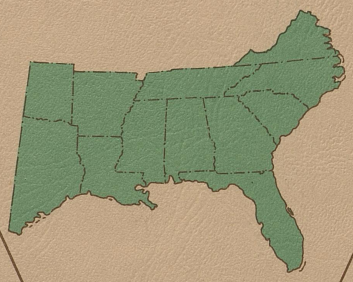
A FOREST ATLAS OF THE SOUTH



SOUTHERN FOREST EXPERIMENT STATION
New Orleans, Louisiana
and
SOUTHEASTERN FOREST EXPERIMENT STATION
Asheville, North Carolina
FOREST SERVICE, U. S. DEPARTMENT OF AGRICULTURE
1969

LIST OF MAPS

The South is an important forest region with a wide range of climate, vegetation, soil, and topography. These varied conditions influence the practice of forest management for timber, rangeland, wildlife, water, and recreation.

This atlas provides a ready source of useful information for managers of these forest lands and a reference for research workers, students, and others.

An effort was made to select those maps most in demand by a wide variety of users. In all cases the data are the most recent available, and some of the information is heretofore unpublished. The three maps depicting precipitation during parts of the growing season were especially prepared for this atlas by the Environmental Science Services Administration of the U. S. Department of Commerce. The map of Major Forest Types is a revision of previous maps issued by the Forest Survey Units of the Southern and Southeastern Forest Experiment Stations. The map showing proportions of land forested is new, and the data on pine and hardwood distribution and on fire-hazard areas are drawn from publications that became available only during 1969. The locations of State forests were compiled from a canvass of State forestry offices, and probably represent the most complete information available, since a number of recent changes have been made in these lands.

Concern for water resources of the South, though by no means new, is increasing, and we have included a set of maps depicting potential evapotranspiration, runoff, productive aquifers, and water deficits.

The atlas was prepared under the supervision of Isabel T. Duffy of the Southern Forest Experiment Station, but outstanding help has been received from many sources. The Environmental Science Services Administration, particularly the Environmental Data Service of the National Weather Records Center at Asheville, North Carolina, not only provided the new maps but advised on the selection of other weather maps from its immense store. Dr. John R. Mather, Director of the Laboratory of Climatology, C. W. Thornthwaite Associates, and Henry Jarrett, Director of Publications, Resources for the Future, Inc., gave permission to copy portions of the maps on potential evapotranspiration and water deficits (pages 19 and 20) and furnished valuable general counsel on water-resource data. The advice of Dr. Charles E. Kellogg, Deputy Administrator for Soil Survey, Soil Conservation Service, U. S. Department of Agriculture, was of great assistance in choosing and presenting the information on soils and physiography. The legends or text accompanying each map indicate specific sources and obligations. Two of the maps, it will be noted, reproduce parts of sheets from the National Atlas being compiled by the Geological Survey, U. S. Department of the Interior.

A burgeoning population will inevitably make vastly increased demands on the South's renewable resources, which will figure to an ever greater extent in the national welfare and economy. We hope this atlas will be of some value in meeting the challenge.

Thomas C. Nelson

Walter M. Zillgitt

Land Resource Regions and Major Land Resource Areas

The map on the facing page is a redrafting of the southern portion of a map issued in 1963 by the USDA Soil Conservation Service. The boundaries of the resource areas follow those of the original, and the coding is identical. The original map accompanied USDA Agriculture Handbook 296, "Land Resource Regions and Major Land Resource Areas of the United States," and the following descriptions have been synopsized from that handbook.

H Central Great Plains Winter Wheat and Range Region

76 Bluestem Hills

Nearly all the land is in farms and ranches. Elevation is from 1,000 to 1,500 feet. These dissected uplands have narrow divides and narrow steep-sided valleys. Only a few large streams have any significant area of flood plains. Woodlands are extremely limited.

78 Central Rolling Red Plains

Nearly all the land is in farms and ranches, with virtually no woodlands. Elevations are 1,500 to 3,000 feet, increasing gradually from east to west. On this dissected plain the broad divides are nearly level to gently sloping and the valleys have short but steep slopes. In places the valleys are bordered by rolling to steep irregular dunes.

80 Central Rolling Red Prairies

Farms and ranches comprise nearly all the land. There is a dissected plain at elevations of 1,000 to 1,500 feet. The divides are undulating to gently rolling and the valley sides hilly and steep. Flood plains of large streams are wide and level.

J Southwestern Prairies, Cotton and Forage Region

84 Cross Timbers (17,700 square miles)

Nearly all the land is in farms and ranches. About one-fourth is open woodland with a grass understory used for grazing. Elevation is 1,000 to 1,200 feet, but only 600 feet along the Red River. Ridgetops on these rolling to hilly uplands are nearly level to strongly rolling, and narrow to moderately broad. Stream valleys are narrow and have steep gradients.

85 Grand Prairie (Texas and Oklahoma, 12,700 square miles)

The entire area is in farms and ranches. More than half is in range consisting of short grasses, bunch grasses, mesquite, scrub oak, juniper, and cedar. Elevation is 800 to 1,200 feet, except that the Arbuckle Mountains rise to 1,350 feet. These low, rugged mountains are in the north of an otherwise rolling to hilly dissected plateau. Stream valleys are shallow and narrow in their upper reaches, but deepen and broaden near the margins in the east.

86 Texas Blackland Prairie (Texas, 19,700 square miles; Arkansas, 700 square miles)

Nearly all the area is in farms. In Texas there are narrow strips of woodland along streams. A small part of the Arkansas area is in woodland. Elevations are 300 to 800 feet, increasing gradually from south to north and from east to west. On these gently rolling dissected plains, gentle upland slopes merge into narrow valleys with more sloping sides. The large rivers have broad but shallow valleys.

87 Texas Claypan Area (Texas, 13,200 square miles)

Nearly all the land is in farms, about half of it in woodland. Open post oak savannas that have a thin understory of bunch grasses and brush are dominant over much of the area, but there are some pine-hardwood forests in the east. Hardwood forests of oak, elm, pecan, and other species grow on some of the wet bottom lands. On this nearly level to gently sloping coastal plain, whose elevation ranges from 200 to 500 feet, stream valleys are shallow, and the wide flood plains of large streams are bordered by nearly level terraces.

M Central Feed Grains and Livestock Region

112 Cherokee Prairies (Kansas, Oklahoma, and Missouri, 25,400 square miles; Arkansas, 1,000 square miles)

Nearly all the area is in farms. About one-tenth of the land, notably the steeper valley slopes and some of the wet bottom land, is wooded. Elevation is 400 to 1,200 feet. These gently sloping to rolling dissected plains are underlain by sandstones, shales, and limestones.

N East and Central Farming and Forest Region

116 Ozark Highland (Missouri, Arkansas, and Oklahoma, 34,400 square miles)

About three-fifths of the area is in forest, most of it in farm woodland. Sharply dissected limestone plateaus with narrow rolling ridgetops that break sharply to steep side slopes range in elevation from 500 to 1,500 feet. Valleys are narrow and have steep gradients, especially in the upper reaches. There are some gently sloping plateau remnants in the west.

117 Boston Mountains (Arkansas and Oklahoma 6,200 square miles)

About three-fourths of the area is in forest, mainly farm woodland. Valley floors have the lowest elevation—500 feet—with ridge crests rising to 2,500 feet. Ridgetops of these deeply dissected sandstone and shale plateaus are narrow and rolling; valleys are narrow and steep-sided.

118 Arkansas Valley and Ridges (Arkansas and Oklahoma, 7,000 square miles)

About one-half the area is in forest, about two-thirds of which is in farm woodland. Elevation ranges from 300 feet on some of the valley floors to 2,800 feet on some mountains. The ridges and valleys are underlain by slightly folded to level beds of sandstone and shales. Ridge slopes are steep; most crests are narrow and rolling, but some are broad and flat. Intervening valleys are broad and smooth. Ridges and mountains rise sharply hundreds of feet above adjacent valleys.

119 Ouachita Mountains (Arkansas and Oklahoma, 11,700 square miles)

Slightly more than four-fifths of the area is forested, much of it in farm woodland. Some is in large holdings. Elevation varies from 300 feet on the lowest valley floors to 2,700 feet on mountain peaks. These steep mountains are underlain by folded and faulted shales, slates, quartzites, sandstones, and novaculite. Wide terraces and flood plains border the Ouachita River in western Arkansas.

122 Highland Rim and Pennyroyal (Kentucky, Tennessee, Indiana, and Alabama, 22,700 square miles)

About one-third of the area is in forest, mainly farm woodlands, with large commercial holdings on steeper land. This is a dissected limestone plateau, 350 feet elevation on valley floors to about 1,000 feet on the highest ridgetops.

123 Nashville Basin (Tennessee, 5,700 square miles)

About one-fourth of the area is in forest, nearly all in farm woodland. The central part of the area is a gently rolling to hilly limestone plain, but the outer margins are deeply dissected and have steep slopes. Elevations range from 400 feet on valley floors to 1,000 feet in the hills.

125 Cumberland Plateau and Mountains (Kentucky, Tennessee, and West Virginia, 25,900 square miles)

Almost all of the forest, which covers about four-fifths of the area, is privately owned, mainly in small individual holdings but partly in large commercial tracts. Elevation is 1,000 feet at the base of the escarpments that border the plateau and 2,000 feet on the plateau top. Some mountains along the eastern margin rise to 2,500 feet and a few to 3,500 feet. The deeply dissected sandstone and shale plateau has some very steep slopes separated by narrow, level valleys. Ridgetops are narrow and rolling. In the south there are some flat plateau remnants and some mountain ranges that rise above the general plateau level.

127 Eastern Allegheny Plateau and Mountains (Pennsylvania, West Virginia, and Maryland)

Most of the area is in farms; about three-fourths is in forest, mainly in small holdings. Elevation ranges from 1,000 feet in the lowest valleys to 2,000 to 2,500 feet over much of the plateau top. Mountains in the southeast are 3,500 to 4,500 feet, with some peaks rising 1,000 feet or more above the plateau or adjacent valleys.

