# Ecoregions of Georgia

Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources. They are designed to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components. Ecoregions are directly applicable to the immediate needs of state agencies, including the development of biological criteria and water quality standards and the establishment of management goals for nonpoint-source pollution. They are also relevant to integrated ecosystem management, an ultimate goal of many federal and state resource management

The approach used to compile this map is based on the premise that ecological regions can be identified through the analysis of the spatial patterns and the composition of biotic and abiotic phenomena that affect or reflect differences in ecosystem quality and integrity (Wiken 1986; Omernik 1987, 1995). These phenomena include geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. The relative importance of each characteristic varies from one ecological region to another regardless of the hierarchical level. A Roman numeral hierarchical scheme has been adopted for different levels of ecological regions. Level I is the coarsest level, dividing North America into 15 ecological regions. Level II divides the continent into 52 regions (Commission for Environmental Cooperation Working Group 1997). At level III, the continental United States contains 104 ecoregions and the conterminous United States has 84 ecoregions (United States Environmental Protection Agency [USEPA] 2000). Level IV is a further subdivision of level III ecoregions. Explanations of the methods used to define the USEPA's ecoregions are given in Omernik (1995), Omernik and others (2000), and Gallant and others (1989).

Georgia contains barrier islands and coastal lowlands, large river floodplain forests, rolling plains and plateaus, forested mountains, and a variety of aquatic habitats. Ecological and biological diversity is enormous. There are 6 level III ecoregions and 28 level IV ecoregions in Georgia and most continue into ecologically similar parts of adjacent states.

The level III and IV ecoregion map was compiled at a scale of 1:250,000 and depicts revisions and subdivisions of earlier level III ecoregions that were originally compiled at a smaller scale (USEPA 2000; Omernik 1987). This poster is part of a collaborative project primarily between USEPA Region IV, USEPA National Health and Environmental Effects Research Laboratory (Corvallis, Oregon), Georgia Department of Natural Resources (GA DNR), and the United States Department of Agriculture-Natural Resources Conservation Service (NRCS). Collaboration and consultation also occured with the United States Department of Agriculture-Forest Service (USFS), United States Department of the Interior-Geological Survey (USGS)-Earth Resources Observation Systems (EROS) Data Center, and with other State of Georgia

The project is associated with an interagency effort to develop a common framework of ecological regions (McMahon and others, 2001). Reaching that objective requires recognition of the differences in the conceptual approaches and mapping methodologies applied to develop the most common ecoregion-type frameworks, including those developed by the USFS (Bailey and others, 1994), the USEPA (Omernik 1987, 1995), and the NRCS (U.S. Department of Agriculture-Soil Conservation Service, 1981). As each of these frameworks is further refined, their differences are becoming less discernible. A regional collaborative project such as this one in Georgia, where some agreement has been reached among multiple resource management agencies, is a step toward attaining consensus and consistency in ecoregion frameworks for the

Agriculture Handbook 296, 156 p.

Bailey, R.G., Avers, P.E., King, T., and McNab, W.H., eds., 1994, Ecoregions and subregions of the United States (map) (supplementary table of map unit descriptions compiled and edited by McNab, W.H. and Bailey, R.G.): Washington, D.C., U.S. Department of Agriculture-Forest

Commission for Environmental Cooperation Working Group, 1997, Ecological regions of North America - toward a common perspective: Montreal, Quebec, Commission for Environmental Cooperation, 71 p. Gallant, A.L., Whittier, T.R., Larsen, D.P., Omernik, J.M., and Hughes, R.M., 1989, Regionalization as a tool for managing environmental resources: Corvallis, Oregon, U.S. Environmental Protection Agency, EPA/600/3-89/060, 152 p.

McMahon, G., Gregonis, S.M., Waltman, S.W., Omernik, J.M., Thorson, T.D., Freeouf, J.A., Rorick, A.H., and Keys, J.E., 2001, Developing a spatial framework of common ecological regions for the conterminous United States: Environmental Management, v. 28, no. 3, p. 293-316. Omernik, J.M., 1987, Ecoregions of the conterminous United States (map supplement): Annals of the Association of American Geographers, v. 77, no. 1, p. 118-125, scale 1:7,500,000.

Omernik, J.M., 1995, Ecoregions - a framework for environmental management, in Davis, W.S. and Simon, T.P., eds., Biological assessment and criteria-tools for water resource planning and decision making: Boca Raton, Florida, Lewis Publishers, p. 49-62.

Omernik, J.M., Chapman, S.S., Lillie, R.A., and Dumke, R.T., 2000, Ecoregions of Wisconsin: Transactions of the Wisconsin Academy of Sciences, Arts and Letters, v. 88, no. 2000, p. 77-103.

U.S. Department of Agriculture-Soil Conservation Service, 1981, Land resource regions and major land resource areas of the United States:

U.S. Environmental Protection Agency, 2000, Level III ecoregions of the continental United States (revision of Omernik, 1987): Corvallis, Oregon, U.S. Environmental Protection Agency-National Health and Environmental Effects Research Laboratory, Map M-1, various scales. Wiken, E., 1986, Terrestrial ecozones of Canada: Ottawa, Environment Canada, Ecological Land Classification Series no. 19, 26 p.

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To obtain additional copies of this map, the accompanying table of ecoregion characteristics, GIS coverages, or more information about Georgia or U.S. ecoregions, contact Glenn Griffith, USDA-NRCS, 200 SW 35th Street, Corvallis, OR 97333, phone (541)754-4465, email griffith.glenn@epa.gov, or see http://www.epa.gov/wed/pages/ecoregions/ecoregions.htm.

University of Georgia Press, 218 p.

Laboratory, EPA/600/Q-95-002, 83 p.

Professional Paper 1265, 49 p.

