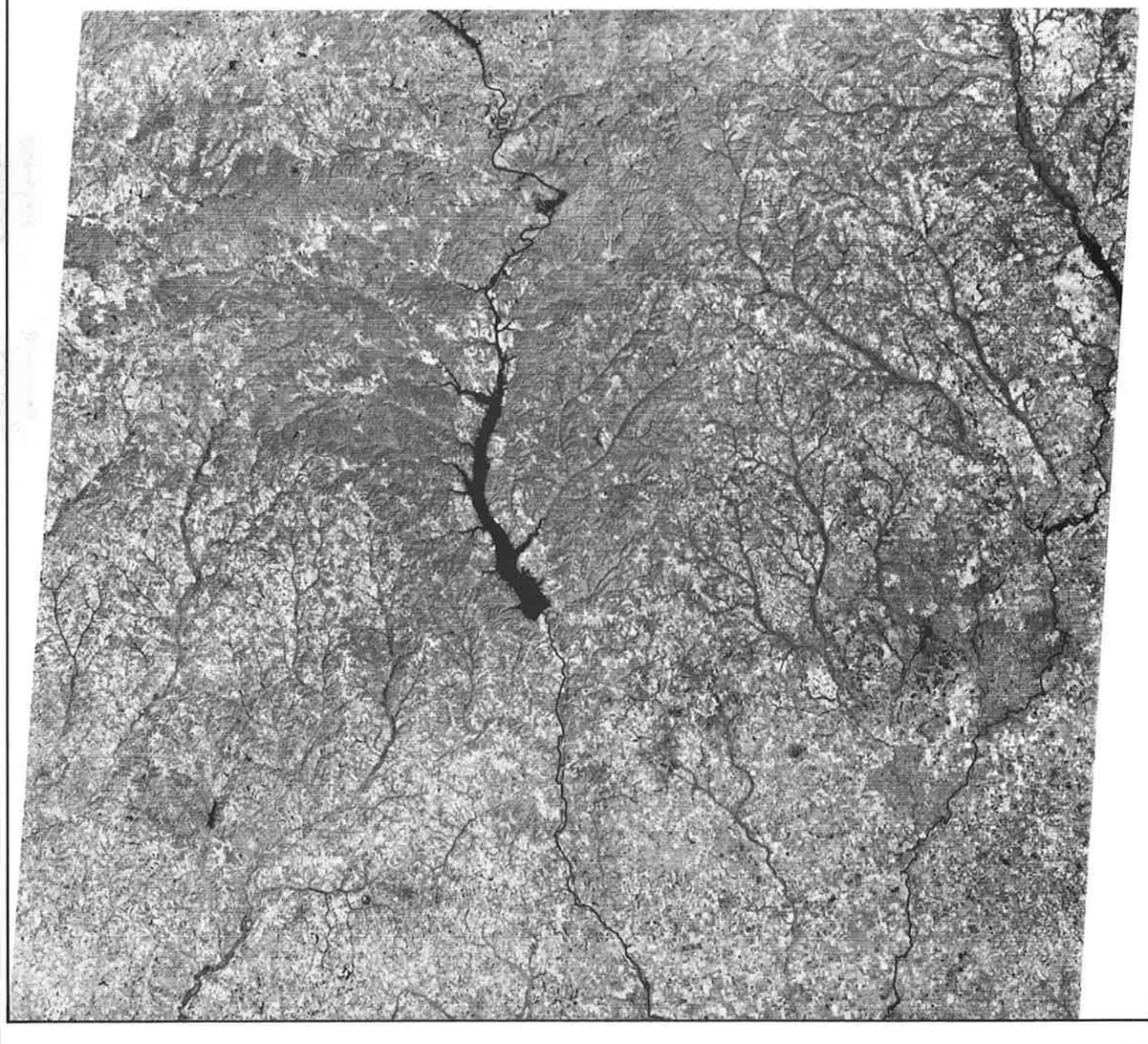
J-3
MSS-7
28 NOV. 74

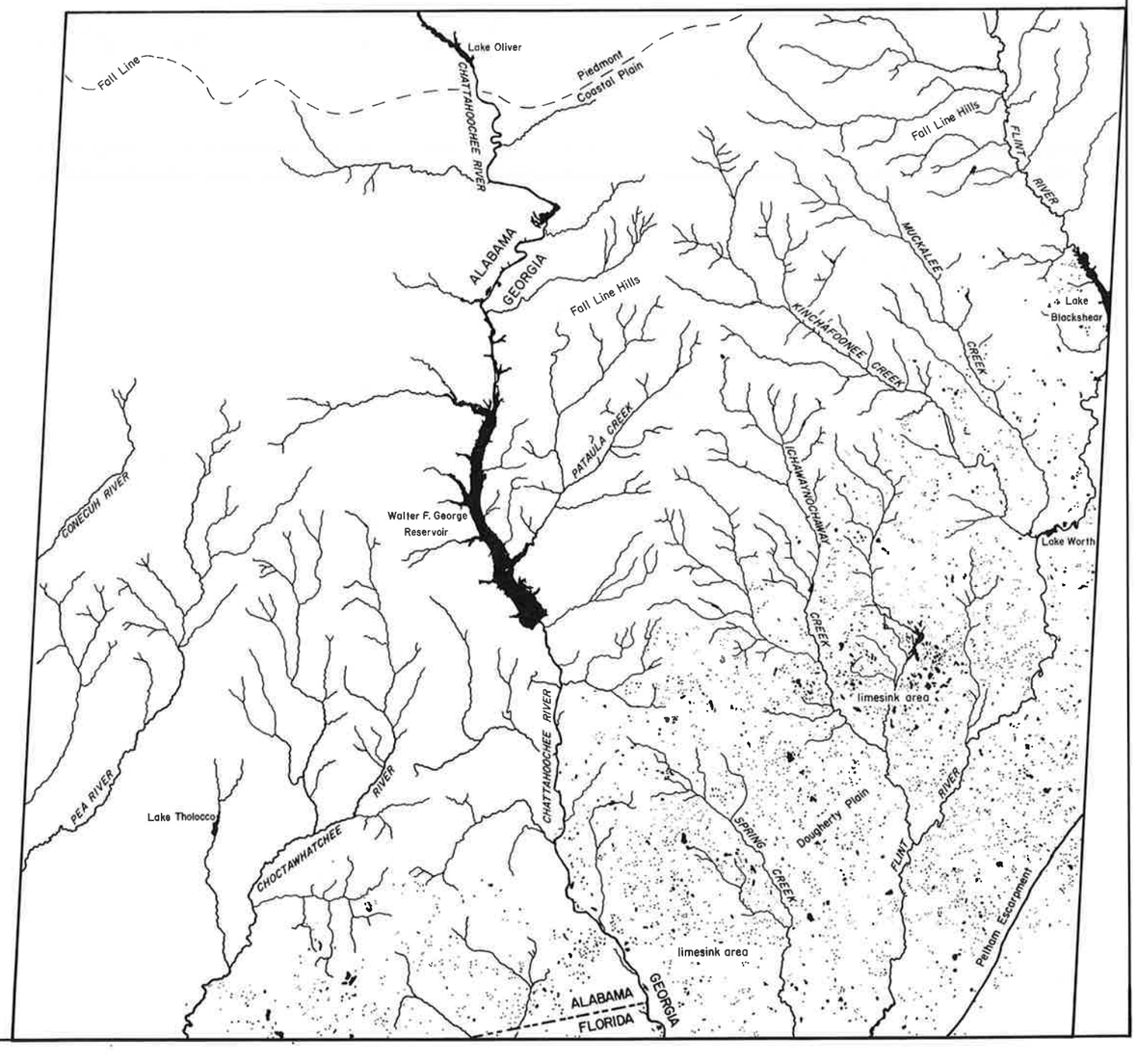


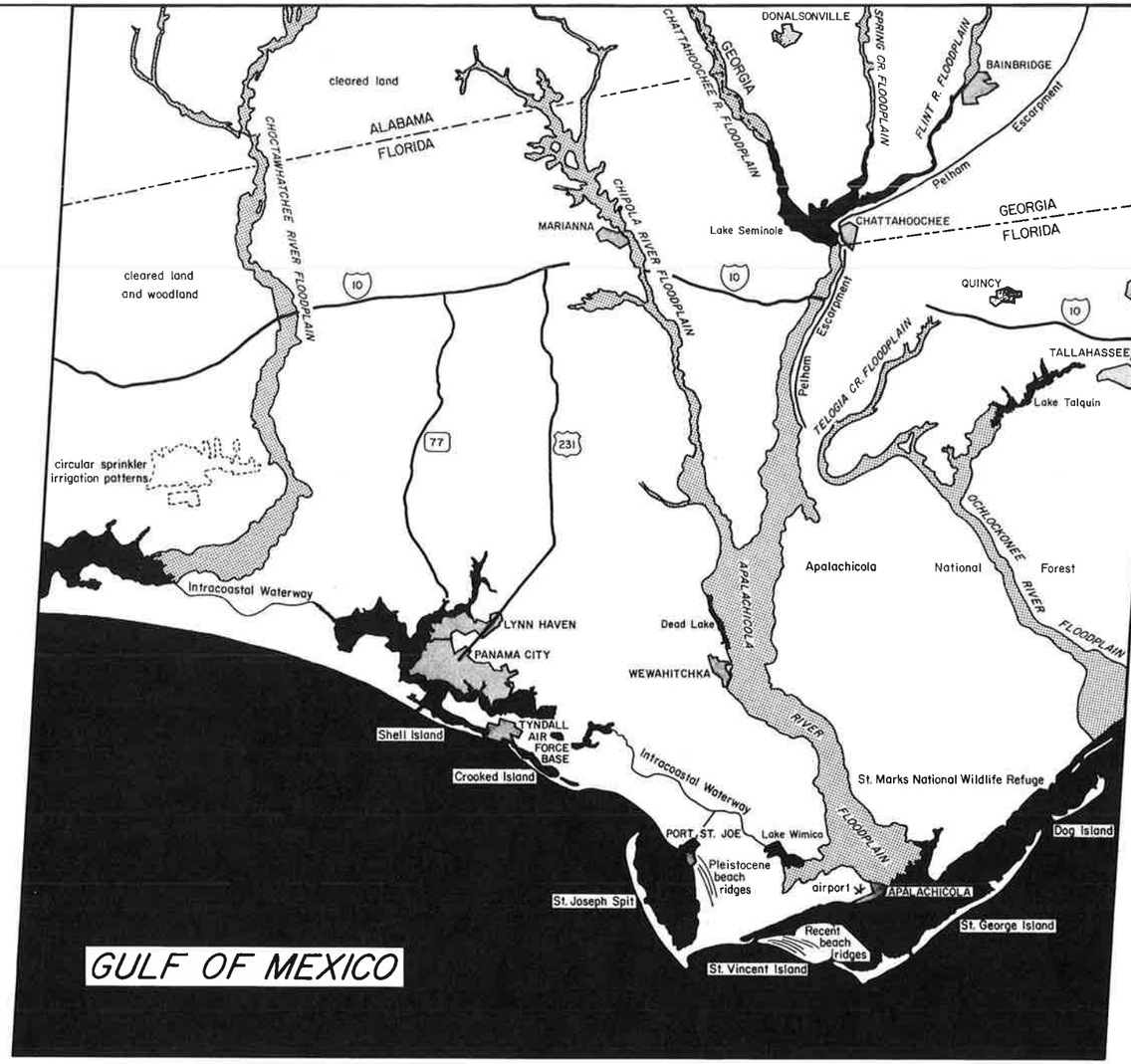
1 inch equals approximately 16 miles

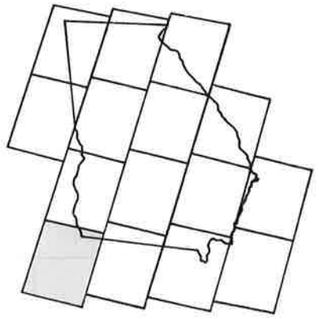
10 0 10 20 30 40 miles

10 0 10 20 30 40 50 kilometers









J-4
MSS-5
28 NOV. 74

1 inch equals approximately 16 miles

10 0 10 20 30 40 miles

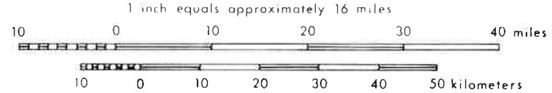
10 0 10 20 30 40 50 kilometers

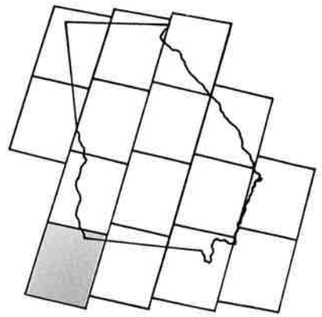
This frame includes the extreme southwest corner of Georgia. Lake Seminole is fed by the Chattahoochee and Flint River systems. On the band 5 image notice the east side of Lake Seminole, fed by the Flint River. It has much clearer water than the west side which is fed by the sediment-laden Chattahoochee River. The Flint River drains the limestone terrain of the Dougherty Plain, an area of abundant clear