128 Southern Appalachian Ridges and Valleys (Virginia, West Virginia, Tennessee, Georgia, and Alabama, 28,600 square miles)

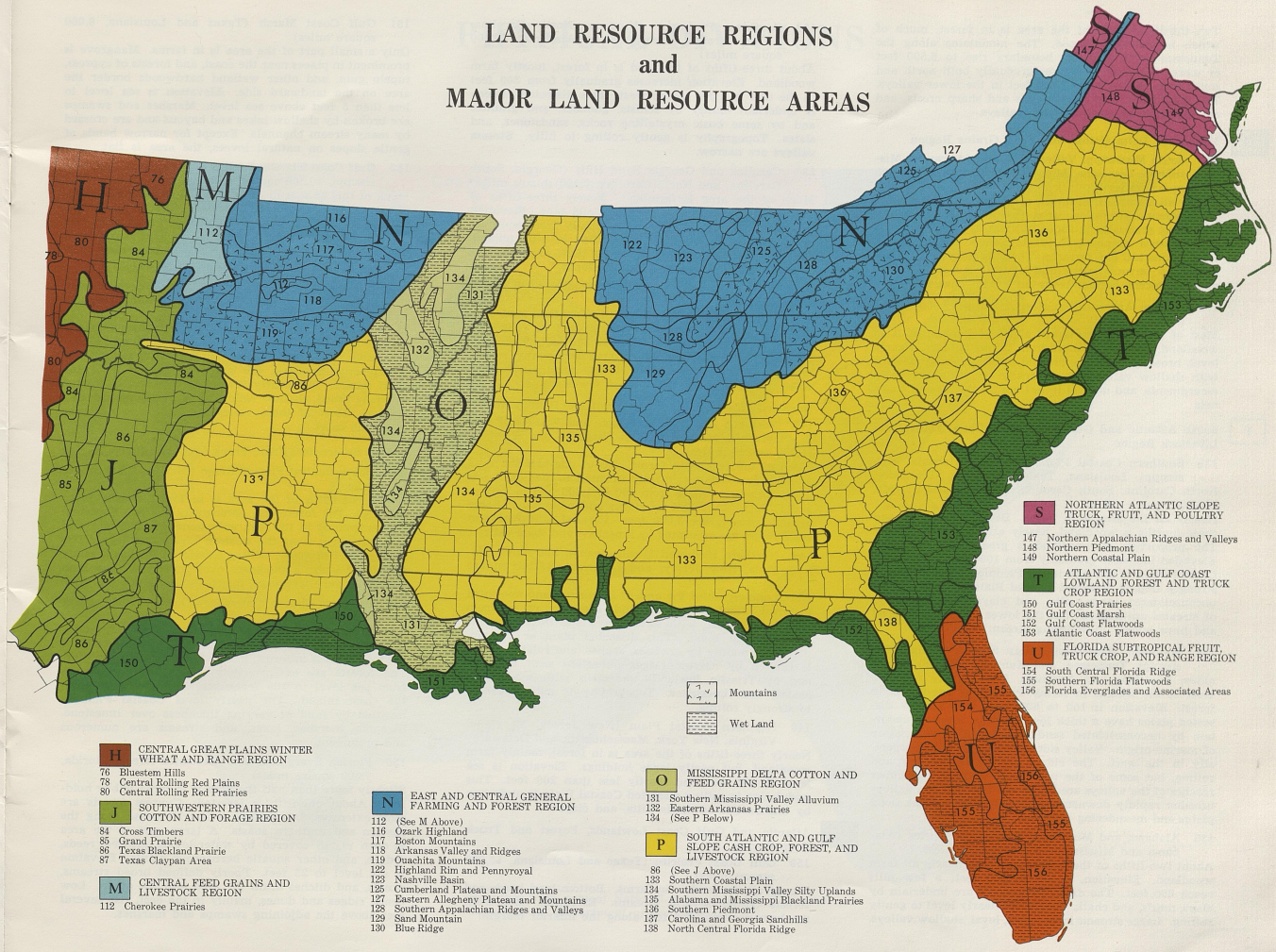
About three-fourths of the area is in farms, about one-half of it in forest, mainly farm woodland. In valleys elevation is 600 feet in the southwest, ranging to more than 1,000 feet in the north. The highest ridgetops are 2,000 to 3,000 feet, rising gradually from south to north, with a few mountains in the north rising 4,000 feet or more. Valleys trend from northeast to southwest, and are underlain mainly by limestones and shales. The steep ridges or mountains that intervene are underlain by sandstones and shales. Valleys are undulating to strongly rolling or hilly.

129 Sand Mountain (Alabama, 8,700 square miles)

Most of the area is in farms; about three-fifths is in forest, mostly farm woodland or other small holdings. Elevation is 500 feet at the base of plateau escarpments to 1,000 feet at the plateau top, with one or two mountain peaks 1,500 feet high. The sandstone plateau has an undulating to rolling top, but it is deeply dissected and steep along the margin.

130 Blue Ridge (North Carolina, Virginia, Georgia, Tennessee, South Carolina, and Maryland, 18,900 square miles)

LAND RESOURCE REGIONS and MAJOR LAND RESOURCE AREAS



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Two-thirds or more of the area is in forest, much of which is privately owned. The mountains along the Tennessee-North Carolina boundary rise to 6,500 feet or more. Elevation decreases gradually both north and south from this point to 1,000 feet in the lower valleys. The mountains have steep slopes and sharp crests, and are dissected by steep, narrow valleys.

O Mississippi Delta Cotton and Feed Grains Region

131 South Mississippi Valley Alluvium (Arkansas, Mississippi, Louisiana, Missouri, and Tennessee, 36,600 square miles)
Nearly all the area is in farms, of which about 10 percent is woodland. Elevation is at sea level in the south, increasing gradually to about 500 feet in the north. The area consists of nearly level to gently sloping broad flood plains and low terraces. The only noticeable slopes are sharp terrace scarps and natural levees that rise above adjacent bottom lands or stream channels.

132 Eastern Arkansas Prairies (Arkansas, 7,000 square miles)
Most of the area is in farms, about 10 percent of it in woodland. Elevation ranges from 150 to 300 feet. Nearly level, broad terraces are crossed by meandering streams with shallow valleys. The terraces end in short, steep escarpments, and natural levees border the stream channels.

P South Atlantic and Gulf Slope Cash Crop, Forest, and Livestock Region

133 Southern Coastal Plain (Georgia, Alabama, Mississippi, Louisiana, Texas, Arkansas, Tennessee, North Carolina, South Carolina, Virginia, and Florida, 145,300 square miles)
Nearly all the area is in farms. Between one half and three-fourths is woodland, nearly all in small holdings. The proportion of woodland is greatest in the west. Elevation increases gradually from 100 feet in the lower Coastal Plain to 600 feet in the Piedmont. The gently to strongly sloping dissected Coastal Plain is underlain by unconsolidated sands, silts, and clays. Upper valleys of streams are narrow, but the lower valleys are broad and have widely meandering stream channels.

134 Southern Mississippi Valley Silty Uplands (Mississippi, Tennessee, and Kentucky, 24,000 square miles; Louisiana and Arkansas, 2,000 square miles)
Most of the land is in farms with about one-fourth in forest. Elevation is 100 to 600 feet. The sharply dissected plains have a thick loess mantle, which is underlain by unconsolidated sands, silts, and clays, mainly of marine origin. Valley sides are hilly to steep, especially in the west. The ridges are mostly narrow and rolling, but some of the interfluves between the upper reaches of the valleys are broad and flat. Stream valleys broaden rapidly downstream and have wide, flat flood plains and meandering channels.

135 Alabama and Mississippi Blackland Prairies (Alabama and Mississippi, 9,000 square miles)
About two-fifths of the land is in forest, nearly all farm woodland. Elevation is 100 to 300 feet; a few hills reach 500 feet. The dissected uplands are underlain by clays, marls, and chalk. Slopes are nearly level to gently rolling. Large streams have broad, level, shallow valleys.

136 Southern Piedmont (Virginia, North Carolina, South Carolina, Georgia, and Alabama, 59,000 square miles)
About three-fifths of the land is in forest, mostly farm woodland. Elevation increases gradually from 300 feet in the east to 1,000 in the west. This dissected plateau is underlain mostly by schists, gneisses, and granites and by some basic crystalline rocks, sandstones, and slates. Topography is gently rolling to hilly. Stream valleys are narrow.

137 Carolina and Georgia Sand Hills (Georgia, South Carolina, and North Carolina, 8,200 square miles)
Much of the area is farmland. Nearly three-fifths of the area is in forests of scrub oak and pine. Elevation is 200 to 500 feet, increasing gradually from south to north. The area is a dissected, rolling to hilly upland. In many of the more dissected areas there are stabilized dunes, resulting in very irregular slopes.

138 North Central Florida Ridge (Florida 4,000 square miles)
Most of the land is in farms, with more than half of it in forest, a large part of which is used as range for cattle. Elevation ranges from 50 to 200 feet. The sand-mantled limestone upland has irregular, gently rolling topography. Many limestone sinks, some filled with water, dot the area. There are a few streams.

S Northern Atlantic Slope Truck, Fruit, and Poultry Region

147 Northern Appalachian Ridges and Valleys (Pennsylvania, Maryland, West Virginia, and Virginia, 15,700 square miles)
Much of the area is in farms. About one-half the land is in hardwood forest, mainly in small to medium holdings. Elevation ranges from 400 to 1,000 feet in valleys and 1,200 to 2,500 feet on ridges and mountains. Some mountain crests are 3,000 feet. Parallel sandstone and shale ridges are separated by limestone and shale valleys.

148 Northern Piedmont (Pennsylvania, Maryland, Virginia, New Jersey, and Delaware, 15,200 square miles)
About one-eighth of the area is in pasture and one-third in forest, mainly farm woodland. Elevation ranges from 300 to 1,000 feet, with some ridges and isolated peaks 1,500 feet or more. This dissected plain or plateau, underlain mainly by gneisses, schists, and related rocks, is broken by narrow ridges underlain with traprock and by Triassic lowlands underlain with sandstones, shales, and limestones. Topography is mainly gently to strongly rolling.

149 Northern Coastal Plain (New Jersey, Maryland, Virginia, New York, Massachusetts, and Delaware)
Nearly three-fifths of the area is in forest, mainly farm woodland, but partly large holdings. Elevation is sea level to 300 feet, but mostly less than 200 feet. This undulating to rolling dissected Coastal Plain is underlain by unconsolidated sands, silts, and clays.

T Atlantic and Gulf Coast Lowlands, Forest and Truck Crop Region

150 Gulf Coast Prairies (Texas and Louisiana, 15,900 square miles)
Nearly all the land is in farms. Bottom-land hardwood forests border several streams. Elevation rises from sea level to about 200 feet along the interior margin.

151 Gulf Coast Marsh (Texas and Louisiana, 8,000 square miles)
Only a small part of the area is in farms. Mangrove is prominent in places near the coast, and forests of cypress, tupelo gum, and other wetland hardwoods border the area on the landward side. Elevation is sea level to less than 5 feet above sea level. Marshes and swamps are broken by shallow lakes and bayous and are crossed by many stream channels. Except for narrow bands of gentle slopes on natural levees, the area is flat.

152 Gulf Coast Flatwoods (Florida, Alabama, and Mississippi, 10,500 square miles)
Much of this area is in large public and industrial holdings. Nearly nine-tenths is forested; part of the woodland is grazed seasonally. Elevation ranges from sea level to 50 feet and locally to 100 feet. This nearly level low Coastal Plain is crossed by many large streams. The areas in Florida have many lakes and ponds.

153 Atlantic Coast Flatwoods (Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, and Florida, 42,800 square miles)
More than two-thirds of the land is in forest, partly farm woodland, but much of it in large holdings. Elevation ranges from sea level to 100 feet, with several low escarpments breaking the gradual increase from the coast inland. The nearly level Coastal Plain is crossed by many broad, shallow valleys with widely meandering streams. Most of these valleys terminate in estuaries along the coast.