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#### 45. Piedmont

Considered the nonmountainous portion of the old Appalachians Highland by physiographers, the northeast-southwest trending Piedmont ecoregion comprises a transitional area between the mostly mountainous ecoregions of the Appalachians to the northwest and the relatively flat coastal plain to the southeast. It is a complex mosaic of Precambrian and Paleozoic metamorphic and igneous rocks with landforms of moderately dissected irregular plains and some hills. Granite outcrops are scattered throughout the Piedmont and often contain endemic plant species. The soils tend to be finer-textured than in coastal plain regions with less sand and more clay. Several major land cover transformations have occurred in the Piedmont over the past 200 years, from forest to cropland, then back to pine and hardwood woodlands, and now in many areas, spreading urban- and suburbanization.

forested, with major forest types of oak-pine and oak-hickory, with less loblolly-shortleaf pine forest than 45b. the region, including Alabama's highest peak, 2407-foot Cheaha Mountain. The climate of 45d is slightly cooler Open areas are mostly in pasture, although there are some small areas of cropland. Hay, cattle, and poultry are the and wetter than the other ecoregions (45a, b, c) of the Georgia Piedmont. Oak-hickory-pine is the natural main agricultural products. In Georgia, urban/suburban land cover has increased greatly within this ecoregion over vegetation type. the past twenty years. The Southern Outer Piedmont ecoregion has lower elevations, less relief, and less precipitation than 45a. Loblolly-shortleaf pine is the major forest type, with less oak-hickory and oak-pine than in 45a. Gneiss,

majority of soils are Kanhapludults. The southern boundary of the ecoregion occurs at the Fall Line, where Huckleberry Pinnacle. All have steep slopes and rugged terrain. Pine Mountain Valley, a southward-sloping unconsolidated coastal plain sediments are deposited over the Piedmont metamorphic and igneous rocks. The Carolina Slate Belt is found primarily in the Carolinas, although a small area extends into Georgia. metamorphosed than most Piedmont regions. It tends to be less rugged and less dissected than other Piedmont gravelly substrates.

The **Southern Inner Piedmont** is mostly higher in elevation with more relief than 45b, but has less elevation and relief and has different rocks and soils than 45d. The rolling to hilly, well-dissected upland

The **Talladega Upland** of the Georgia Piedmont contains some dissected hills and tablelands that are mostly forested and at generally higher elevations than 45a and 45b. The geology is distinctive, consisting contains mostly schist, gneiss, and granite bedrock. In the western portion, west of Atlanta and into Alabama, mica of mostly phyllite, quartzite, slate, metasiltstone, and metaconglomerate, in contrast to the high-grade schist and micaceous saprolite are typical. To the east, biotite gneiss is more common. The region is now mostly metamorphic and intrusive igneous rocks of 45a and 45b. To the west in Alabama, are more mountainous parts of The Pine Mountain Ridges, a small, narrow region in the southwest portion of the Georgia Piedmont,

schist and granite are the dominant rock types, covered with deep saprolite and mostly red, clayey subsoils. The northeast, with smaller ridges including Bull Trail Mountain, Indian Grave Mountain, Salter Mountain, and rolling plain roughly 700 to 950 feet in elevation, is situated between Pine Mountain to the north and Oak Mountain on the south. The Flint River has cut some narrow, steep gorges, 400 feet deep, through the ridges. The mineral-rich metavolcanic and metasedimentary rocks with slatey cleavage are finer-grained and less

Streams in this region are often of higher gradient than surrounding areas of 45b, and contain more rocky and

### 65. Southeastern Plains

areas, and it generally has more silty and silty clay soils.

These irregular plains with broad interstream areas have a mosaic of cropland, pasture, woodland, and forest. Natural vegetation is mostly oak-hickory-pine and Southern mixed forest. The Cretaceous or Tertiary-age sands, silts, and clays of the region contrast geologically with the Paleozoic limestone, shale and sandstone of ecoregions 67 and 68 or with the even older metamorphic and igneous rocks of the Piedmont (45) and Blue Ridge (66). Elevations

The Sand Hills of Georgia form a narrow, rolling to hilly, highly dissected coastal plain belt stretching across the state from Augusta to Columbus. The region is composed primarily of Cretaceous and some

15k

In contrast to the more forested Sand Hills (65c) that formed mostly on light-colored Cretaceous sands, the Coastal Plain Red Uplands formed on reddish Eocene sand and clay formations. Soils are mostly Eocene-age marine sands and clays deposited over the crystalline and metamorphic rocks of the Piedmont (45). well-drained with a brown or reddish brown loamy or sandy surface layer and red subsoils. The majority of the Many of the droughty, low-nutrient soils formed in thick beds of sand, although soils in some areas contain more area is in cropland or pasture, with some woodland on steeper slopes. Crops include, peanuts, soybeans, wheat, loamy and clayey horizons. On the drier sites, turkey oak and longleaf pine are dominant, while shortleaf-loblolly cotton, corn, and rye. Natural vegetation was primarily southern mixed forest and oak-hickory-pine forest.

65g and 65k, and streams have increased gradient. The natural vegetation is mostly oak-hickory-pine forest, and to woody mints found at places places such as the Ohoopee dunes in Tattnall County. the south begins a transition into southern mixed forest. Land cover is mostly mixed forest and woodland, pine

The Tallahassee Hills/Valdosta Limesink ecoregion combines two slightly different areas, both

bottomed depressions are scattered throughout the region, caused by solution of the underlying limestone. The drained areas. wetter, poorly drained depressions contain blackgum, sweetgum, water oak, and a few pines and cypress. Many of the limesink ponds and marshes act as biological oases in the mostly agricultural landscape. Crops such as peanuts

Southeastern Floodplains and Low Terraces comprise a riverine ecoregion of large sluggish rivers and backwaters with ponds, swamps, and oxbow lakes. River swamp forests of bald cypress and water tupelo and pecans are common, and cotton production has increased dramatically in recent years.