springs and little surface erosion, hence, the noticeable lack of suspended sediment. Similar differences in sediment load may be seen between the open ocean and lagoons along the Gulf of Mexico. Impoundment of Lake Seminole has raised the local water table in the near surface aquifer. The now higher water table has filled previously dry limesinks throughout a 13 kilometer (8 mile) radius of the dam, creating numerous ponds or swamps.

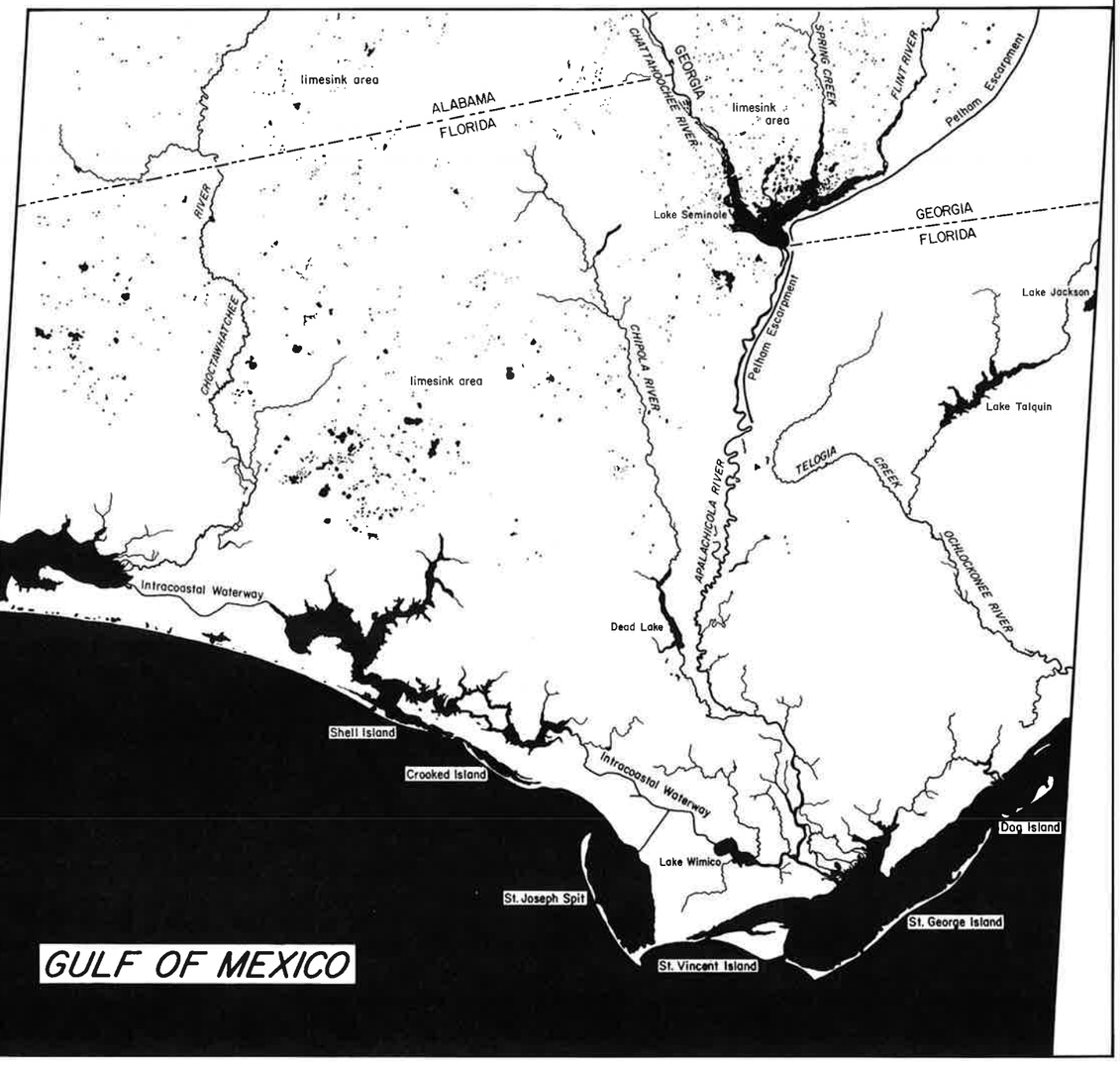
On the band 5 image notice the widening of the Apalachicola River floodplain as it continues southward to the Gulf and compare the Florida coastline with Georgia's (G-1 and G-2). There are few sediment plumes in this portion of the Gulf Coast, because any sediment derived from the few estuary systems is trapped and settles in the shallow bays behind the bars and barrier islands typical of this shoreline.