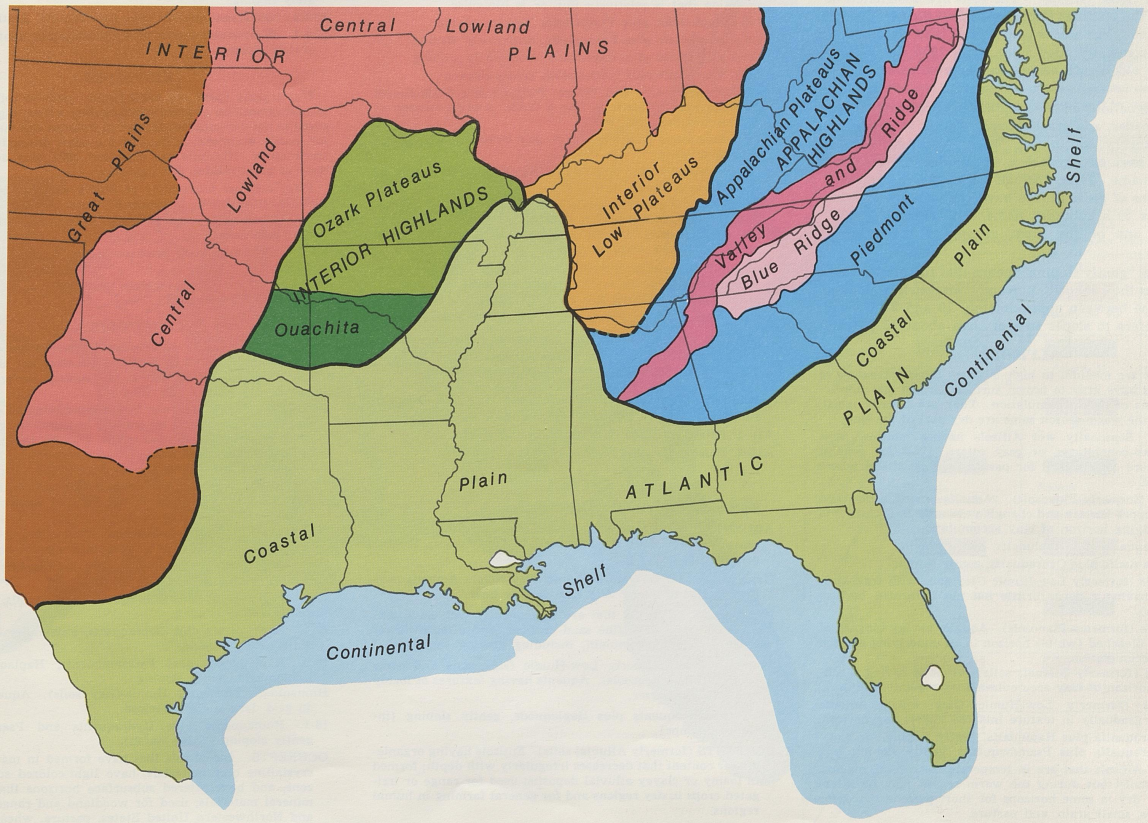
U Florida Subtropical Fruit, Truck Crop, and Range Region

154 South-Central Florida Ridge (Florida, 8,500 square miles)
About two-fifths of the area is in forest, mostly large holdings. The forests are extensively grazed. Elevation ranges from 50 to 150 feet, with some hills 250 feet, and a narrow strip along the western edge at sea level. The nearly level to gently rolling Coastal Plain has a sandy mantle of varying thickness over limestone. The land surface is very irregular; many sinkholes dot the area.

155 Southern Florida Flatwoods (Florida, 17,900 square miles)
About nine-tenths of the area is privately owned, mostly in large holdings. Slightly more than one-fourth of the total area is in forest, mostly longleaf and slash pine. The forests are extensively grazed. Elevation ranges from sea level to 100 feet, increasing gradually from the coast inland. The nearly level Coastal Plain is mantled by sand of varying thickness over limestone. Swamps, marshes, lakes, and streams are numerous and prominent.

156 Florida Everglades and Associated Areas (Florida, 7,200 square miles)
Slightly more than half the area is in large public holdings. About one-fifth is forested. Cypress forests are most extensive, but mangrove is widespread along the eastern and southern coasts. A large part of the area is open marsh covered by water-loving grasses, reeds, sedges, and other aquatic herbaceous plants. Elevation is sea level to 25 feet. Poorly defined broad streams, canals, and ditches drain the area into the ocean. Low beach ridges and dunes, mainly in the east, rise several feet above the adjoining swamps and marshes.

PHYSICAL DIVISIONS



Redrawn from part of National Atlas sheet 59, Geological Survey, U. S. Department of the Interior, 1969.

SOILS OF THE SOUTH:

Orders, Suborders, and Great Groups

This soils map of the South is a part of a United States map compiled by the National Cooperative Soil Survey for publication by the U. S. Geological Survey in a projected new National Atlas. Title of the parent map is "Distribution of Principal Kinds of Soils: Orders, Suborders and Great Groups." The soils are designated according to the National Cooperative Soil Survey Classification of 1967, but names used in the 1938 classification and those commonly used since about 1950 are included where the old names correspond approximately to the new.

Soil designations on the map are in three categories—order, suborder, and great groups. Names of orders, the highest category, end in "sol," as in "Alfisol." Names of suborders have two syllables, the final one taken from the order name. Thus, "Aqualf" is a suborder of "Alfisol." Names of great groups have one or more syllables as a prefix to a suborder name. For example, "Albaqualf" is one of the great groups of the suborder "Aqualf."

The term "gently sloping" means that the predominant slope is less than about 10 percent. "Moderately sloping" means slope between approximately 10 and 25 percent. "Steep" refers to slopes steeper than about 25 percent.

ALFISOLS

Soils that are medium to high in bases (base saturation at pH 8.2) and have gray to brown surface horizon and subsurface horizons of clay accumulation. They are usually moist, but during the warm season some are dry part of the time.

AQUALFS. Seasonally wet Alfisols having mottles, iron-manganese concretions, or gray colors. Used for general crops where drained and for pasture and woodland where undrained.

Albaqualfs (formerly Planosols). Aqualfs having a bleached (white) upper horizon and changing abruptly in texture into an underlying horizon of clay accumulation.

A1-2. Albaqualfs plus Hapludalfs, gently sloping.

A1-4. Albaqualfs plus Ochraqualfs, gently sloping.

Fragiaqualfs (formerly Low-Humic Gley soils with fragipan). Aqualfs having a dense brittle but not indurated horizon (fragipan).[1]

Glossaqualfs (formerly Planosols). Aqualfs having tongues of an upper bleached (white) horizon in an underlying horizon of clay accumulation.[1]

Natraqualfs (formerly Solonetz soils). Aqualfs having a subsurface horizon of clay accumulation with alkali (sodium).[1]

Ochraqualfs (formerly Low-Humic Gley soils). Aqualfs changing gradually in texture into the underlying horizon.

A2-2. Ochraqualfs plus Hapludalfs, gently sloping.

A2-3. Ochraqualfs plus Psammaquents, gently sloping.

UDALFS. Alfisols that are in temperate to tropical regions. Usually moist but during the warm season may be intermittently dry in some horizons for short periods. Used for row crops, small grain, and pasture.

[1] No map units are listed under this great group (or phase) because it is not the most extensive soil in any map unit.

Fragiudalfs (formerly Gray-Brown Podzolic soils with fragipan). Udalfs that have a dense, brittle, but not indurated horizon (fragipan) usually below a horizon in which clay has accumulated.

A6-1. Fragiudalfs, gently sloping.

A6-5. Fragiudalfs plus Glossaqualfs, gently sloping.

A6-6. Fragiudalfs plus Hapludalfs, gently sloping.

A6-8. Fragiudalfs plus Natraqualfs, gently sloping.

Hapludalfs (formerly Gray-Brown Podzolic soils without fragipan). Udalfs having a subsurface horizon of clay accumulation that is relatively thin or is brownish.

A7-8. Hapludalfs plus Fragiudalfs, gently sloping.

A7-9. Hapludalfs plus Fragiudalfs, moderately sloping.

A7-14. Hapludalfs plus Hapludults, moderately sloping.

A7-15. Hapludalfs plus Ochraqualfs, gently sloping.

Paleudalfs (formerly Red-Yellow Podzolic and Gray-Brown Podzolic soils). Udalfs having a thick, reddish horizon of clay accumulation.

A8-1. Paleudalfs plus Hapludalfs and Dystrochrepts, gently sloping to steep.

A8-2. Paleudalfs plus Hapludults and Rock land, gently or moderately sloping.

USTALFS. Alfisols that are in temperate to tropical regions. Soils mostly reddish brown. During the warm season they are intermittently dry for long periods. Used for range, small grain, and irrigated crops.

Haplustalfs (formerly Reddish Chestnut and Reddish Brown soils). Ustalfs having a subsurface horizon of clay accumulation that is relatively thin or is brownish.

A9-4. Haplustalfs plus Paleustalfs, gently sloping.

Paleustalfs (formerly Reddish Chestnut and Reddish Brown soils). Ustalfs having an indurated (petrocalcic) horizon cemented by carbonates or a horizon having one or both of the following: A thick reddish clay accumulation of a distribution that is clayey in the upper part and abruptly changes in texture into an overlying horizon.

A10-1. Paleustalfs plus Argiustolls, gently sloping.

A10-2. Paleustalfs plus Haplustalfs, gently sloping.

ENTISOLS

Soils having no pedogenic horizons.

AQUENTS. Entisols that are either permanently wet or are seasonally wet and that have mottles or gray colors; limited use for pasture.

Haplaquents (formerly Low-Humic Gley soils). Aquents having textures of loamy very fine sand or finer.[1]

Hydraquents. Aquents that are permanently wet, have textures of loamy very fine sand or finer, and offer little resistance to applied weight, including grazing livestock.[1]

Psammaquents (formerly Low-Humic Gley soils and some poorly drained Regosols). Aquents having textures of loamy fine sand or coarser.

E1-1. Psammaquents plus Haplaquods, gently sloping (includes swamps).

FLUVENTS (formerly Alluvial soils). Entisols having organic-matter content that decreases irregularly with depth; formed in loamy or clayey alluvial deposits; used for range or irrigated crops in dry regions and for general farming in humid regions.

Udifluvents (formerly Alluvial soils). Fluvents that are usually moist.[1]

PSAMMENTS. Entisols having textures of loamy fine sand or coarser; used for range, wild hay, and some hardy vegetables in Alaska, woodland and small grains where warm and moist, pasture and citrus in Florida, and range and irrigated crops where warm and dry.

Quartzipsamments (formerly Regosols). Psamments consisting almost entirely of minerals highly resistant to weathering, mainly quartz.

E10-1. Quartzipsamments plus Paleudults, gently sloping.

E10-2. Quartzipsamments plus Paleudults, gently or moderately sloping.

E10-3. Quartzipsamments plus Ochraquults, gently sloping.

E10-4. Quartzipsamments plus Umbraquults, gently or moderately sloping.

HISTOSOLS

Wet organic (peat and muck) soils; includes soils in which the decomposition of plant residues ranges from highly decomposed to not decomposed; formed in swamps and marshes; used for mostly woodland or lie idle, but some drained areas have truck crops. Histosols are classified here only according to state of plant-residue decomposition.

Plant residues moderately or highly decomposed; formerly called peat or muck. Histosols of warm regions.

H2-1. Histosols (plant residues moderately decomposed), gently sloping.

H2-2. Histosols (plant residues highly decomposed), gently sloping.

H2-3. Histosols (plant residues moderately or highly decomposed), gently sloping.

INCEPTISOLS

Soils having weakly differentiated horizons; materials in the soil have been altered or removed but have not accumulated. These soils are usually moist, but during the warm season some are dry part of the time.

AQUEPTS. Seasonally wet Inceptisols having an organic surface horizon, sodium saturation, mottles, or gray colors, used for pasture, hay, and where drained, hardy vegetables in Alaska, woodland pasture, and where drained, row crops in Southeastern United States.

Fragiaquepts (formerly Low-Humic Gley soils with fragipan). Aquepts having a dense brittle but not indurated horizon (fragipan).[1]

Haplaquepts (formerly Low-Humic Gley soils). Aquepts with either a light-colored or a thin black surface horizon.

I5-2. Haplaquepts plus Haplaquolls, Udifluvents, and Hapludalfs, gently sloping.

I5-3. Haplaquepts plus Ochraqualfs, Haplaquolls, and Natraqualfs, gently sloping.

I5-4. Haplaquepts plus Ochraquults, Paleudults, and Hapludults, gently sloping.

I5-5. Haplaquepts plus Psammaquents, Haplaquents, and Haplaquods, gently sloping.