The **Tifton Upland** of Georgia has more rolling, hilly topography compared to 65g and 75e, with a mosaic of agriculture, pasture, and some mixed pine/hardwood forests. Soils are well-drained, brownish, and higher, better-drained terraces. The Georgia portion of the region includes the major river systems, such as the loamy, often with iron-rich or plinthic layers. They support crops of cotton, peanuts, soybeans, and corn. On the Chattahoochee, Flint, Ocmulgee, Oconee, Ogeechee, and Savannah. All of these alluvial rivers of 65p either west side of the region, the Pelham Escarpment has bluffs and deep ravines with cool microclimates that support originate in or cross the Piedmont (45). several rare plants and animals, as well as species with more northern affinities. The eastern boundary in Georgia is a transitional area to the Okefenokee Plains (75e) where the relief diminishes, and solution basins and lower

The dissected irregular plains and gently rolling low hills of the **Southern Hilly Gulf Coastal Plain**The dissected irregular plains and gently rolling low hills of the **Southern Hilly Gulf Coastal Plain**Southern Hilly Gulf Coastal Plain

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influenced by underlying limestone. The Floridan aquifer is thinly confined in this region, and streams are The **Dougherty Plain** is mostly flat to gently rolling and influenced by the near-surface limestone. The karst topography contains sinkholes, springs, and fewer streams in the flatter part of the plain. The has rolling, hilly topography that is more forested than 65h. Clayey sands have weathered to a thick red residual northwestern boundary is gradational, as more gentle slopes and lower relief are found towards the center of the soil. Relief decreases towards the east, and the Valdosta Limesink area has more solution basins with ponds, lakes, region. On the southeast, the base of the Pelham escarpment marks the boundary with the Tifton Upland (65h). and swampy depressions. Soils in the east tend to be brownish and have more cropland. Mixed hardwoods and Natural forest cover consisted of pines, including longleaf pine, red oaks, and hickories. Many shallow, flat-pine are found on the clayhill upland soils, while longleaf pine/xerophytic oak types occur on the sandy, well-

and oak-dominated bottomland hardwood forests provide important wildlife corridors and habitat. In Georgia, the

## 66. Blue Ridge

The Blue Ridge extends from southern Pennsylvania to northern Georgia, varying from narrow ridges to hilly plateaus to more massive mountainous areas with high peaks. The mostly forested slopes, high-gradient, cool, clear streams, and rugged terrain occur on a mix of igneous, metamorphic, and sedimentary geology. Annual precipitation of over 80 inches can occur on the well-exposed high peaks. The southern Blue Ridge is one of the richest centers of biodiversity in the eastern U.S. Black bear, whitetail deer, wild boar, turkey, grouse, songbirds, many species of amphibians and reptiles, thousands of species of invertebrates, and a variety of small mammals are found here. It is one of the most floristically diverse ecoregions, and includes Appalachian oak forests, northern hardwoods, and, at the highest elevations in Tennessee and North Carolina, Southeastern spruce-fir forests. Shrub, grass, and heath balds, hemlock, cove hardwoods, and oak-pine communities are also significant.

The **Southern Crystalline Ridges and Mountains** contain the highest and wettest mountains in Georgia. These occur primarily on Precambrian-age igneous and high-grade metamorphic rocks. The common schist and gneiss. Although the highest peaks are lower than in 66d, and parts of the region have more open low crystalline rock types include gneiss, schist, and quartzite, covered by well-drained, acidic, brownish, loamy soils. hills, there are some isolated masses of rugged mountains, such as the biologically-diverse Cohutta Mountains, Some mafic and ultramafic rocks also occur here, producing more basic soils. Elevations of this rough, dissected Rich Mountains, and Fort Mountains support complex and numerous plant communities and a region are typically 1800-4000 feet, with Brasstown Bald Mountain, the highest point in Georgia, reaching 4,784 great diversity of plant species. feet. Although there are a few small areas of pasture and apple orchards, the region is mostly forested. Shrub balds, with rhododendron and mountain laurel, are found on the highest peaks such as Brasstown Bald and Rabun Bald.

The **Broad Basins** ecoregion is drier, and has lower elevations and less relief than the more mountainous Blue Ridge regions (66g, 66d). It also has less bouldery colluvium than those two surrounding regions Oak ridge forests at the highest elevations have stunted northern red oak or white oak trees. Northern hardwood or and more saprolite. The soils are mostly deep, well-drained, loamy to clayey Ultisols. The Broad Basins have a cove hardwood forests include yellow birch, beech, buckeye, basswood, tulip poplar, sugar maple, striped maple, mix of oaks and pines, including white, chestnut, black, and scarlet oaks and shortleaf and Virginia pine. and silverbell. Hemlock grows in the moist areas closer to streams. Variations of oak-dominated forests and oak-

The **Southern Metasedimentary Mountains** in Georgia contain rocks that are generally not as strongly metamorphosed as the gneisses and schists of 66d. The geologic materials are mostly late Pre-Cambrian support local cattle, hog, or poultry operations.

pine forests occur on the lower slopes. White pine is often found in the Georgia Blue Ridge above 1500-2000 feet.

narrow areas of row crops and truck crops on terraces and floodplains. Much of the pasture and corn crops

# 67. Ridge and Valley

Sometimes called the Great Valley in Georgia, this is a relatively low-lying region between the Blue Ridge (66) to the east and the Southwestern Appalachians (68) on the west. As a result of extreme folding and faulting events, the roughly parallel ridges and valleys come in a variety of widths, heights, and geologic materials, including limestone, dolomite, shale, siltstone, sandstone, chert, mudstone, and marble. Springs and caves are relatively numerous. Land cover is mixed and present-day forests cover about 50% of the region. The ecoregion's diverse habitats contain many unique species of terrestrial and aquatic flora and fauna.

ecoregion 65 in Alabama.

The Southern Shale Valleys consist of undulating to rolling valleys and some low, rounded hills and knobs that are dominated by shale. The soils formed in materials weathered from shale, shaly limestone, some white oak communities are typical, along with loblolly, Virginia, and shortleaf pines. grown on the foot slopes and bottom land.