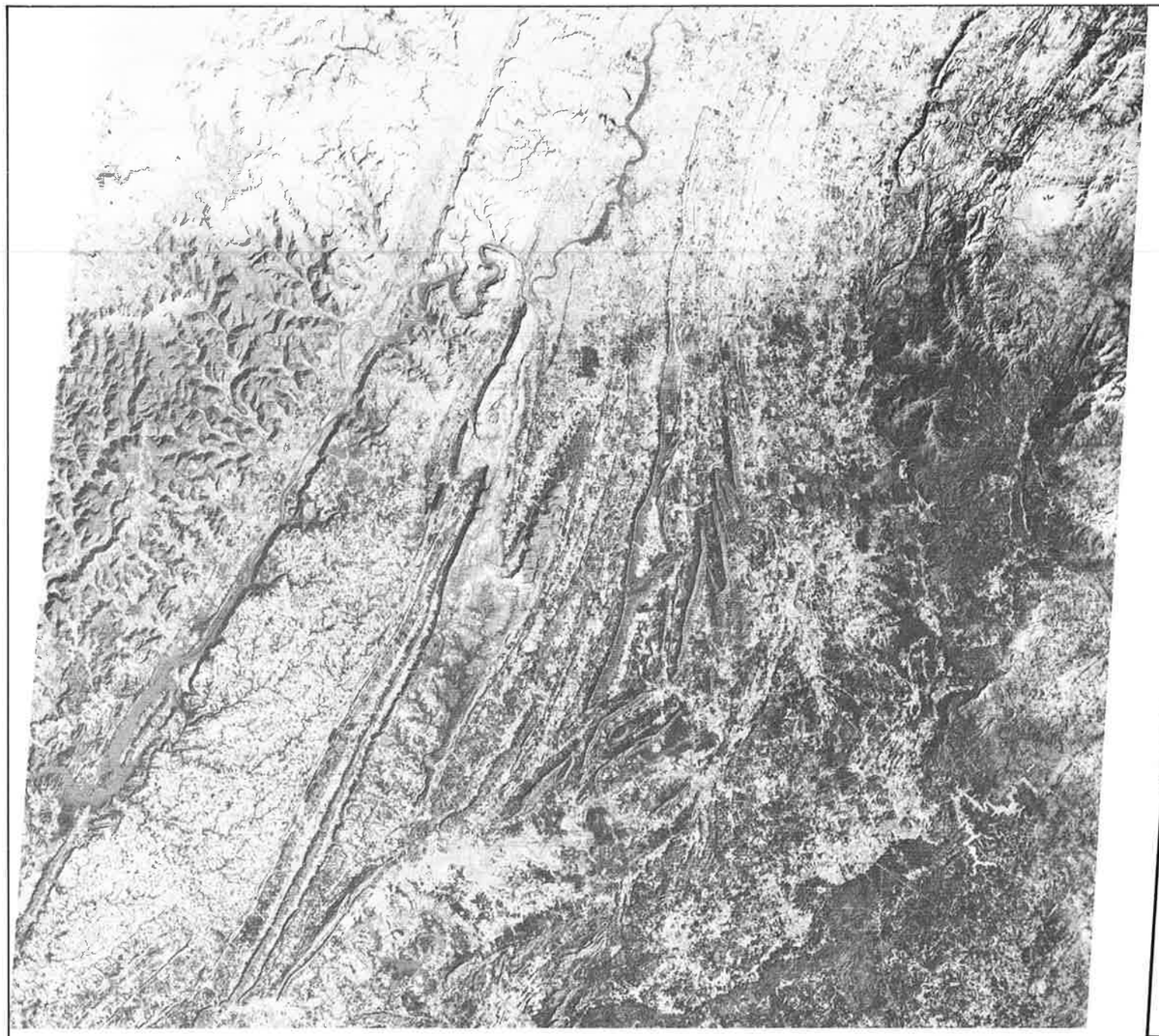
Bordering the Gulf Coast are a series of white dots or line segments that represent the dredge spoils for the Intracoastal Waterway. This series of canals and rivers is a discontinuous waterway system along the Gulf and Atlantic Coasts designed to protect small vessels from hazards of the open sea.