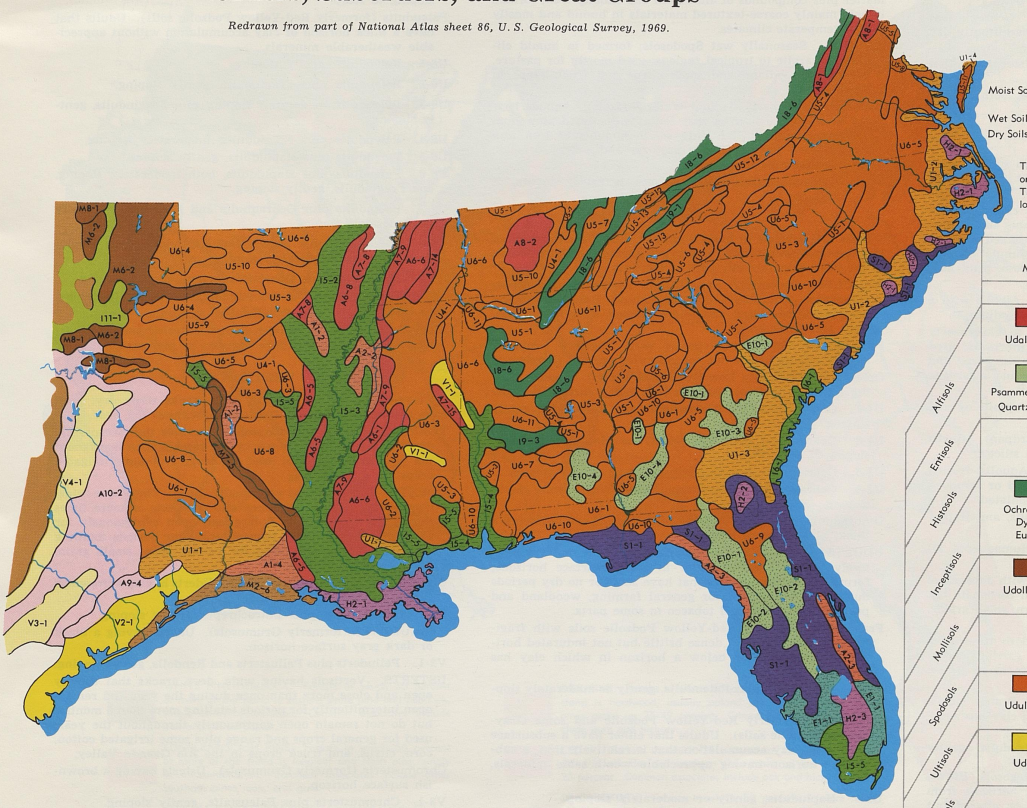
Humaquepts (formerly Humic-Gley soils). Aquepts having an acid dark surface horizon.

I6-1. Humaquepts plus Hydraquents and Psammaquents, gently sloping (Tidal marsh).

OCHREPTS. Inceptisols that have formed in materials with crystalline clay materials, have light-colored surface horizons, and have altered subsurface horizons that have lost mineral materials; used for woodland and range in Alaska and Northwestern United States, pasture, wheat, sorghum, and hay in Oklahoma and Kansas, and pasture, silage corn, small grain, and hay in Northeastern United States.

SOILS OF THE SOUTH:
Orders, Suborders, and Great Groups

Redrawn from part of National Atlas sheet 86, U. S. Geological Survey, 1969.



Moist Soils: Usually not saturated with water, but for long periods have enough moisture for plant growth.

Wet Soils: Seasonally or permanently saturated with water.

Dry Soils: Lack moisture for plant growth for long periods.

The letter-number symbols below are abbreviated from those on the map to the letter and number that precede the hyphen. The dot pattern on the map indicates soils with textures of loamy fine sand or coarser.

WARM SOILS

Mean annual soil temperature higher than about 47° F.

	MOIST	WET	DRY
Alfisols	Udalfs A6 A7 A8	Aqualfs A1 A2	Ustalfs A9 A10
Entisols	Psamments Quartzipsamments E10	Aquents E1	
Histosols		H2	
Inceptisols	Ochrepts Dystrochrepts I8 Eutrochrepts I9	Aquepts Haplaquepts I5 Humaquepts I6	Ochrepts Ustochrepts I11
Mollisols	Udolls M6 M7 M8	Aquolls M2	
Spodosols		Aquods S1	
Ultisols	Udults U4 U5 U6	Aquults U1	
Vertisols	Uderts V1 V2		Usterts V3 V4

Dystrochrepts (formerly Sols Bruns Acides and some Brown Podzolic and Gray-Brown Podzolic soils). Ochrepts that are usually moist and low in bases and have no free carbonates in the subsurface horizons.

I8-6. Dystrochrepts plus Rock land and Hapludults, steep.

Eutrochrepts (formerly Brown Forest soils). Ochrepts that are usually moist and are either high in bases, have free carbonates in the subsurface horizons, or both.

I9-1. Eutrochrepts, steep.

I9-3. Eutrochrepts plus Chromuderts, gently sloping.

Ustochrepts (formerly Reddish Chestnut soils). Ochrepts that during the warm season of the year are intermittently dry for long periods.[1]

Ustochrepts (shallow; formerly Lithosols). Ustochrepts that are shallower than 20 inches to bedrock.

I11-1. Ustochrepts (shallow) plus Haplustalfs, both moderately sloping.

MOLLISOLS

Soils having nearly black friable organic-rich surface horizons high in bases; formed mostly in subhumid and semiarid warm to cold climates.

ALBOLLS. Mollisols of flat places and high closed depressions. They have a seasonal perched water table and a nearly black surface horizon underlain by a bleached (white) mottled horizon over a horizon of clay accumulation that has mottles or gray colors; used for small grain, peas, hay, pasture, and range.

Argialbolls (formerly Planosols and Soloths). Albolls with a horizon of clay accumulation without alkali (sodium).[1]

AQUOLLS. Seasonally wet Mollisols having a thick nearly black surface horizon and gray subsurface horizons; used for pasture, and where drained, small grains, corn, and potatoes in the North-Central States, and rice and sugarcane in Texas.

Cryaquolls (formerly Alpine Meadow soils). Aquolls of cold regions.[1]

Duraquolls (formerly Humic-Gley soils with hardpan). Aquolls having a hardpan (duripan) cemented with silica.[1]

Haplaquolls (formerly Humic-Gley soils). Aquolls having horizons in which materials have been altered or removed but no clay or calcium carbonate has accumulated.

M2-4. Haplaquolls plus Udifluvents, Hapludolls, and Hapludalfs, gently sloping.

M2-6. Haplaquolls plus Udipsamments and Humaquepts, all gently sloping.

RENDOLLS (formerly Rendzinas). Mollisols with subsurface horizons that have large amounts of calcium carbonate but no accumulation of clay; used for cotton, corn, small grains, and pasture.

UDOLLS. Mollisols of temperate climates. Udolls are usually moist and have no horizon in which either calcium carbonate or gypsum has accumulated; used for corn, small grains, and soybeans.

Argiudolls (formerly Brunizems and Reddish Prairie soils). Udolls having a subsurface horizon in which clay has accumulated.

M6-2. Argiudolls plus Albaqualfs and Paleudolls, gently sloping.

Hapludolls (formerly Brunizems and some Regosols, Brown Forest, and Alluvial soils). Udolls having horizons from which some materials have been removed or altered but having no subsurface horizon of clay accumulation.

M7-5. Hapludolls plus Eutrochrepts and Udifluvents, gently sloping.

Hapludolls (shallow; formerly Lithosols). Hapludolls that are shallower than 20 inches to bedrock.

M8-1. Hapludolls (shallow) plus Argiustolls and Argiudolls, moderately sloping.

SPODOSOLS

Soils with low base supply that have in subsurface horizons an accumulation of amorphous materials consisting of organic matter plus compounds of aluminum and usually iron; formed in acid mainly coarse-textured materials in humid and mostly cool or temperate climates.

AQUODS. Seasonally wet Spodosols; formed in humid climates of arctic to tropical regions; used mostly for pasture, range, or woodland and some citrus and truck crops in Florida.

Haplaquods (formerly Ground Water Podzols). Aquods having a subsurface horizon that contains dispersed aluminum and organic matter but only small amounts of free iron oxides; used for woodland, pasture, and where drained, some truck crops and citrus.

S1-1. Haplaquods plus Quartzipsamments, gently sloping.

ULTISOLS

Soils that are low in bases and have subsurface horizons of clay accumulation; usually moist, but during the warm season of the year, some are dry part of the time.

AQUULTS. Seasonally wet Ultisols having mottles, iron-manganese concretions, or gray colors. Used for limited pasture and woodland, and where drained, some hay, cotton, corn, and truck crops.

Fragiaquults (formerly Planosols with fragipan). Aquults having a dense brittle but not indurated horizon (fragipan).[1]

Ochraquults (formerly Low-Humic Gley soils). Aquults having either a light-colored or a thin black surface horizon.

U1-1. Ochraquults plus Glossaqualfs and Paleudults, gently sloping.

U1-2. Ochraquults plus Paleudults and Hapludults, gently sloping.

U1-3. Ochraquults plus Quartzipsamments, gently sloping.

U1-4. Ochraquults plus Umbraquults and Tidal marsh, gently sloping.

Umbraquults (formerly Humic-Gley soils). Aquults having a thick, black surface horizon.[1]

UDULTS. Ultisols that are usually moist and that are relatively low in organic matter in the subsurface horizons; formed in humid climates that have short or no dry periods during the year; used for general farming, woodland and pasture, and cotton and tobacco in some parts.

Fragiudults (formerly Red-Yellow Podzolic soils with fragipan). Udults having a dense brittle but not indurated horizon (fragipan) in or below a horizon in which clay has accumulated.

U4-1. Fragiudults plus Paleudults, gently or moderately sloping.

Hapludults (formerly Red-Yellow Podzolic and some Gray-Brown Podzolic soils). Udults that either have a subsurface horizon of clay accumulation that is relatively thin, a subsurface horizon having appreciable weatherable minerals, or both.

U5-1. Hapludults, gently or moderately sloping.

U5-3. Hapludults, moderately sloping.

U5-4. Hapludults, steep.

U5-6. Hapludults plus Dystrochrepts, steep.

U5-7. Hapludults plus Dystrochrepts, gently or moderately sloping, and Rock land, steep.

U5-8. Hapludults plus Fragiudults, gently sloping.

U5-9. Hapludults plus Hapludalfs and Dystrochrepts, steep.

U5-10. Hapludults plus Hapludalfs and Rock land, moderately sloping or steep.

U5-12. Hapludults plus Paleudults, moderately sloping.

U5-13. Hapludults plus Paleudults and Dystrochrepts, gently sloping to steep.

Paleudults (formerly Red-Yellow Podzolic soils). Udults that have a thick horizon of clay accumulation without appreciable weatherable minerals.

U6-1. Paleudults, gently sloping.

U6-2. Paleudults plus Fragiudults, gently sloping.

U6-3. Paleudults, moderately sloping, plus Fragiudults, gently sloping.

U6-4. Paleudults plus Fragiudults, moderately sloping.

U6-5. Paleudults plus Hapludults, gently sloping.

U6-6. Paleudults plus Hapludults, both moderately sloping, and Fragiudults, gently sloping.

U6-7. Paleudults plus Ochraquults and Fragiaquults, gently or moderately sloping.

U6-8. Paleudults plus Paleudalfs, Hapludults, and Hapludalfs, gently or moderately sloping.

U6-9. Paleudults plus Quartzipsamments, gently sloping.

U6-10. Paleudults plus Quartzipsamments, moderately sloping.

U6-11. Paleudults plus Rhodudults, moderately sloping.

Rhodudults (formerly Reddish-Brown Lateritic soils). Udults having dark-red subsurface horizons of clay accumulation.[1]

VERTISOLS

Clayey soils that have wide, deep cracks when dry; most have distinct wet and dry periods throughout the year.