The Southern Limestone/Dolomite Valleys and Low Rolling Hills form a heterogeneous region composed predominantly of limestone and cherty dolomite. Landforms are mostly undulating valleys and low region have areas of shale, siltstone, and conglomerate. The steep, forested ridges tend to have narrow crests, and rounded ridges and hills, with many caves and springs. Soils vary in their productivity, and land cover includes the soils are typically stony, sandy, and of low fertility. The chemistry of streams flowing down the ridges can oak-hickory and oak-pine forests, pasture, intensive agriculture, and urban and industrial. Along the Coosa River vary greatly depending on the geologic material. In Georgia and Tennessee, most of the sandstone ridges are floodplain, biota more typical of coastal plain regions can be found due to the valley and riverine connection to relatively narrow, but in Alabama, the region also includes the Coosa and Cahaba ridges that are broader and of younger Pennsylvanian-age sandstone and shale. Although most all of the ridges were once logged, a variety of

and clayey sediments, and tend to be deep, acidic, moderately well-drained, and slowly permeable. The steeper slopes are used for pasture or have reverted to brush and mixed forest land. The forested sections are mostly mixed

The Southern Dissected Ridges and Knobs contain more crenulated, broken, or hummocky ridges, compared to the smoother, more sharply crested sandstone ridges of 67h. Although shale is common, oak communities and some oak-hickory-pine. Small fields of hay, corn, soybeans, tobacco, and garden crops are there is a mixture and interbedding of geologic materials, including cherts, siltstone, sandstone, and quartzose limestone. Oak forests and pine forests are typical for the higher elevations of the ridges, with oak-hickory and a number of more mesic forest species on the lower slopes, knobs, and draws.

# 68. Southwestern Appalachians

Stretching from Kentucky to Alabama, these low mountains contain a mosaic of forest and woodland with some cropland and pasture. The eastern boundary of the ecoregion, along the abrupt escarpment next to the Ridge and Valley (67), is relatively smooth and only slightly notched by small eastward flowing stream drainages. The western boundary, next to the Interior Plateau's Eastern Highland Rim (71g) in Alabama and Tennessee, is more crenulated with a rougher escarpment that is more deeply incised. The deeper gorges provide wet and cool environments that can harbor distinct plant communities. The mixed mesophytic forest is restricted mostly to the deeper ravines and escarpment slopes, and the summit or tableland forests are dominated by mixed oaks with shortleaf pine.

The Plateau Escarpment is characterized by steep, forested slopes and high velocity, high gradient streams. It is an abrupt transition area between the plateau (68d) and the valley areas (67f). Local relief is

The Southern Table Plateaus include Sand Mountain and Lookout Mountain in northwest Georgia. While it has some similarities to the Cumberland Plateau (68a) in Tennessee with its Pennsylvanian-age often 1000 feet or more. The geologic strata include Mississippian-age limestone, sandstone, shale, and siltstone, sandstone caprock, shale layers, and coal-bearing strata, this ecoregion is lower in elevation, has a slightly warmer and Pennsylvanian-age shale, siltstone, sandstone, and conglomerate. Streams have cut down into the limestone, climate, and has more agriculture. Although the Georgia portion is mostly forested, primarily with mixed oak and but the gorge talus slopes are composed of colluvium with huge angular, slabby blocks of sandstone. Vegetation oak-hickory communities, elevations decrease to the southwest in Alabama and there is more cropland and community types in the ravines and gorges include mixed oak and chestnut oak on the upper slopes, more mesic pasture. The plateau surface is less dissected with lower relief compared to the Plateau Escarpment (68c), and it is forests on the middle and lower slopes (beech-yellow poplar, sugar maple-basswood-ash-buckeye), with some rare slightly cooler with more precipitation than in the nearby lower elevations of 67f. hemlock along rocky streamsides and river birch along floodplain terraces.

# 75. Southern Coastal Plain

The Southern Coastal Plain extends from South Carolina and Georgia through much of central Florida, and along the Gulf coast lowlands of the Florida Panhandle, Alabama, and Mississippi. From a national perspective, it appears to be mostly flat plains, but it is a heterogeneous region also containing barrier islands, coastal lagoons, marshes, and swampy lowlands along the Gulf and Atlantic coasts. In Florida, an area of discontinuous highlands contains numerous lakes. This ecoregion is generally lower in elevation with less relief and wetter soils than ecoregion 65. Once covered by a variety of forest communities that included trees of longleaf pine, slash pine, pond pine, beech, sweetgum, southern magnolia, white oak, and laurel oak, land cover in the region is now mostly slash and loblolly pine with oak-gum-cypress forest in some low lying areas, citrus groves, pasture for beef cattle, and urban.

forest and young pine plantation land cover, with areas of forested wetland.

Spodosols and other wet soils are common, although a few ridges and small areas of better-drained soils add some forests are found in the wet, narrow floodplains.

headwaters for the St. Marys and Suwannee Rivers. The swamp contains numerous islands, lakes, and thick beds and oxbow lakes. River swamp forests of bald cypress and water tupelo and oak-dominated bottomland of peat. The slow-moving waters are tea-colored and acidic. The Okefenokee Swamp is a rainfall-dependent hardwood forests provide important wildlife habitat.