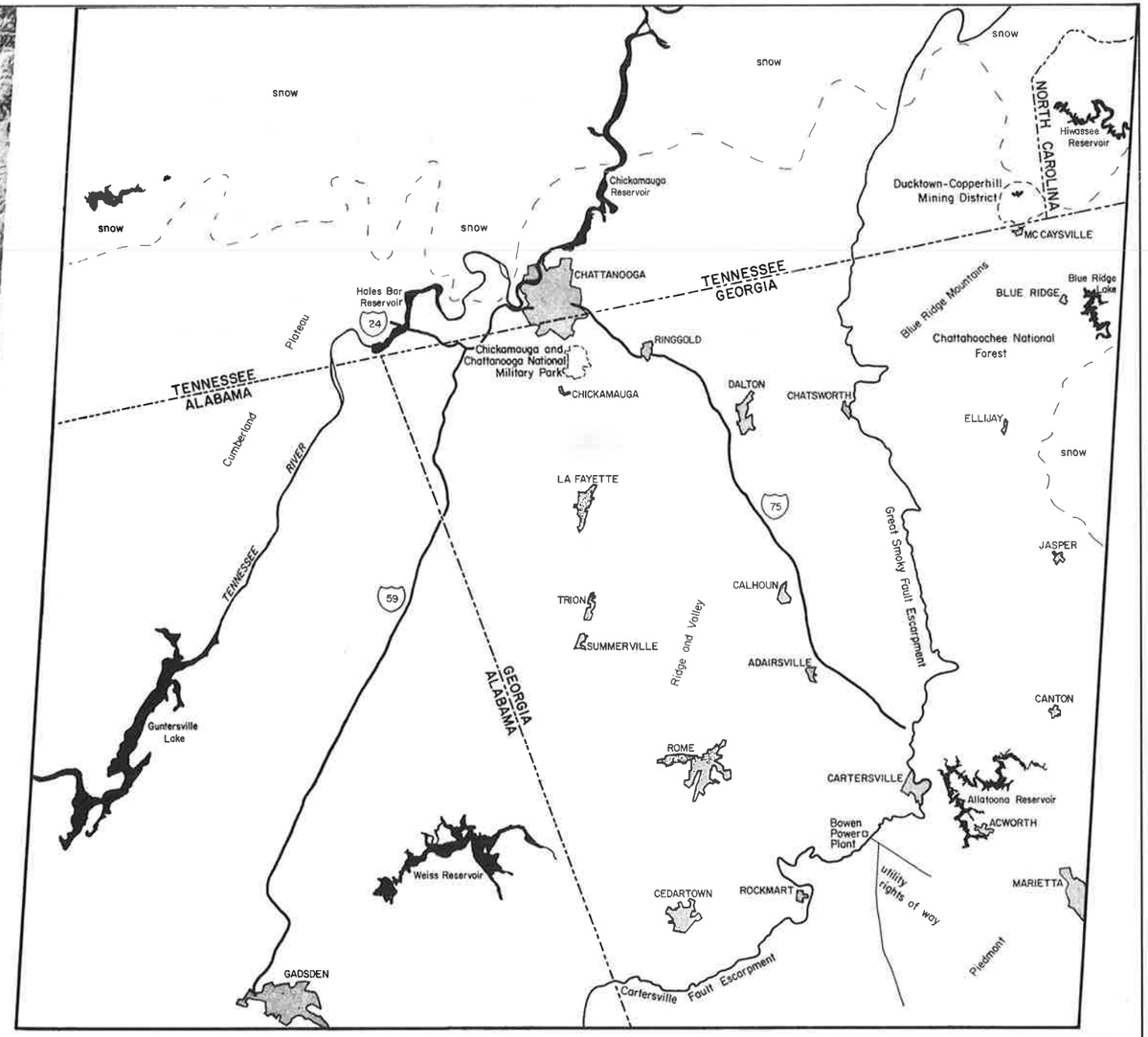
J-4
MSS-7
28 NOV. 74

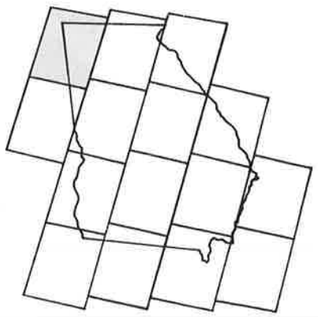












K-1
MSS-5
14 JAN. 73

1 inch equals approximately 16 miles

10 0 10 20 30 40 miles

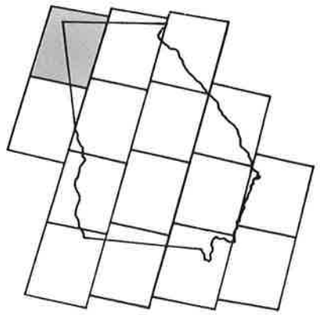
10 0 10 20 30 40 50 kilometers

The Great Smoky-Cartersville Fault, at the base of a prominent escarpment, forms the eastern boundary between sedimentary and crystalline rocks. The northern strike of the fault line escarpment appears to end near Cartersville. It then strikes southwestward to form the southern boundary of the sedimentary rocks. The band 5 image displays the influence of topography on land use patterns. The Ridge and Valley is predominantly agricultural in contrast to the more forested areas of the Cumberland Plateau, Piedmont, and Blue Ridge. Throughout the Ridge and Valley, sandstone and chert ridges remain naturally forested areas, while farms and pasture lands are located in the fertile limestone and shale valleys. The transmission rights-of-way from the Bowen Power Plant are clearly visible on band 5. Carters Dam, under construction on the date this

imagery was taken, had already impounded a small amount of water. The Chickamauga and Chattanooga National Military Park, the forested Civil War battlefield, is distinguishable on band 5 from the surrounding agricultural land.

The band 7 image best shows the chevron pattern of the Armuchee Ridges. Silurian sandstones are the resistant units holding up these ridges. Lookout and Pigeon Mountains are synclinal structures capped with Pennsylvanian sandstone units. On Lookout Mountain, the band 7 imagery reveals a series of dark lineaments trending normal to the synclinal axis. These features are joints or cross-faults which may be a source of ground water for this rapidly developing area. The white band across the top of the frame is light snow, which masks, but does not hide, the denuded Copperhill area.