TORRERTS (formerly Grumusols). Vertisols that are usually dry and have wide, deep cracks that remain open throughout the year in most years; used for range and some irrigated crops.

UDERTS. Vertisols that are usually moist. They have wide, deep cracks that usually open and close one or more times during the year but do not remain open continuously for more than 2 months or intermittently for periods totalling more than 3 months; used for cotton, corn, small grain, pasture, and some rice.

Chromuderts (formerly Grumusols). Uderts having a brownish surface horizon.

V1-1 Chromuderts plus Eutrochrepts, gently sloping.

PELLUDERTS (formerly Grumusols). Uderts having a black or dark gray surface horizon.

V2-1. Pelluderts plus Pellusterts and Rendolls, gently sloping.

USTERTS. Vertisols having wide, deep cracks that usually open and close more than once during the year and remain open intermittently for periods totalling more than 3 months, but do not remain open continuously throughout the year; used for general crops and range plus some irrigated cotton, corn, citrus, and truck crops in the Rio Grande Valley.

Chromusterts (formerly Grumusols). Usterts having a brownish surface horizon.

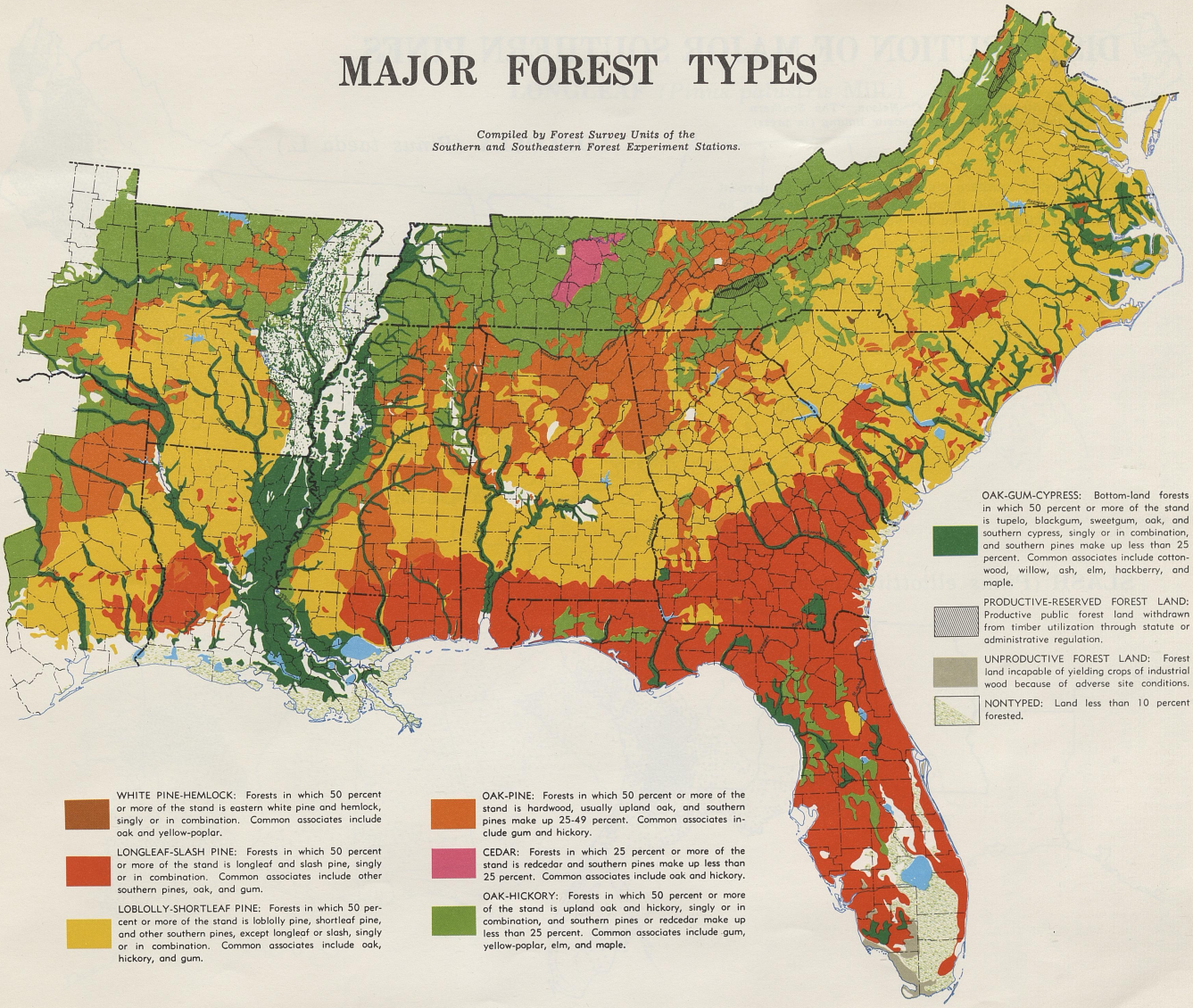
V3-1. Chromusterts plus Paleustalfs, gently sloping.

Pellusterts (formerly Grumusols). Usterts having a black or dark-gray surface horizon.

V4-1. Pellusterts plus Chromusterts, gently sloping.

MAJOR FOREST TYPES

Compiled by Forest Survey Units of the Southern and Southeastern Forest Experiment Stations.



WHITE PINE-HEMLOCK: Forests in which 50 percent or more of the stand is eastern white pine and hemlock, singly or in combination. Common associates include oak and yellow-poplar.

LONGLEAF-SLASH PINE: Forests in which 50 percent or more of the stand is longleaf and slash pine, singly or in combination. Common associates include other southern pines, oak, and gum.

LOBLOLLY-SHORTLEAF PINE: Forests in which 50 percent or more of the stand is loblolly pine, shortleaf pine, and other southern pines, except longleaf or slash, singly or in combination. Common associates include oak, hickory, and gum.

OAK-PINE: Forests in which 50 percent or more of the stand is hardwood, usually upland oak, and southern pines make up 25-49 percent. Common associates include gum and hickory.

CEDAR: Forests in which 25 percent or more of the stand is redcedar and southern pines make up less than 25 percent. Common associates include oak and hickory.

OAK-HICKORY: Forests in which 50 percent or more of the stand is upland oak and hickory, singly or in combination, and southern pines or redcedar make up less than 25 percent. Common associates include gum, yellow-poplar, elm, and maple.

OAK-GUM-CYPRESS: Bottom-land forests in which 50 percent or more of the stand is tupelo, blackgum, sweetgum, oak, and southern cypress, singly or in combination, and southern pines make up less than 25 percent. Common associates include cottonwood, willow, ash, elm, hackberry, and maple.

PRODUCTIVE-RESERVED FOREST LAND: Productive public forest land withdrawn from timber utilization through statute or administrative regulation.

UNPRODUCTIVE FOREST LAND: Forest land incapable of yielding crops of industrial wood because of adverse site conditions.

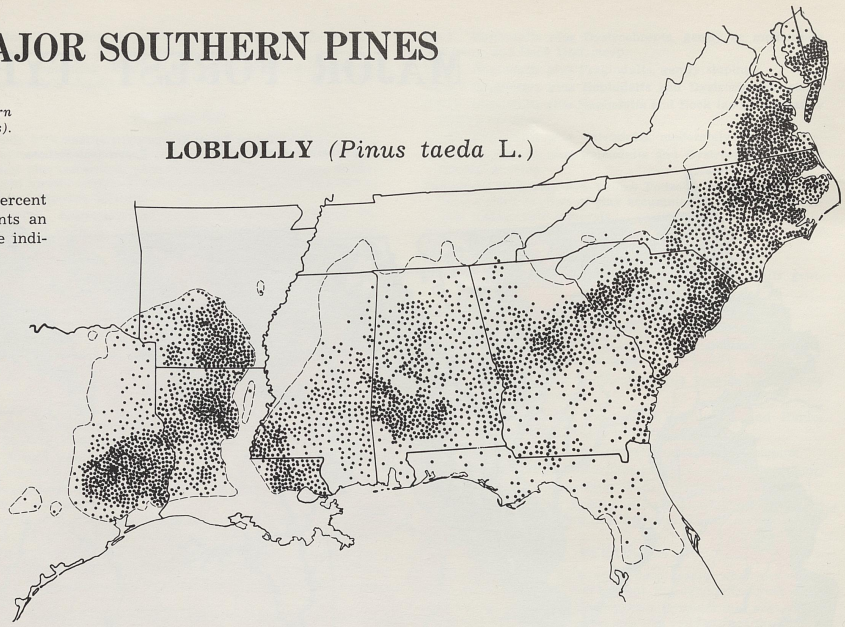
NONTYPED: Land less than 10 percent forested.

DISTRIBUTION OF MAJOR SOUTHERN PINES

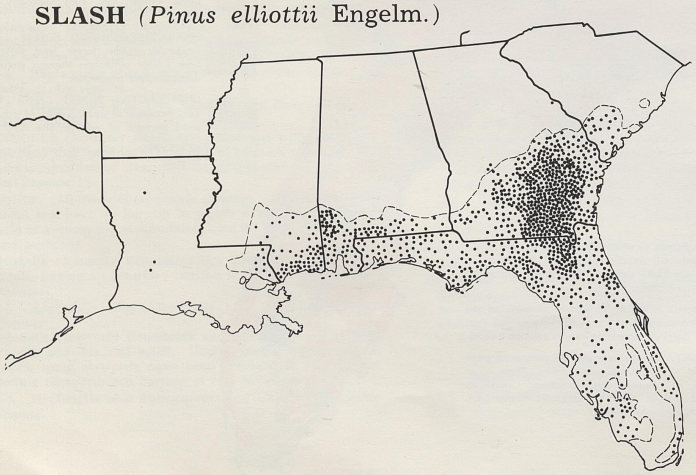
From H. S. Sternitzke and T. C. Nelson, "The Southern Pines of the United States." Economic Botany (in press).

Four of the 10 southern pine species comprise 90 percent of the total softwood inventory. Each dot represents an average of 5,000,000 cubic feet volume. Dashed line indicates natural range of species.

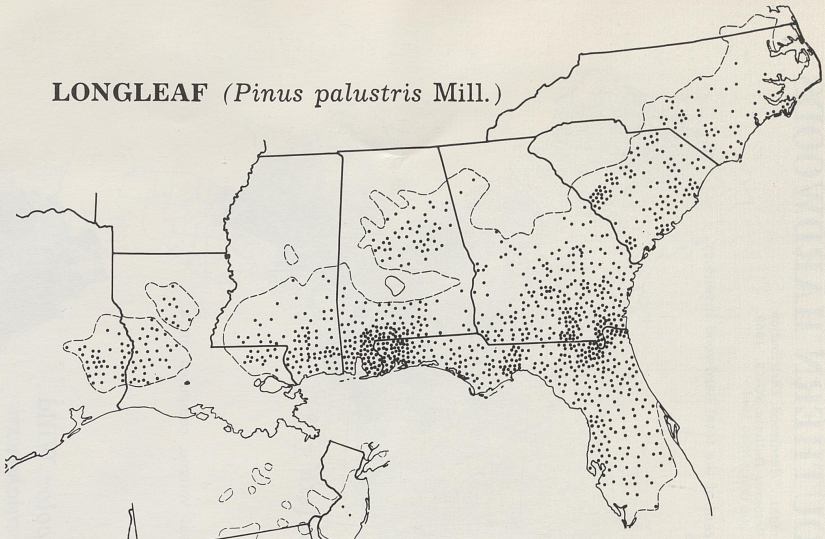
LOBLOLLY *(Pinus taeda* L.)