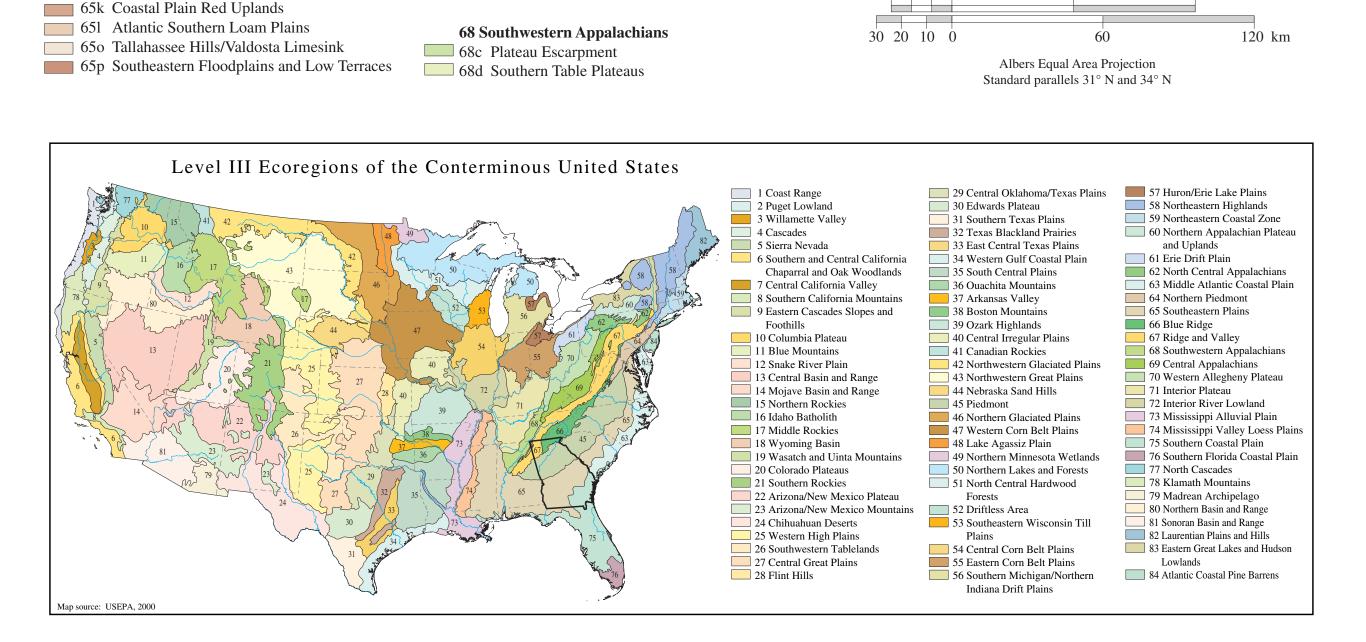
The Okefenokee Plains consist of flat plains and low terraces developed on Pleistocene-Pliocene sands and gravels. These plains have slightly higher elevations and less standing water than 75g, although there are numereous swamps and bays. Soils are somewhat-poorly to poorly drained. The region has mostly coniferous pattern by much of the upper Satilla River basin. Cropland is found mostly on the well-drained soils on the long, narrow, flat to gently sloping ridges paralleling many of the stream courses. Some excessively drained soils on The **Sea Island Flatwoods** are mostly poorly-drained flat plains with lower elevations and less dissection than 651. Pleistocene sea levels rose and fell several times creating different terraces and shoreline deposits.

ecological diversity. Trail Ridge is in this region, forming the boundary with 75g. Loblolly and slash pine plantations cover much of the region. Water oak, willow oak, sweetgum, blackgum and cypress occur in wet areas.

Toological diversity. Trail Ridge is in this region, forming the boundary with 75g. Loblolly and slash pine plantations cover much of the region. Water oak, willow oak, sweetgum, blackgum and cypress occur in wet areas. The **Okefenokee Swamp** is a mixture of forested swamp and freshwater marsh with some pine uplands. With Trail Ridge at its eastern boundary, the swamp drains to the south and southwest and contains the

system, and cycles of drought and fire affect both its vegetation and wildlife distributions. Cypress, blackgum, and bay forests are common, with scattered areas of prairie, which are comprised of grasses, sedges, and various dynamic environment affected by ocean wave, wind, and river action. Mostly sandy soils occur on the aquatic plants. The peripheral upland and many of the islands within the swamp are forested with slash and barrier islands, while organic and clayey soils occur in the freshwater, brackish, and salt marshes. Maritime longleaf pine interspersed with hardwood hammocks. Most of this region is within the Okefenokee National forests of live oak, red cedar, slash pine, and cabbage palmetto grow on parts of the sea islands, and various species of cordgrass, saltgrass, and rushes are dominant in the marshes. The coastal marshes are important nursery areas for fish, crabs, shrimp, and other marine species.

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66d Southern Crystalline Ridges and Mountains

67f Southern Limestone/Dolomite Valleys and

67i Southern Dissected Ridges and Knobs

66g Southern Metasedimentary Mountains

66j Broad Basins

**67 Ridge and Valley** 

Low Rolling Hills

67h Southern Sandstone Ridges

67g Southern Shale Valleys

75 Southern Coastal Plain

75i Floodplains and Low Terraces

75j Sea Islands/Coastal Marsh

15 10 5 0

75e Okefenokee Plains

75f Sea Island Flatwoods

75g Okefenokee Swamp

75h Bacon Terraces

Level III ecoregion

— Level IV ecoregion

**—-—** State boundary

— - - — County boundary

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Anderson, J.R., 1970, Major land uses, in The national atlas of the United States of America: Washington, D.C., U.S. Geological Survey, p. 158-159, scale 1:7,500,000.

Bailey, R.G., 1995, Description of the ecoregions of the United States (2d ed.): Miscellanous Publication No. 1391, U.S. Department of Agriculture, Forest Service, 108p. + map.

Bailey, R.G., Avers, P.E., King, T., and McNab, W.H., eds., 1994, Ecoregions and subregions of the United States (map) supplementary table of map unit descriptions compiled and edited by McNab, W.H. and Bailey, R.G.): Washington, D.C., 1.7 500 000

Barnes, C.P., and Marschner, F.J., 1933, Natural land-use areas of the United States: U.S. Department of Agriculture, scale: 1:4.000.000.

Bayer, K.C., 1983, Generalized structural lithologic and physiographic provinces in the fold and thrust belts of the United States: U.S. Geological Survey, scale 1:2,500,000.

Beck, B.F., Asmussen, L., and Leonard, R., 1985, Relationship of geology, physiography, agricultural land use, and ground-water quality in Southwest Georgia: Ground Water, v. 23, no. 5, p. 627-

J.R., and Oaksford, E.T., 1998, Water quality in the Georgia-Florida Coastal Plain, Georgia and Florida, 1992-1996: U.S. Geological Survey Circular 1151. Berndt, M.P., Oaksford, E.T., Darst, M.R., and Marella, R.L.,

1996, Environmental setting and factors that affect water quality in the Georgia-Florida Coastal Plain: U.S. Geological Survey Water Resources-Investigations Report 95-4268, 45 p.

Bonner, J.C., 1964, A history of Georgia agriculture: Athens, University of Georgia Press, 242 p.

Braun, E.L., 1950, Deciduous forests of eastern North America: New York, Hafner Publishing Company, 596 p. Bryant, W.S., McComb, W.C., and Fralish, J.S., 1993, Oakhickory forests (western mesophytic/oak-hickory forests), in

Martin, W.H., Boyce, S.G., and Echternacht, A.C., eds.

Burbanck, M.P., and Platt, R.B., 1964, Granite outcrop communities of the Piedmont Plateau in Georgia: Ecology, v. 45,

communities: New York, John Wiley & Sons, p. 143-201.