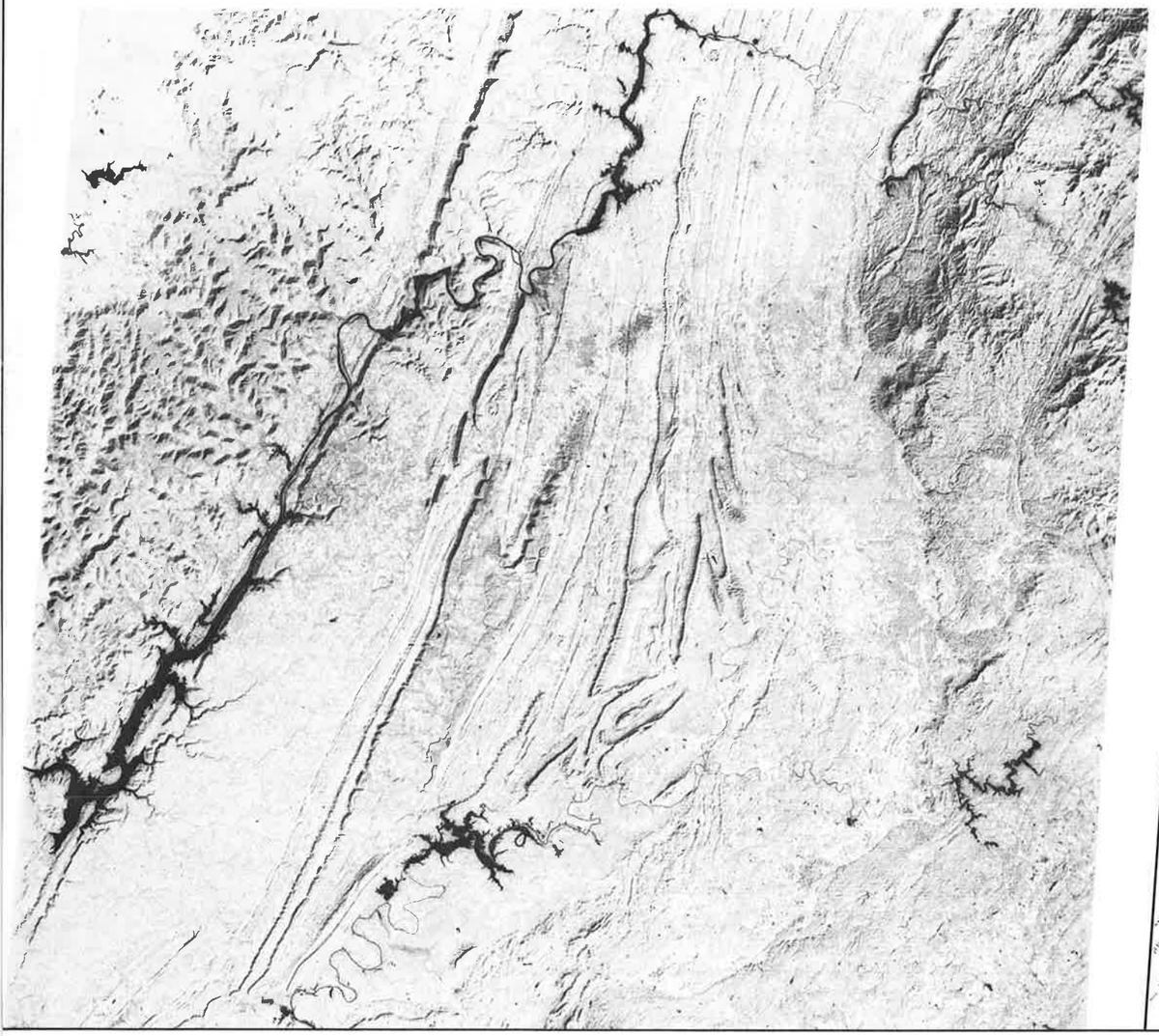
K-1
MSS-7
14 JAN. 73

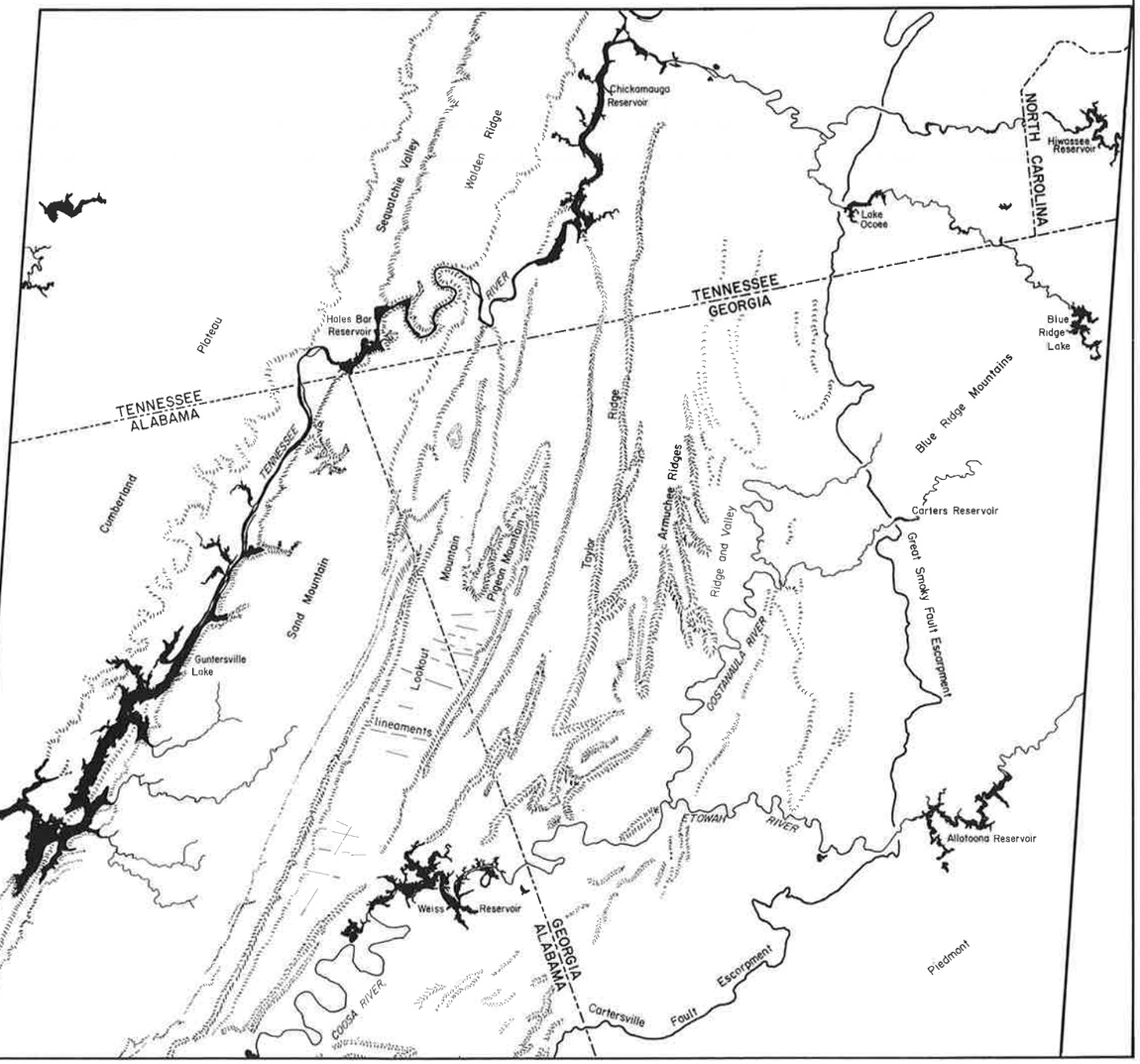


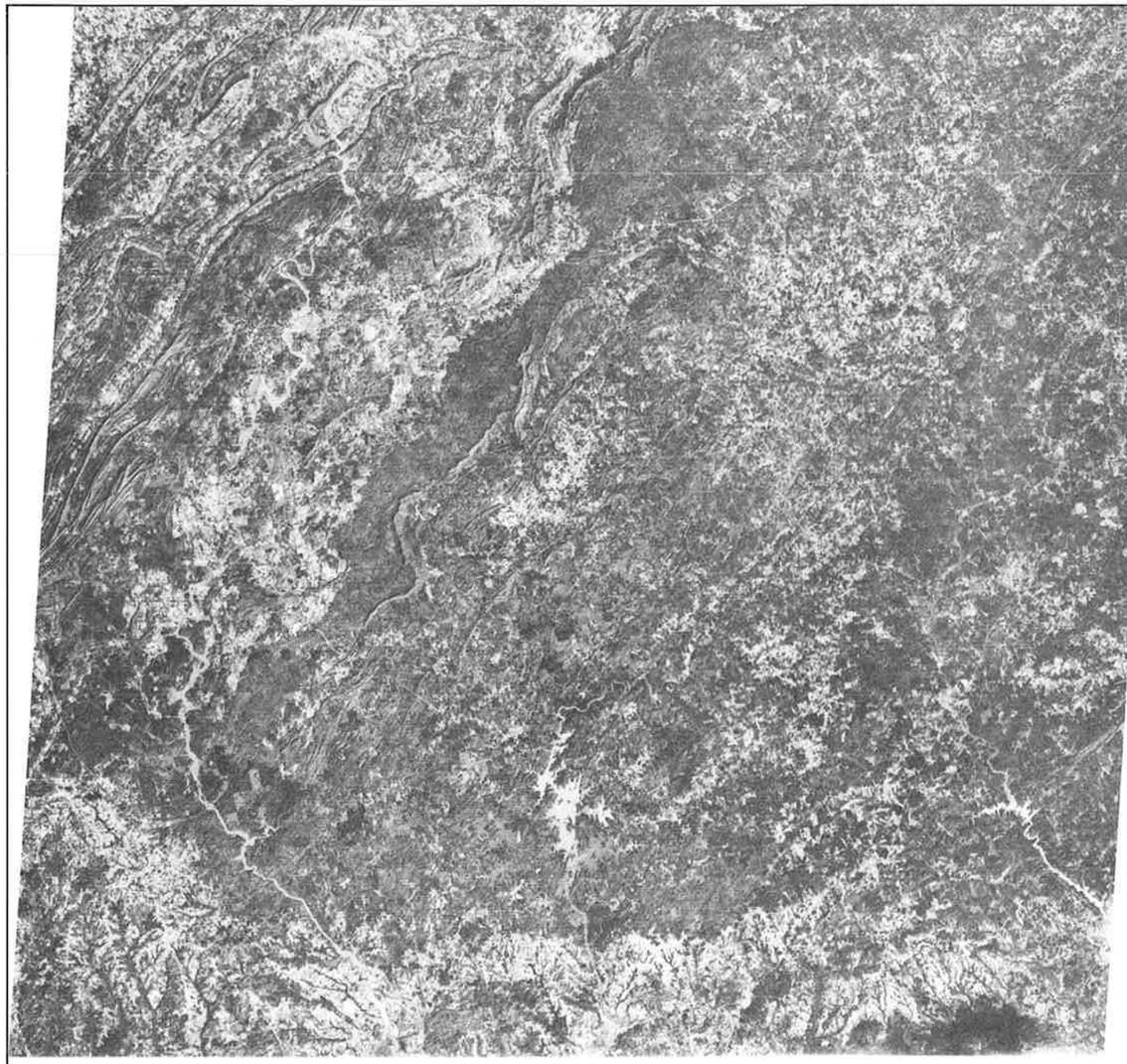
1 inch equals approximately 16 miles

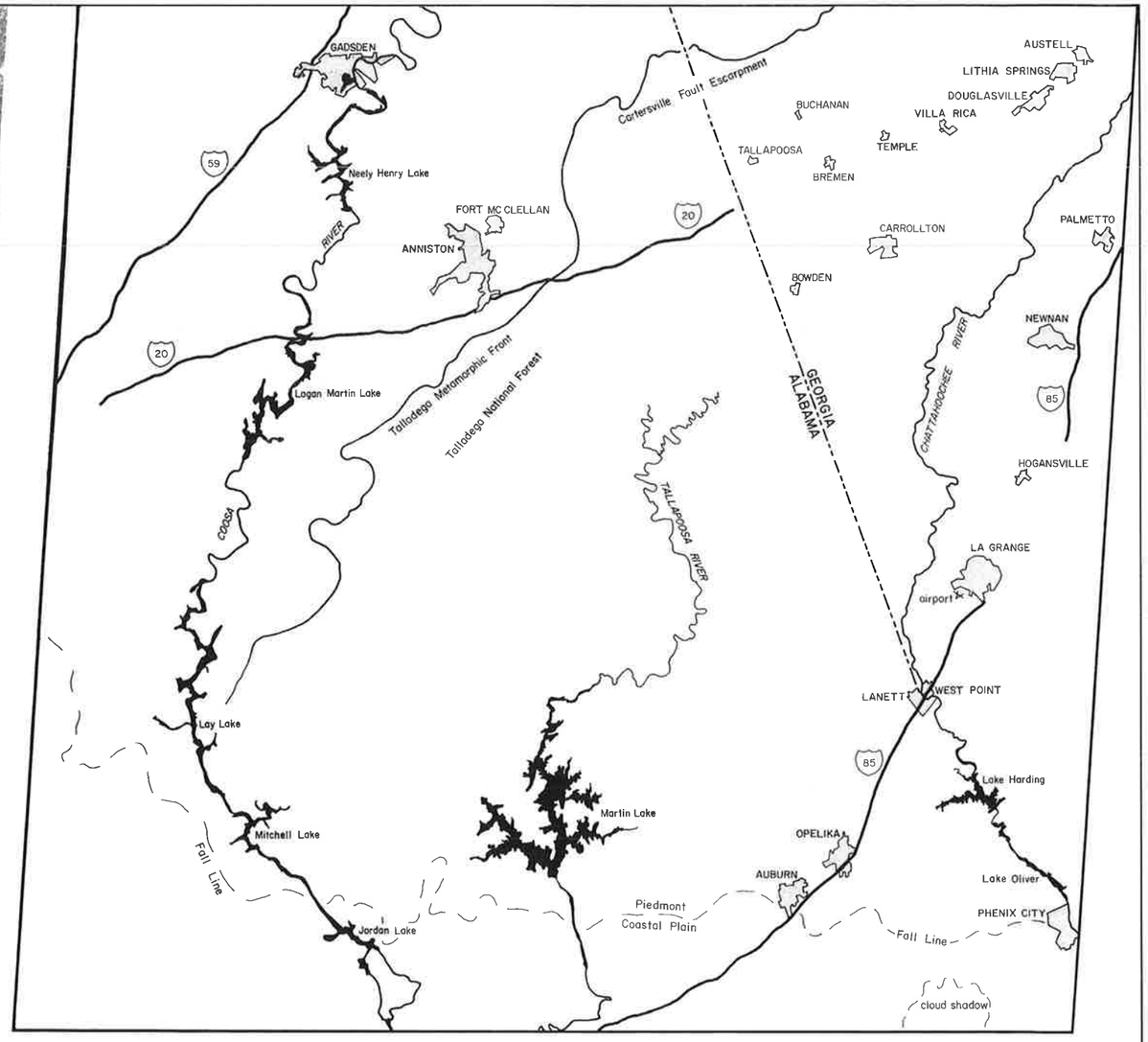
10 0 10 20 30 40 miles

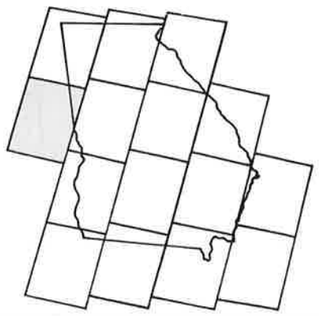
10 0 10 20 30 40 50 kilometers











K-2
MSS-5
14 JAN. 73

1 inch equals approximately 16 miles

10 0 10 20 30 40 miles

10 0 10 20 30 40 50 kilometers

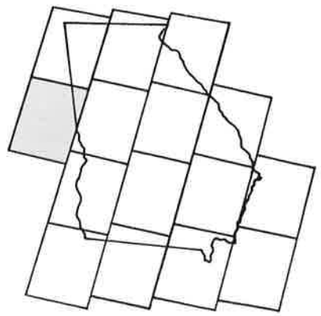
The last frame of K orbit includes only a small portion of western Georgia. Band 5 shows cultural features such as the LaGrange Airport and the huge military depot at Anniston, Alabama, as well as Fort McClellan. The same contrast of land use patterns that was observed on K-1 can be seen on either side of the Cartersville Fault-line Escarpment as it continues into Alabama. The Great Valley is largely agricultural while the Piedmont area is more forested.

It is interesting to note the structural pattern of the geology on these images. Recognition of fold and fault systems is generally best on band 7 imagery. The structural features seem to disappear southwest of the Coosa River and south of Martin Lake. This is the northern edge of the Coastal Plain sediments and the location of the Fall Line in Alabama. In the Georgia portion of the imagery, the

Chattahoochee River leaves the structural control of the Brevard Fault Zone and forms the western boundary of the state. The Brevard Fault Zone continues southwestward into Alabama.

On band 7 the Coosa River in Alabama provides an interesting comparison to the Savannah River in that practically the entire course of the river has been impounded. Compare this frame with I-1.