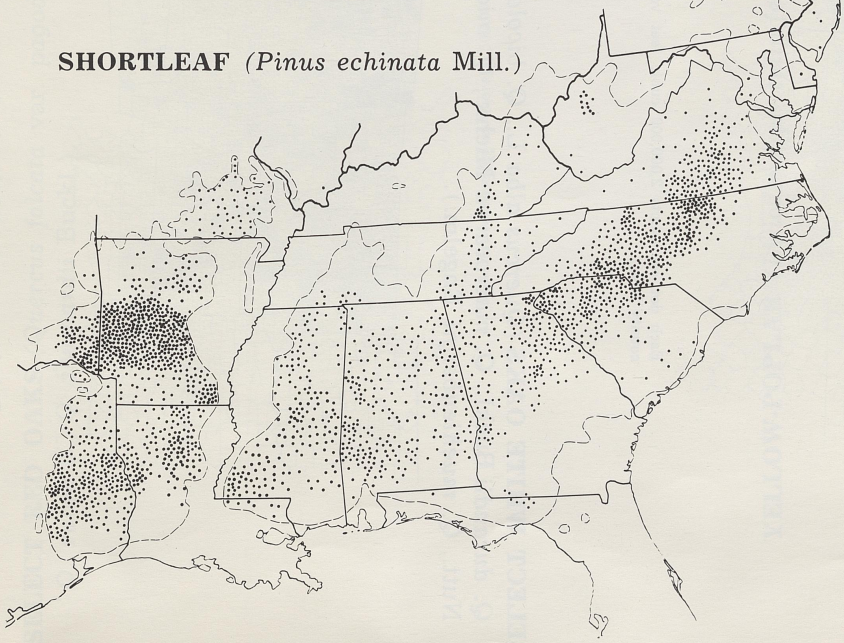
SLASH *(Pinus elliottii* Engelm.)



LONGLEAF *(Pinus palustris* Mill.)



SHORTLEAF *(Pinus echinata* Mill.)

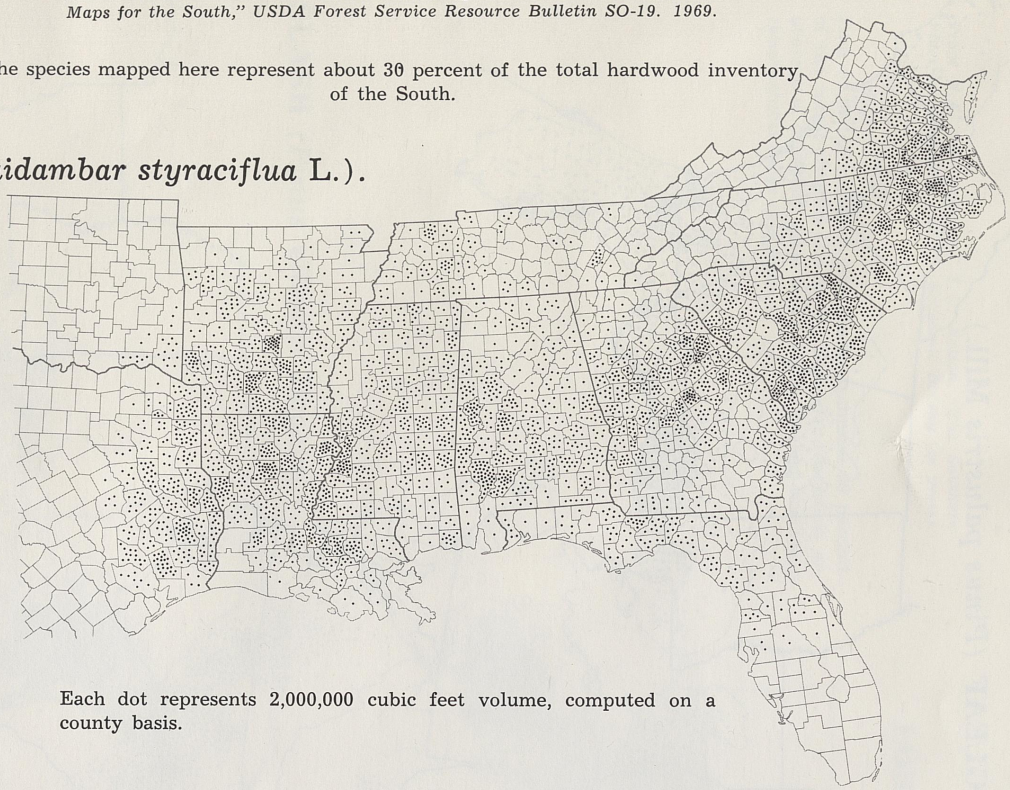


DISTRIBUTION OF MAJOR SOUTHERN HARDWOODS

From Arnold Hedlund and Herbert A. Knight, "Hardwood Distribution Maps for the South," USDA Forest Service Resource Bulletin SO-19. 1969.

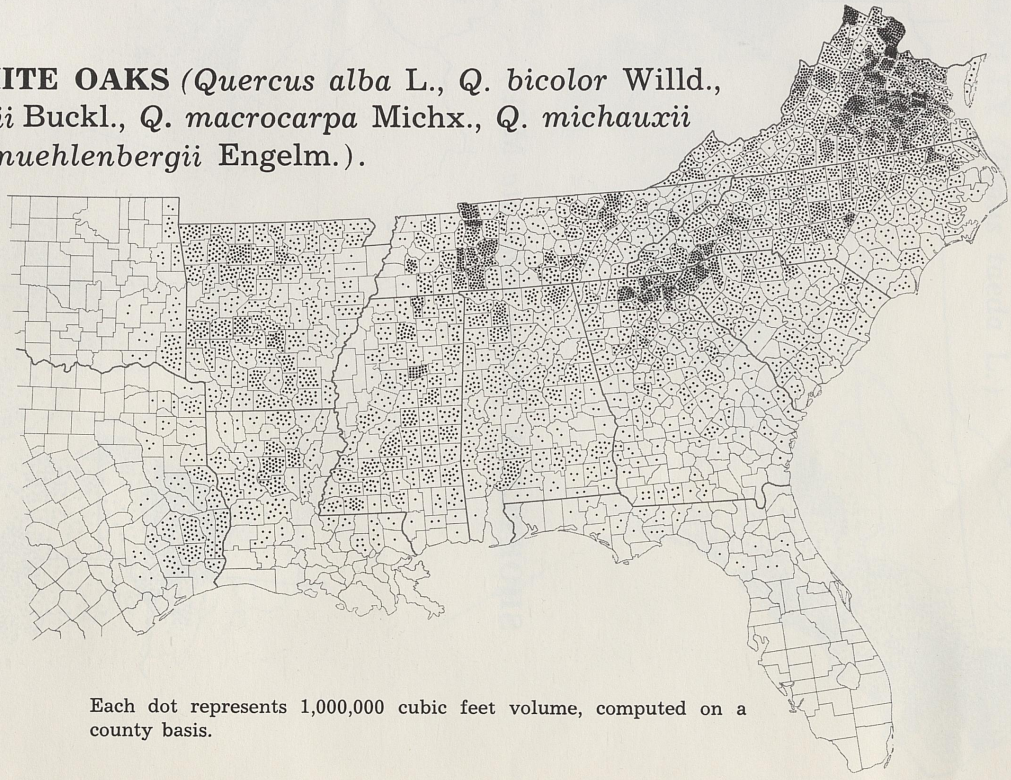
The species mapped here represent about 30 percent of the total hardwood inventory of the South.

SWEETGUM *(Liquidambar styraciflua* L.).



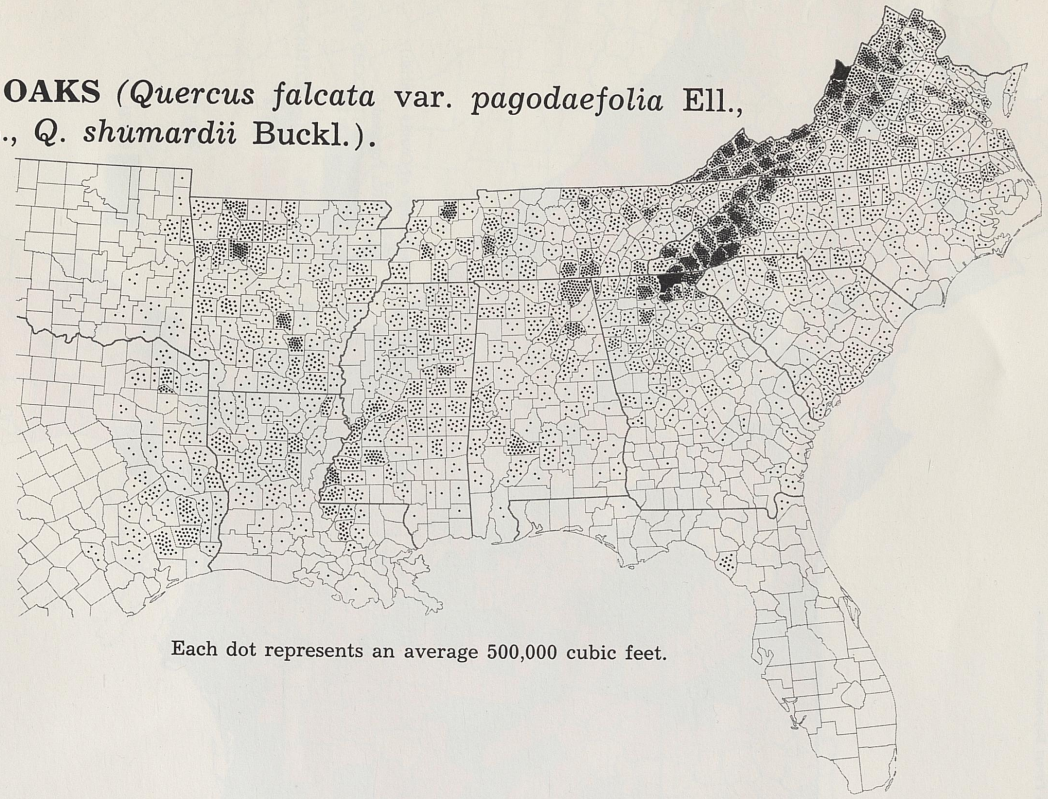
Each dot represents 2,000,000 cubic feet volume, computed on a county basis.

SELECT WHITE OAKS *(Quercus alba* L., *Q. bicolor* Willd., *Q. durandii* Buckl., *Q. macrocarpa* Michx., *Q. michauxii* Nutt., *Q. muehlenbergii* Engelm.).