Carter, H.S., 1974, The climate of Georgia, in U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Climates of the States, v. 1: Port Washington, N.Y., Water scale 1:3.500.000. Information Center, Inc., p. 71-89.

Christensen, N.L., 1988, Vegetation of the southeastern Coastal Plain, in Barbour, M.G., and Billings, W.D., eds., North American terrestrial vegetation: Cambridge, U.K., Cambridge University Press, p. 317-363.

Georgia: Georgia Department of Natural Resources, scale Colquhoun, D.J., Friddell, M.S., Wheeler, W.H., Daniels, R.B.,

Gregory, J.P., Miller, R.A., and Van Nostrand, A.K., 1987. Quaternary geologic map of the Savannah 4° x 6° quadrangle,

Cooke, C.W., 1943, Geology of the Coastal Plain of Georgia: U.S. Geological Survey Bulletin 941, 119 p. Copeland, C.W., Jr., Rheams, K.F., Neathery T.L., Gilliland,

Quaternary geologic map of the Mobile 4° x 6° quadrangle, Marshall Forest, Rome, Georgia: Castanea, v. 34, p. 414-432.

W.A., Schmidt, W., Clark, W.C., Jr., and Pope, D.E., 1988,

United States: U.S. Geological Survey, Map I-1420(NH-16), scale

Couch, C.A., Hopkins, E.H., and Hardy, P.S., 1996. Influences of regions of the United States: Annals of the Association of environmental settings on aquatic ecosystems in the Apalachicola- American Geographers, v. 85, no. 2, p. 339-355. Chattahoochee-Flint River basin: U.S. Geological Survey Water-Resources Investigations Report 95-4278, 58 p.

Cowdrey, A.E., 1996, This land, this South: an environmental history: Lexington, Ky., University Press of Kentucky, 240 p.

Naturalist, v. 140, no. 1, p. 78-89. Cowell, C.M., 1995, Presettlement Piedmont forests: Patterns of Mart, S.A., 1996, "What nature suffers to groe": Life, labor, and composition and disturbance in central Georgia: Annals of the landscape on the Georgia coast, 1680-1920: Athens, University of Association of American Geographers, v. 85, no. 1, p. 65-83.

Cowell, C.M., 1993, Environmental gradients in secondary forests

Martin, W.H., 1989, Forest patterns in the Great Valley of
U.S. Department of Agriculture, Natural Resources Conservation

Gordon, Whitfield, and Murray Counties, Georgia: Atlanta, Geological Survey of Georgia, Information Circular 47. Dahlberg, M.D., and Scott, D.C., 1971, The freshwater fishes of Martin, W.H., Boyce, S.G., and Echternacht, A.C., eds., 1993b, Georgia: Bulletin of the Georgia Academy of Science, v. 29, p. 1-

Drew, M.B., Kirkman, L.K., and Gholson, A.K., Jr., 1998, The vascular flora of Ichauway, Baker County, Georgia: a remnant Georgia Piedmont: Bulletin of the Georgia Academy of Science, longleaf pine/wiregrass ecosystem: Castanea, v. 63, no. 1, p. 1-24. Feminella, J.W., 2000, Correspondence between stream

macroinvertebrate assemblages and four ecoregions of the

southeastern USA: Journal of the North American Benthological

Fenneman, N.M., 1938, Physiography of eastern United States: New York, McGraw-Hill, 714 p.

Society, v. 19, no. 3, p. 442-461.

Fournier, E.J., and Risse, L.M., 1996, Cotton returns to the South: evidence from Georgia: Southeastern Geographer, v. 35, no. 2, p.

Frost, C.C., 1993, Four centuries of changing landscape patterns in the longleaf pine ecosystem, in Hermann, S.H., ed., Tall Timbers Fire Ecology Conference, the longleaf pine ecosystem: ecology, restoration and management, 18th, Tallahassee, Fla., 1991, Proceedings, Tall Timbers Research Station, p. 17-43.

marshes, peatlands, and swamps, in Cerulean, S.I., and Engstrom, R.T., eds., Tall Timbers Fire Ecology Conference, fire in Ecology, v. 38, no. 3, p. 390-397. wetlands: a management perspective, 19th, Tallahassee, Fla., 1995, Proceedings, Tall Timbers Research Station, p. 39-60. Georgia Department of Natural Resources, 1976, Geologic map of Georgia: Georgia Geological Survey, Geologic and Water 1:1.000.000.

Frost, C.C., 1995, Presettlement fire regimes in southeastern

Resources Division, scale 1:500,000. Georgia Department of Natural Resources, 1995, Landcover of Georgia, 1988-1990: Wildlife Resources Division, scale Georgia College of Agriculture, in cooperation with U.S.

Golley, F.B., 1962, Mammals of Georgia; a study of their Perkins, H.F., and Shaffer, M.E., 1977, Soil associations and land distribution and functional role in the ecosystem: Athens, Ga., use potential of Georgia soils: Georgia Agricultural Experiment Stations, University of Georgia College of Agriculture, in cooperation with U.S. Department of Agriculture, Soil Conservation Service, scale 1:750,000. Greening, H.S., and Gerritsen, J., 1987, Changes in macrophyte

Poole, D.H., 1960, The physical base of Georgia, in Belcher, J.C.,

Prunty, M.C., and Aiken, C.S., 1972, The demise of the Piedmont

cotton region: Annals of the Association of American

Quarterman, E., and Keever, C., 1962, Southern mixed hardwood

Quarterman, E., Burbanck, M.P., and Shure, D.J., 1993, Rock

outcrop communities: limestone, sandstone, and granite, in

United States: U.S. Geological Survey, Map I-1420(NH-17),

Sharitz, R.R., and Mitsch, W.J., 1993, Southern floodplain

forests, in Martin, W.H., Boyce, S.G., and Echternacht, A.C., eds.,

Biodiversity of the southeastern United States: lowland terrestrial

Sheffield, R.M., and Johnson, T.G., 1989, Georgia's Forests:

Asheville, N.C., U.S. Department of Agriculture, Forest Service,

Southeastern Forest Experiment Station, Resource Bulletin SE-

Smalley, G.W., 1982, Classification and evaluation of forest sites

of Agriculture, Forest Service, Southern Forest Experiment

Southeast Regional Climate Center, 1999, Climatological normals

for Georgia, 1961-1990: U.S. Department of Commerce, National

Oceanic and Atmospheric Administration, National Weather

drainage of the Georgia Piedmont: Geological Society of America

Stiles, B.J., and Howel, C.L., 1996, Preliminary results of a

floristic survey of Rabun County, Georgia: Castanea, v. 61, no. 1,

Thorne, R.F., 1954, The vascular plants of southwestern Georgia:

Trimble, S.W., 1970, The Alcovy River swamps: the result of

culturally accelerated sedimentation: Bulletin of the Georgia

production in the Georgia, USA, landscape: 1935-1982:

U.S. Department of Agriculture, Forest Service, 1969, A forest

atlas of the South: New Orleans, Southern Forest Experiment

Station, and Asheville, N.C., Southeastern Forest Experiment

U.S. Department of Agriculture, Forest Service, 1997, Forest type

groups of the United States, scale 1:7,500,000, in Powell, D.S.,

Faulkner, J.L., Darr, D.R., Zhu, Z., and MacCleery, D.W., Forest

resources of the United States: Fort Collins, Colorado, U.S. Department of Agriculture, Forest Service, Rocky Mountain

Forest and Range Experiment Station, General Technical Report

U.S. Department of Agriculture, National Agricultural Statistics

Service, 1999, Census of agriculture, 1997, v. 2, subject series,

Service (formerly Soil Conservation Service), Various county soil

U.S. Department of Agriculture, Soil Conservation Service, 1981,

Land resource regions and major land resource areas of the

United States: Washington, D.C., U.S. Government Printing

U.S. Department of Commerce, Bureau of the Census, 1995,

Census of agriculture, 1992, v. 2, subject series, part 1,

agricultural atlas of the United States: Washington, D.C., U.S.

U.S. Geological Survey, 1986, Land use and land cover data from

1:250,000- and 1:100,000-scale maps: Reston, Va., U.S.

Waggoner, G.S., 1975, Southeastern evergreen and oak-pine

region; inventory of natural areas and sites recommended as

potential natural landmarks: Washington, D.C., U.S. National

Ware, G.O., 1971, Distribution of natural pine in the Coastal

Plain region of Georgia: Bulletin of the Georgia Academy of

Ware, S., Frost, C. and Doerr, P.D., 1993, Southern mixed

hardwood forest: the former longleaf pine forest, in Martin, W.H.,

Southeastern United States: Lowland Terrestrial Communities:

Wharton, C.H., 1978, The natural environments of Georgia:

Atlanta, Georgia Department of Natural Resources, Geologic and

Woodruff, J.F., and Parizek, E.J., 1956, Influence of underlying

rock structures on stream courses and valley profiles in the

Georgia Piedmont: Annals of the Association of American

Boyce, S.G., and Echternacht, A.C., eds., Biodiversity of the

New York, John Wiley and Sons, Inc., p. 447-493.

Office, Agriculture Handbook 296, 156 p + map.

part 1, agricultural atlas of the United States: Washington, D.C.,

U.S. Government Printing Office, 163 p.

surveys of Alabama and Georgia.

Government Printing Office, 204 p.

Park Service, 206 p.

Science, v. 29, p. 179-182.

Water Resources Division, 227 p.

Geological Survey Data Users Guide no. 4.

American Midland Naturalist, v. 52, no. 2, p. 257-327.

on the mid-Cumberland Plateau: New Orleans, U.S. Department

Station, General Technical Report SO-38, 58 p.

Bulletin, v. 87, no. 3, p. 450-452.

Academy of Science, v. 28, p. 131-141.

Environmental Management, v. 11, p. 237-247.

communities: New York, John Wiley & Sons, p. 311-372.

Biodiversity of the Southeastern United States, Upland Terrestrial

Communities: New York, John Wiley and Sons, Inc., p. 35-86.

forest: climax in the southeastern coastal plain, USA: Ecological

and Dean, K.I., eds., Georgia Today, Facts and Trends: Athens,

Pickering, S.M., Jr., and Higgins, M.W., 1979, Georgia from Swamp, Georgia, USA: Aquatic Botany, v. 28, p. 113-128. space - an explanation of the NASA Landsat 1 satellite image color mosaic of the State of Georgia: U.S. Geological Survey Griffith, G.E., Omernik, J.M., Comstock, J.A., Lawrence, S., Martin, G., Goddard, A., Hulcher, V.J., and Foster, T., 2001, Ecoregions of Alabama and Georgia, (2 sided color poster with

map, descriptive text, summary tables, and photographs): Reston, Plummer, G.L., 1975, 18th century forests in Georgia: Bulletin of Virginia, U.S. Geological Survey, scale 1:1,700,000. the Georgia Academy of Science, v. 33, no. 1, p. 1-19. U.S. Department of Agriculture, Forest Service, scale Griffith, G.E., Omernik, J.M., Rohm, C.M., and Pierson, S.M. Plummer, G.L., 1978, Southeastern ecosystems, an AIBS field 1994, Florida regionalization project: Corvallis, Ore., U.S. trip in Georgia: Athens, University of Georgia, Department of Environmental Protection Agency, Environmental Research Botany, August 18-20, 1978.

Hammond, E.H., 1970, Classes of land-surface form, in The Scott, T.M., Knapp, M.S., Friddell, M.S., and Weide, D.L., 1986,

scale 1:1.000.000.

Griffith, G.E., Omernik, J.M., and Azevedo. S.H., 1997, Ecoregions of Tennessee: Corvallis, Ore., U.S. Environmental Ga., University of Georgia Press, p. 1-23. Protection Agency, National Health and Environmental Effects

community structure following drought in the Okefenokee

Research Laboratory, EPA/600/R-97/022, 51 p. Hack, J.T., 1982, Physiographic divisions and differential uplift in Geographers, v. 62, no. 2, p. 283-306.

the Piedmont and Blue Ridge: U.S. Geological Survey

Hackney, C.T., Adams, S.M., and Martin, W.H., eds., 1992, Monographs, v. 32, p. 167-185. Biodiversity of the southeastern United States: aquatic communities: New York, John Wiley and Sons, Inc., 779 p. Berndt, M.P., Hatzell, H.H., Crandall, C.A., Turtora, M., Pittman,

> Hamel, P., LeGrand, H., Lennartz, M., and Gauthreaux, S., Jr., Martin, W.H., Boyce, S.G., and Echternacht, A.C., eds., 1982, Bird-habitat relationships on southeastern forest lands: U.S. Forest Service General Technical Report SE-22, 417 p.