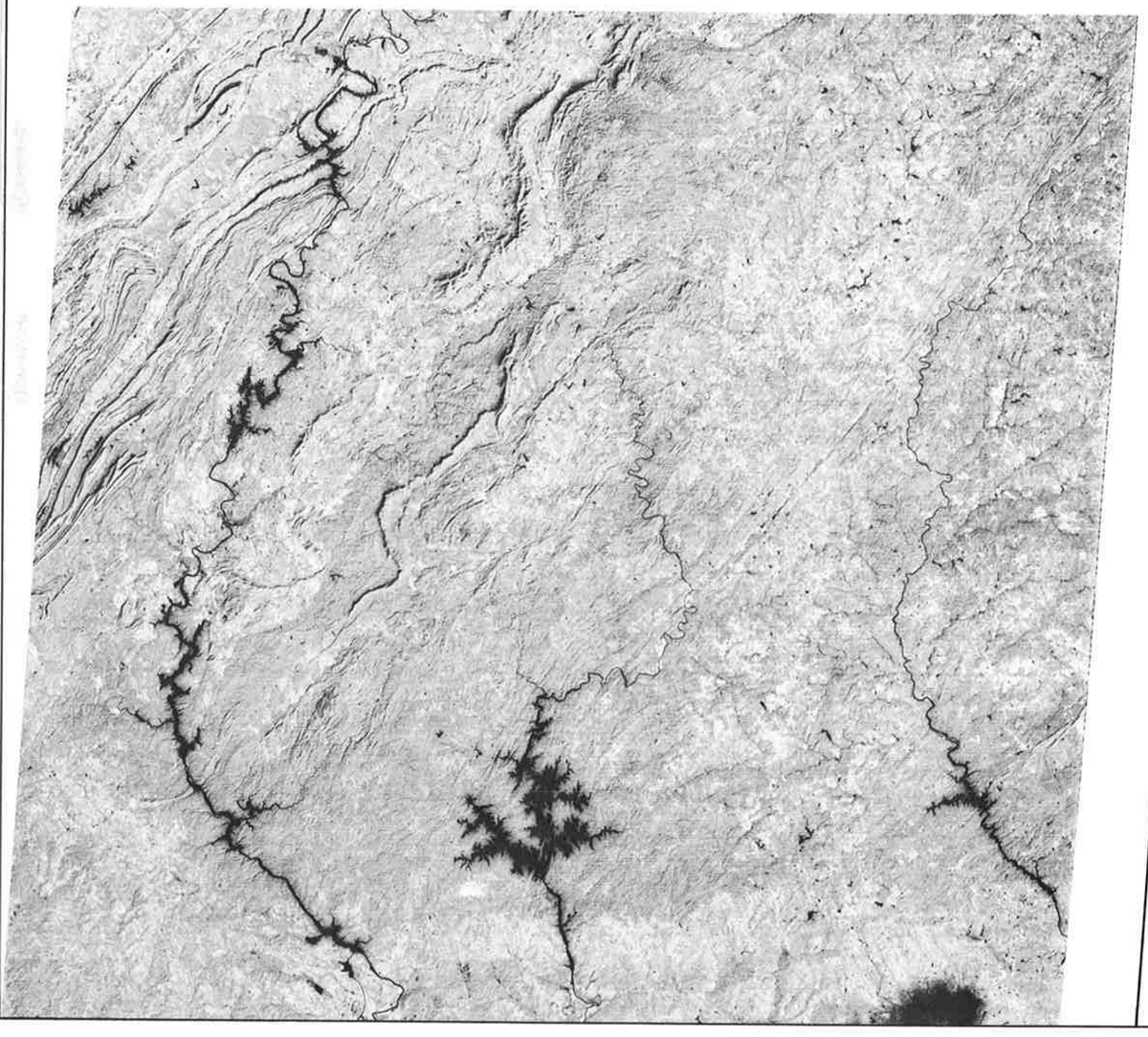
K-2
MSS-7
14 JAN. 73

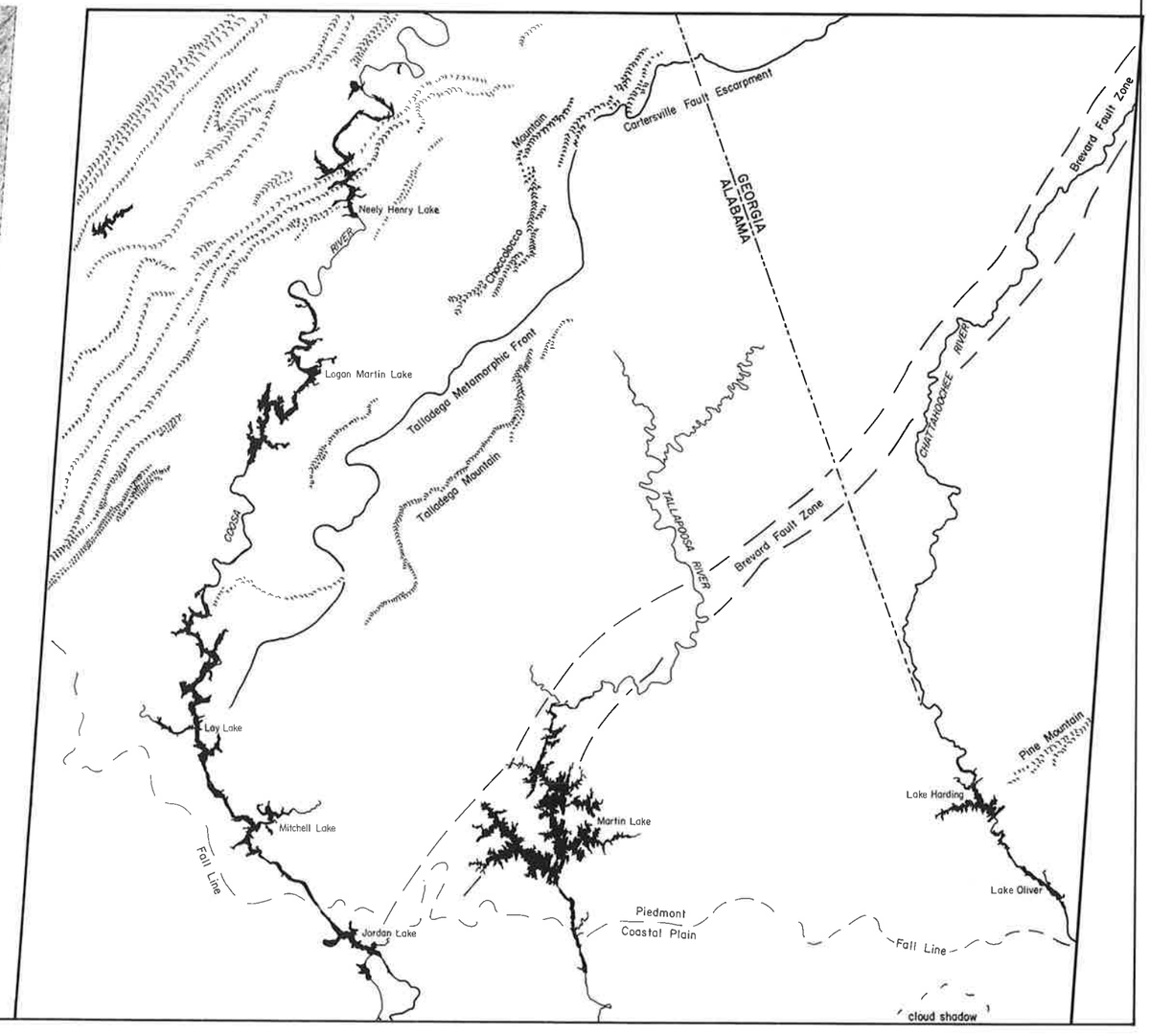


1 inch equals approximately 16 miles

10 0 10 20 30 40 miles

10 0 10 20 30 40 50 kilometers





GLOSSARY

These definitions are taken from the following sources:

(1) Gary, Margaret, et al (eds.); *Glossary of Geology*, Washington: American Geological Institute, 1974.

(2) Fairbridge, Rhodes W., (ed.); *The Encyclopedia of Geomorphology*, Encyclopedia of Earth Science Series, Volume III, New York: Rheinhold Book Corporation, 1968.

All comments within brackets are the authors'. B.P. indicates before present time.

aerial photograph — Any photograph taken from the air, such as a photograph of a part of the Earth's surface taken by a camera mounted in an aircraft. Syn: aerial photo; air photograph; aerophoto; airview. (1)

anticline — A fold, the core of which contains the stratigraphically older rocks; it is convex upward. Ant: syncline. (1)

aquifer — A body of rock that contains sufficient saturated permeable material to conduct ground water and to yield economically significant quantitites of ground water to wells and springs . . . . (1)

beach ridge — A low, essentially continuous mound of beach or beach-and-dune material (sand, gravel, shingle) heaped up by the action of waves and currents on the backshore of a beach beyond the present limit of storm waves or the reach of ordinary tides, and occurring singly or as one of a series of approximately parallel deposits. The ridges are roughly parallel to the shoreline and represent successive positions of an advancing shoreline. (1)

bed rock — A general term for the rock, usually solid, that underlies soil or other unconsolidated superficial material. (1)

Carolina bay — Any of various shallow, often oval or elliptical, generally marshy, closed depressions in the Atlantic Coastal Plain (from southern New Jersey to NE Florida, esp. developed in the Carolinas), ranging from about 100 m to many kilometers in length, rich in humus, and containing tree and shrub vegetation different from that of the surrounding areas. Their origin is much debated and has been attributed to fallen meteorites, upwelling springs, eddy currents, and solution. (1)

coarse-grained — . . . (b) Said of a sediment or sedimentary rock, and of its texture, in which the individual constituents are large enough to see with the naked eye; specif. said of a sediment or rock whose particles have an average diameter greater than 2mm (0.08 in., or granule size and larger). (1)

dendritic drainage pattern — A drainage pattern in which the streams branch irregularly . . . resembling in plan the branching habit of certain trees (such as oaks or maples), and produced where a . . . stream receives several tributaries which in turn are fed by smaller tributaries. It is indicative of . . . streams flowing across horizontal and homogeneous strata or complex crystalline rocks offering uniform resistance to erosion. (1)

dip — The angle that a structural surface, e.g. a bedding or fault plane, makes with the horizontal, measured perpendicular to the strike of the structure. (1)

downdip — A direction that is downwards and parallel to the dip of a structure or surface. (1)

erosion — The general process or the group of processes whereby the earthy and rocky materials of the Earth's crust are loosened, dissolved, or worn away, and simultaneously removed from one place to another, by natural agencies that include weathering, solution, corrasion, and transportation . . . . (1)