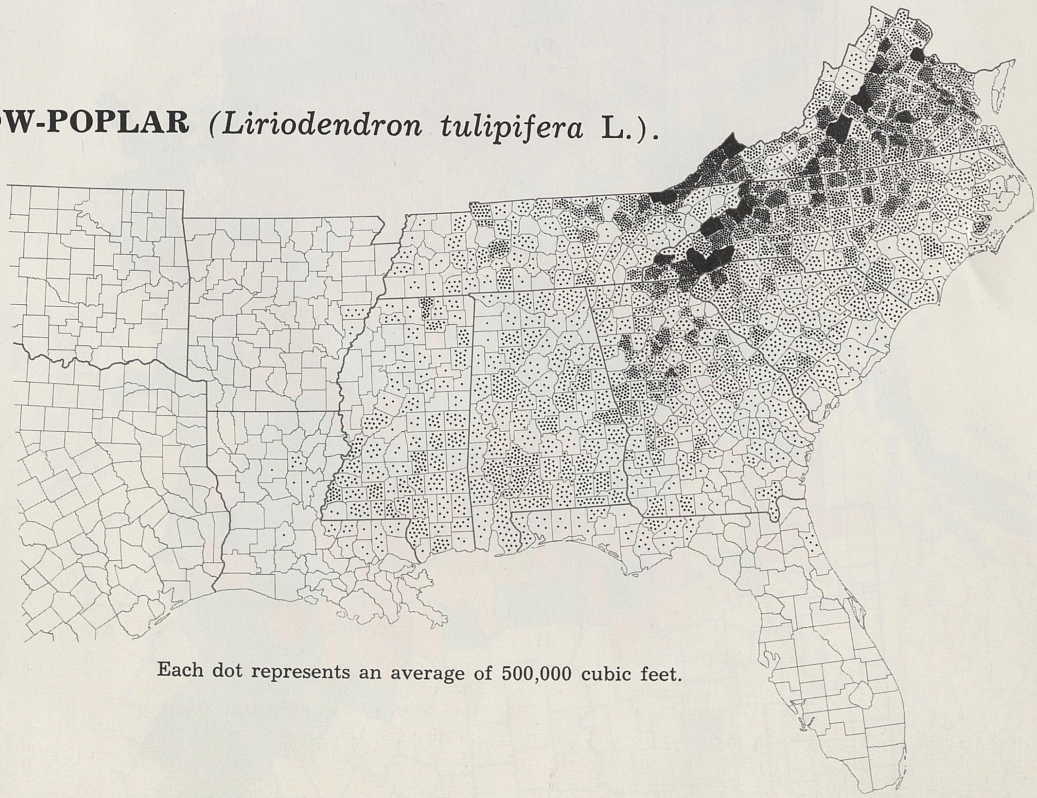
Each dot represents 1,000,000 cubic feet volume, computed on a county basis.

SELECT RED OAKS (*Quercus falcata* var. *pagodaefolia* Ell., *Q. rubra* L., *Q. shumardii* Buckl.).



Each dot represents an average 500,000 cubic feet.

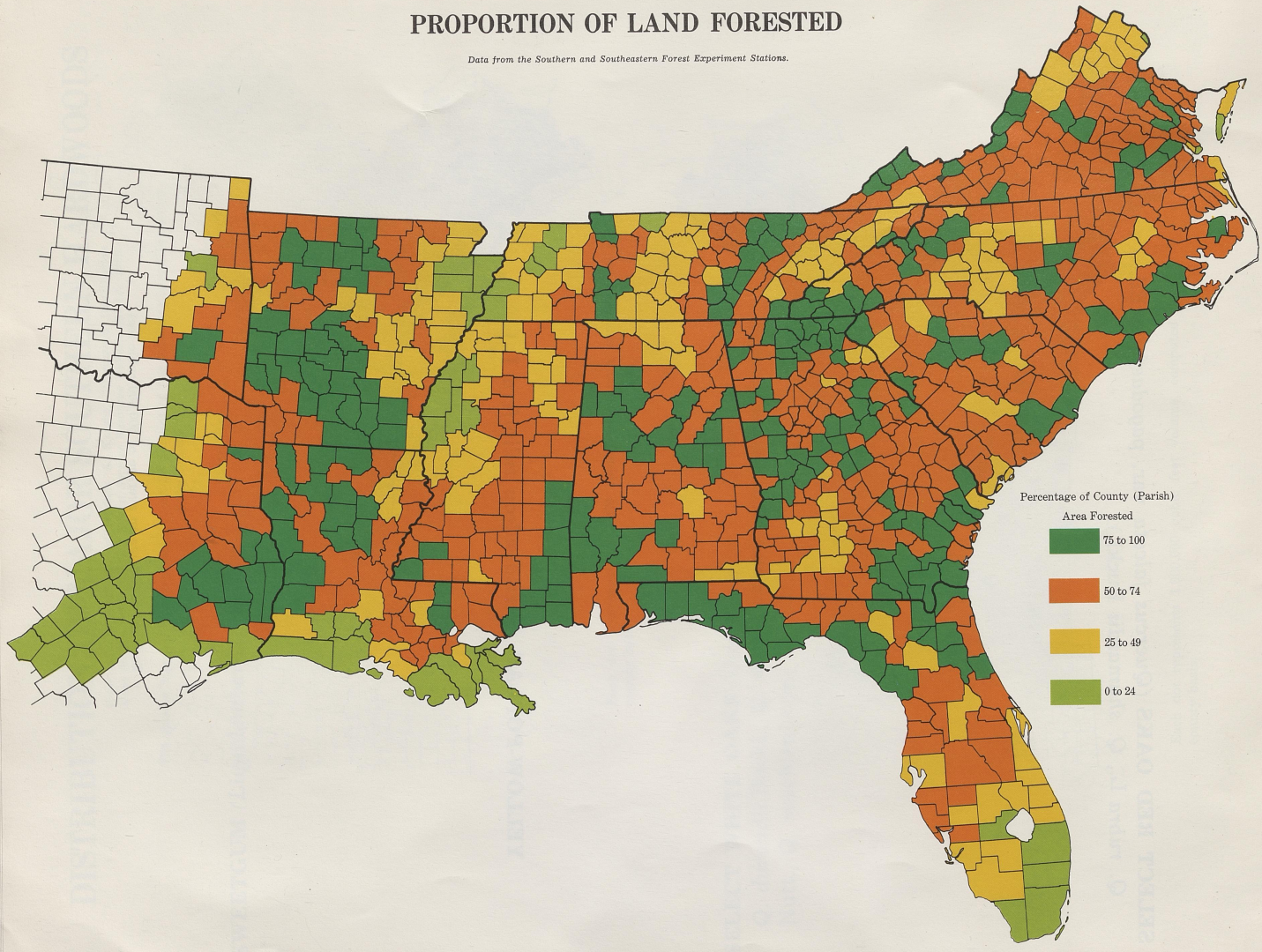
YELLOW-POPLAR (*Liriodendron tulipifera* L.).



Each dot represents an average of 500,000 cubic feet.

PROPORTION OF LAND FORESTED

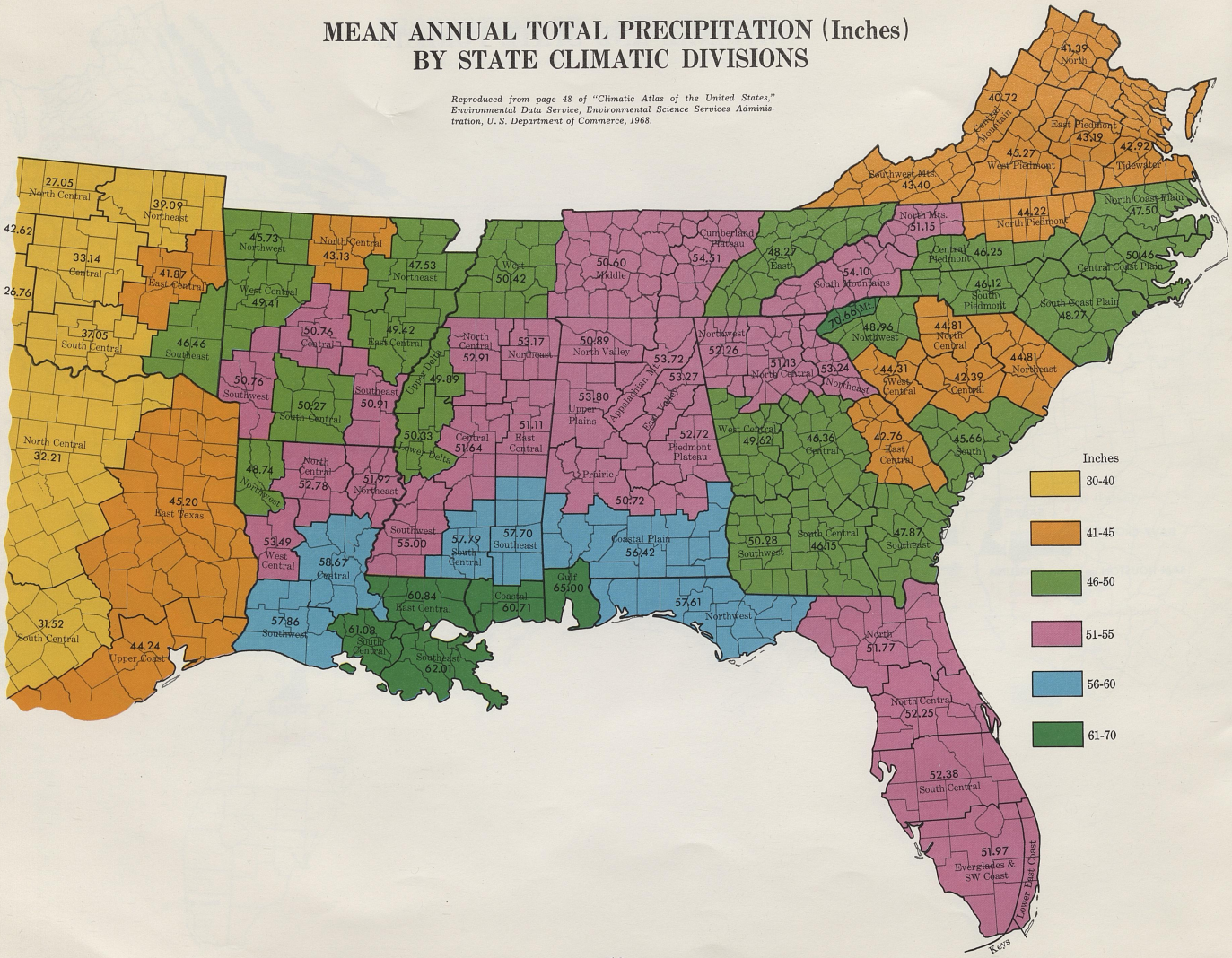
Data from the Southern and Southeastern Forest Experiment Stations.



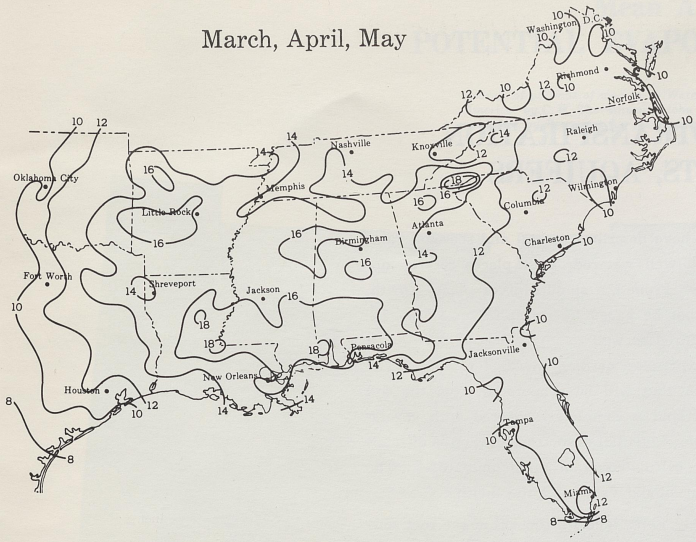
NATIONAL AND STATE FORESTS

MEAN ANNUAL TOTAL PRECIPITATION (Inches) BY STATE CLIMATIC DIVISIONS

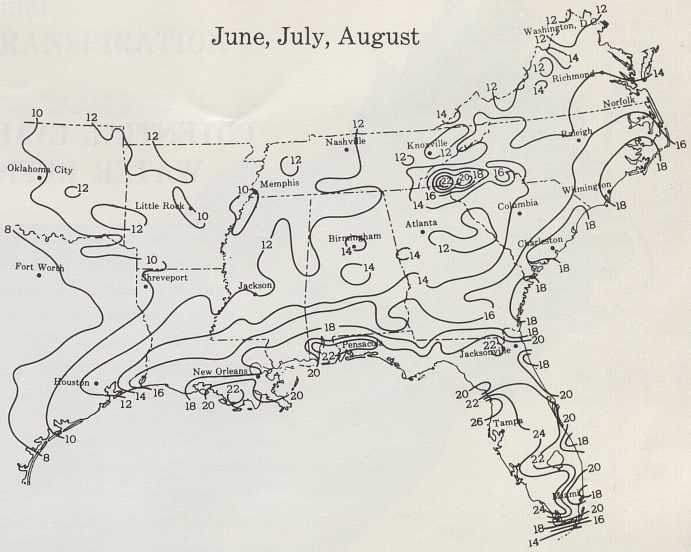
Reproduced from page 48 of "Climatic Atlas of the United States," Environmental Data Service, Environmental Science Services Administration, U. S. Department of Commerce, 1968.