> national atlas of the United States of America: Washington, D.C., Quaternary geologic map of the Jacksonville 40 x 60 quadrangle, U.S. Geological Survey, p. 62-63, scale 1:7,500,000. Harper, R.M., 1930, The natural resources of Georgia: Bulletin of the University of Georgia, v. 30, no. 3, 105 p.

Hodler, T.W., and Schretter, H.A., 1986, The atlas of Georgia: Athens, Ga., University of Georgia Press, 273 p. Hunt, C.B., 1974, Natural regions of the United States and Canada: San Francisco, W.H. Freeman, 725 p.

Biodiversity of the southeastern United States: upland terrestrial Johnson, A.S., Hillestad, H.O., Shanholtzer, S.F., and Shanholtzer, G.F., 1974, An ecological survey of the coastal region of Georgia: National Park Service Scientific Monograph

Keys, J., Jr., Carpenter, C., Hooks, S., Koenig, F., McNab, W. H.,

Russell, W.E., Smith, M-L, 1995, Ecological units of the eastern

United States - first approximation: Atlanta, U.S. Department of Agriculture, Forest Service, Technical Publication R8-TP 21, King, P.B., and Beikman, H.M., 1974, Geologic map of the Staheli, A.C., 1976, Topographic expression of superimposed

United States: U.S. Geological Survey, scale 1:2,500,000. Küchler, A.W., 1964, Potential natural vegetation of the conterminous United States: New York, American Geographical Society, Special Publication no. 36, 116 p., scale 1:3,168,000. Clark, W.Z., Jr., and Zisa, A.C., 1976, Physiographic map of

Kundell, J.E., 1987, Environment and natural resources, in Hepburn, L.R., ed., Contemporary Georgia: Athens, Carl Vinson Institute of Government, University of Georgia, p. 37-72. LaForge, L., Cooke, W., Keith, A., and Campbell, M.R., 1925, United States: U.S. Geological Survey, Map I-1420(NI-17), scale Physical geography of Georgia: Geological Survey of Georgia, Bulletin no. 42, 189 p.

> LaMoreaux, P.E., 1946, Geology and groundwater resources of Trimble, S.W., 1974, Man-induced soil erosion on the Southern the Coastal Plain of east-central Georgia: U.S. Geological Survey
>
> Piedmont, 1700-1970: Ankeny, Iowa, Soil Conservation Society Lipps, E.L., and DeSelm, H.R., 1969, The vascular flora of the Turner, M.G., 1987, Land use changes and net primary

Loveland, T.R., Merchant, J.W., Brown, J.F., Ohlen, D.O., Reed, B.C., Olsen, P., and Hutchinson, J., 1995, Seasonal land-cover Magilligan, F.J., and Stamp, M.L., 1997, Historical land-cover

changes and hydrogeomorphic adjustment in a small Georgia watershed: Annals of the Association of American Geographers, Cowell, C.M., 1998, Historical change in vegetation and Markewich, H.W., Pavich, M.J., and Buell, G.R., 1990, disturbance on the Georgia Piedmont: The American Midlands Contrasting soils and landscapes of the Piedmont and Coastal Plain, eastern United States: Geomorphology, v. 3, p. 417-447.

Cressler, C.W., 1974, Geology and ground-water resources of Martin, W.H., Boyce, S.G., and Echternacht, A.C., eds., 1993a, Biodiversity of the southeastern United States: lowland terrestrial communities: New York, John Wiley and Sons, 502 p.

no. 3, p. 137-143.

Biodiversity of the southeastern United States: upland terrestrial communities: New York, John Wiley and Sons, 373 p. May, J.T., 1968, Composition of upland hardwood forests of the

McNab, W.H. and Avers P.E., comps., 1994, Ecological subregions of the United States: section descriptions: Washington. D.C., U.S. Department of Agriculture, Forest Service Administrative Publication WO-WSA-5, 267 p.

Miller, J.A., 1990, Ground-water atlas of the United States,

segment 6, Alabama, Florida, Georgia, and South Carolina: U.S.

Geological Survey Hydrologic Investigations Atlas 730-G, 28 p. Miller, R.A., Maher, S.W., Copeland, C.W., Jr., Rheams, K.F., LeNeathery, T., Gilliland, W.A., Friddell, M.S., Van Nostrand, A. K., Wheeler, W.H., Holbrook, D.F., and Bush, W.V., 1988, Quaternary geologic map of the Lookout Mountain 4° x 6° quadrangle, United States: U.S. Geological Survey, Map I-

1420(NI-16), scale 1:1,000,000. Myers, R.R., Weaver, D.C., and Upchurch, J.C., 1977, Atlas of Georgia agriculture: Carrollton, Ga., West Georgia College, 85 p. Nelson, T.C., 1957, The original forests of the Georgia Piedmont:

Pehl, C.E., and Brim, R.L., 1985, Forest habitat regions of Georgia, Landsat 4 imagery: Georgia Agriculture Experiment Station Special Publication no. 31, 12 p., map supplement, scale Geographers, v. 46, no. 1, p. 129-139.

Department of Agriculture, Soil Conservation Service.

Perkins, H.F., and Ritchie, F.T., Jr., 1965, Soil associations of Georgia: Georgia Agricultural Experiment Stations, University of











45 Piedmont

45a Southern Inner Piedmont

45b Southern Outer Piedmont

45c Carolina Slate Belt

45h Pine Mountain Ridges

**65 Southeastern Plains** 

65d Southern Hilly Gulf Coastal Plain

45d Talladega Upland

65c Sand Hills

65g Dougherty Plain

65h Tifton Upland