escarpment — A long, more or less continuous cliff or relatively steep slope facing in one general direction, breaking the general continuity of the land by separating two level or gently sloping surfaces, and produced by erosion or by faulting. The term is often used synonymously with scarp, although "escarpment" is more often applied to a cliff formed by differential erosion . . . . (1)

fall line — An imaginary line or narrow zone connecting the waterfalls on several successive and near-parallel rivers and marking the points where these rivers make a sudden descent from the upland to the lowland, as at the edge of a plateau; specif. the Fall Line marking the boundary between the ancient and resistant crystalline rocks of the Piedmont Plateau and the younger and softer sediments of the Atlantic Coastal Plain in the eastern U.S. It also marks the limit of navigability of the rivers. Syn: fall zone. (1)

fault — A surface or zone of rock fracture along which there has been displacement, from a few centimeters to a few kilometers in scale. (1)

fine-grained — . . . (b) Said of a sediment or sedimentary rock, and of its texture, in which the individual constituents are too small to distinguish with the unaided eye; specif. said of a sediment or rock whose particles have an average diameter less than 1/16 mm (62 microns, or silt size and smaller). (1)

floodplain — (a) The surface or strip of relatively smooth land adjacent to a river channel, constructed (or in the process of being constructed) by the present river in its existing regimen and covered with water when the river overflows its banks at times of high water. It is built of alluvium carried by the river during floods and deposited in the sluggish water beyond the influence of the swiftest current. A river has one floodplain and may have one or more terraces representing abandoned floodplains . . . . (b) Any flat or nearly flat, usually dry lowland that borders a stream and that may be covered by its waters at flood stages; the land, beyond a stream channel, described by the perimeter of the maximum probable flood. Syn: floodland . . . . (1)

fluvial — (a) Of or pertaining to a river or rivers . . . . (c) Produced by the action of a stream or river. — The term is used by geologists esp. in regard to river flow and river action. (1)

fluvial deposit — A sedimentary deposit consisting of material transported by . . . and . . . laid down by a . . . stream. Syn: fluviatile deposit. (1)

igneous — Said of a rock or mineral that solidified from molten or partly molten material, i.e., from a magma; also, applied to processes leading to, related to, or resulting from the formation of such rocks. "Igneous" rocks constitute one of the three main classes into which all rocks are divided (i.e. igneous, metamorphic, sedimentary). (1)

image (photo) — (a) A pictorial representation of a subject on photographic film whether produced by direct photography or by imagery . . . . (1)

image/frame — That data from one spectral band of one sensor for a nominal framing area of the Earth's surface. (1)

imagery — The pictorial and indirect representation of a subject, produced by electromagnetic radiation emitted or reflected from, or transmitted through, the subject, and detected electronically . . . such as one displayed on a television-type tube, or a photograph of same. (1)

infiltration — The movement of water or solutions . . . into a rock through its interstices or fractures or into the soil, from another area. (1)

infiltration rate — The rate at which a soil under specified conditions can absorb falling rain or melting snow . . . . (1)

intrusion — The process of emplacement of magma in preexisting rock; magmatic activity; also, the igneous rock mass so formed within the surrounding rock . . . . Syn: injection; emplacement; invasion; irruption. (1)

karst — A type of topography that is formed over limestone, dolomite, or gypsum by dissolving or solution, and that is characterized by closed depressions or sinkholes, caves, and underground drainage . . . . (1)

limesink — See sinkhole.

lithology — (a) The description of rocks . . . on the basis of such characteristics as color, structures, mineralogic composition, and grain size. (b) The physical character of a rock. (1)

medium-grained — . . . (b) Said of a sediment or sedimentary rock, and of its texture, in which the individual particles have an average diameter in the range of 1/16 to 2mm (62-2000 microns, or sand size.) . . . . — The term is used in a relative sense to describe rocks that are neither coarse-grained nor fine-grained. (1)

metamorphic rock — . . . (b) In current usage, any rock derived from preexisting rocks by mineralogical, chemical, and structural changes, essentially in the solid state, in response to marked changes in temperature, pressure, shearing stress, and chemical environment at depth in the Earth's crust, i.e. below the zones of weathering and cementation. (1)

Miocene — An epoch of the upper Tertiary period, after the Oligocene and before the Pliocene [5-25 million years B.P.], also, the corresponding worldwide series of rocks. It is sometimes considered to be a period, when the Tertiary is designated as an era. (1)

oxbow lake — The crescent-shaped, often ephemeral, body of standing water situated by the side of a stream in the abandoned channel (oxbow) of a meander after the stream formed a neck cutoff and the ends of the original bend were silted up. Examples are common along the banks of the Mississippi River, where they are often known as bayous. (1)

Paleozoic — An era of geologic time, from the end of the Precambrian to the beginning of the Mesozoic. (1) [600-225 million years B.P.]

Pleistocene — An epoch of the Quaternary period, after the Pliocene of the Tertiary and before the Holocene [1-8 million years — 10,000 years B.P.]; also, the corresponding worldwide series of rocks. When the Quaternary is designated as an era, the Pleistocene is considered to be a period. Syn: Ice Age; Great Ice Age; glacial epoch; . . . . (1)

Pliocene — An epoch of the Tertiary period, after the Miocene and before the Pleistocene [5-1.8 million years B.P.]; also, the corresponding worldwide series of rocks. It is sometimes considered to be a period, when the Tertiary is designated as an era. (1)

scarp — . . . (b) A relatively steep and straight, cliff-like face or slope of considerable linear extent, breaking the general continuity of the land by separating level or gently sloping surfaces lying at different levels, along the margin of a plateau, mesa, terrace, or bench. A scarp may be of any height. The term should not be used for a slope of highly irregular outline . . . . (1)

sedimentary rock — (a) A rock resulting from the consolidation of loose sediment that has accumulated in layers; . . . or a rock . . . formed by precipitation from solution, or an organic rock (such as certain limestones) consisting of the remains or secretions of plants and animals. The term is sometimes restricted by some authors to include only those rocks consisting of mechanically derived sediment; others extend the term to embrace all rocks other than purely igneous and completely metamorphic rocks, thereby including pyroclastic rocks composed of fragments blown from volcanoes and deposited on land or in water. Syn: stratified rock; . . . (1)

sediment load — The solid material (load) that is transported by a natural agent, esp. by a stream . . . (1)

sink — See sinkhole.

sinkhole — . . . applies to any depression ranging from a shallow saucer shape, where runoff water quickly sinks into the ground, to a funnel-shaped or cylindrical pipe that normally gives access to underground caves . . . . The depression may contain a pond or lake. (2) [They may form in two ways: by the gradual solution of a soluble rock (limestone, salt, gypsum, anhydrite) beneath the soil cover, or by the undermining of a cavern that leads to a collapsed sink.] Syn: sink, limesink, limestone sink, swallow hole.

spoil — Waste material removed in mining, quarrying, dredging, or excavating; . . . or refuse earth, rock, and dirt material removed from a pond, drainage ditch, or other cut in engineering earthworks. (1)

strike — The direction or trend that a structural surface, e.g. a bedding or fault plane, takes as it intersects the horizontal. Syn: line of strike. (1)

syncline — A fold, the core of which contains the stratigraphically younger rocks; it is concave upward. Ant: anticline. (1)

ultramafic — Said of an igneous rock composed chiefly of mafic minerals [e.g. iron-magnesium silicates].

water table — The surface between the zone of saturation and the zone of aeration; that surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere. Syn: waterline; water level; ground-water table; ground-water surface; plane of saturation; saturated surface; level of saturation; phreatic surface; ground-water level; free-water elevation; free-water surface. (1)

weathering — The destructive process or group of processes constituting that part of erosion whereby earthy and rocky materials on exposure to atmospheric agents at or near the Earth's surface are changed in character (color, texture, composition, firmness, or form), with little or no transport of the loosened or altered material; specif. the physical disintegration and chemical decomposition of rock that produce an in-situ mantle of waste and prepare sediments for transportation. Most weathering occurs at the surface, but it may take place at considerable depths, as in well-jointed rocks that permit easy penetration of atmospheric oxygen and circulating surface waters . . . . (1)