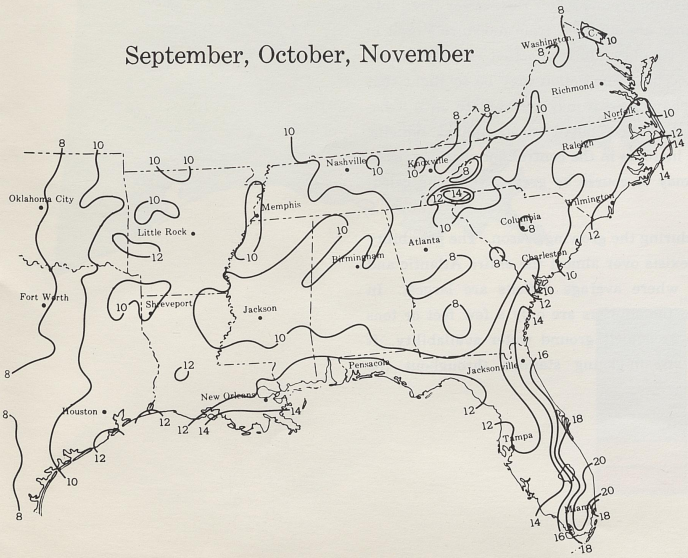
March, April, May



June, July, August



September, October, November



GROWING-SEASON PRECIPITATION

Normal Total Precipitation in Inches
Based on Period 1931-1960

These three maps were drawn for this atlas by the National Weather Records Center, Environmental Data Service, Environmental Science Services Administration, U. S. Department of Commerce.

POTENTIAL EVAPOTRANSPIRATION, WATER DEFICITS, AQUIFERS

Maps on the two preceding pages have described annual and seasonal rainfall. As a whole, the South can be considered well watered; most places receive upwards of 48 inches of precipitation annually. From the standpoint of plant growth, however, wetness or dryness of a climate cannot be gaged by precipitation alone. Information on the water needs of plants is required as well.

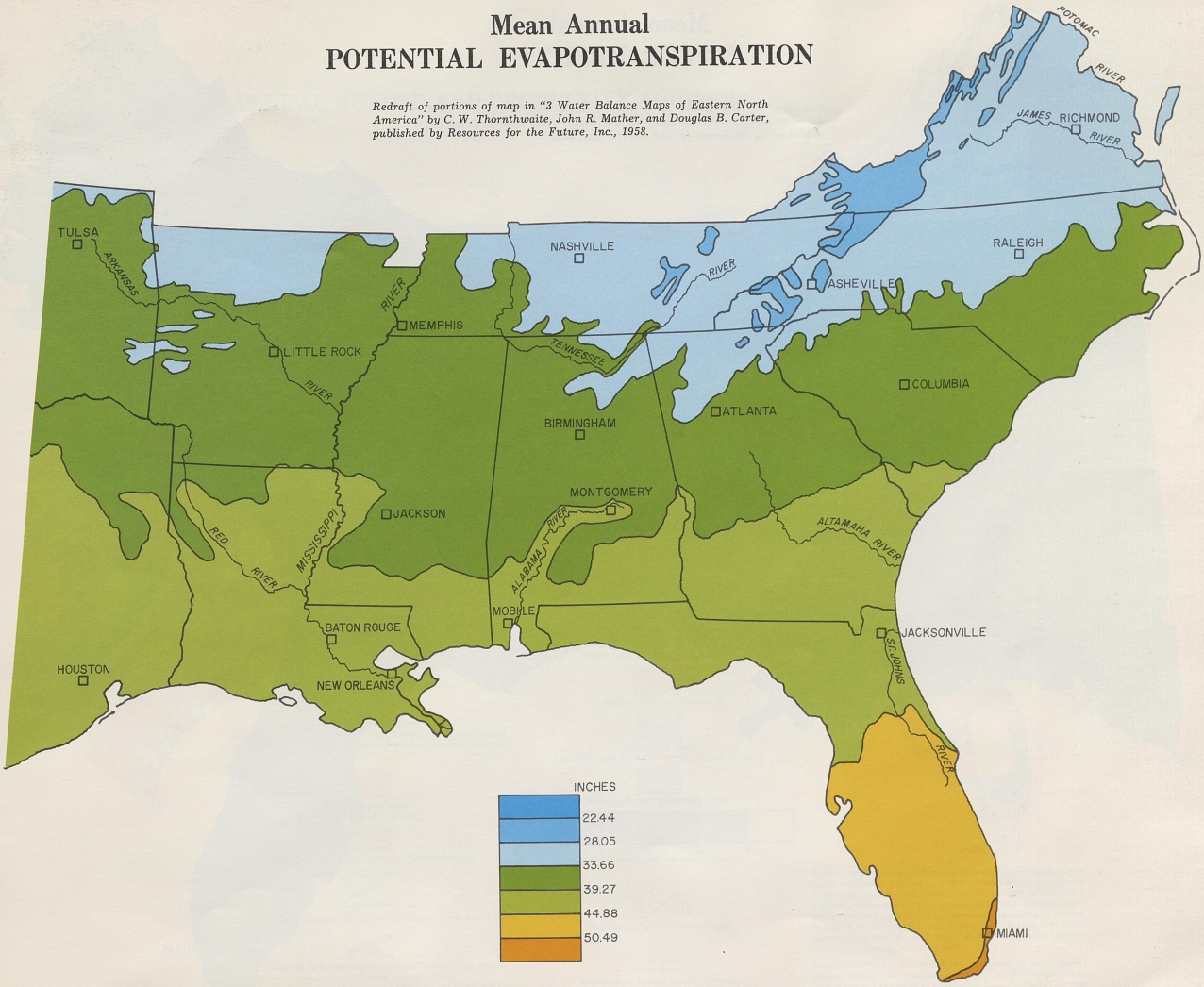
Potential evapotranspiration is an expression of plant needs for water. The term may be defined as the amount of water that will be evaporated from the soil surface or transpired through foliage when land is completely covered with vegetation and supplies of soil moisture are ample. Potential evapotranspiration is difficult to measure directly but can be empirically calculated from air temperatures. The map on the facing page shows estimated mean annual values for the South.

Need for water is low during winter. Rains then fill the soil of the root zone to capacity, after which the surplus percolates into ground water reserves or flows into streams. The higher needs of spring and summer are supplied from moisture stored in the soil plus that added by rains. When these supplies run low, actual evapotranspiration falls below potential. That is, a deficit occurs. The deficit may be so slight that it has no serious effect on forest growth and behavior, or it may accumulate until it becomes a bad drought. The map on page 20 shows computed mean annual deficits. These are small in the eastern portions but increase in the central and western parts. In any given year local or regional deficits may of course be greater than the calculated averages.

Virtually all deficits are incurred during the growing season. The possibility of counteracting drought through irrigation exists over almost the entire Atlantic and Gulf Coastal Plains, which include the areas where average deficits are largest. In this area ground water is abundant and often the aquifers are only a few feet or tens of feet below the surface. The map on page 21 depicts ground water availability. It also shows annual runoff, as measured by stream-gaging stations throughout the region.

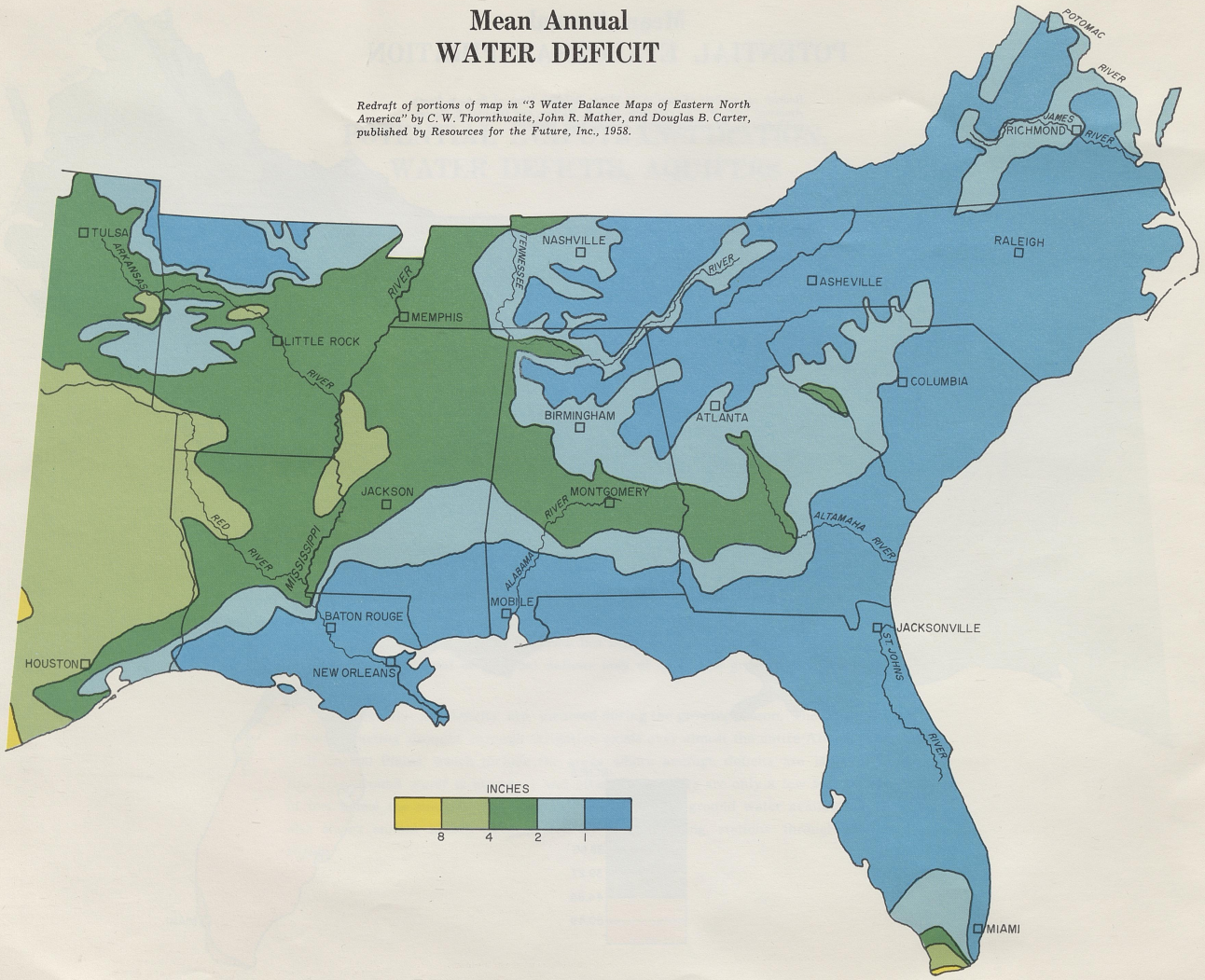
Mean Annual
POTENTIAL EVAPOTRANSPIRATION

Redraft of portions of map in "3 Water Balance Maps of Eastern North America" by C. W. Thornthwaite, John R. Mather, and Douglas B. Carter, published by Resources for the Future, Inc., 1958.

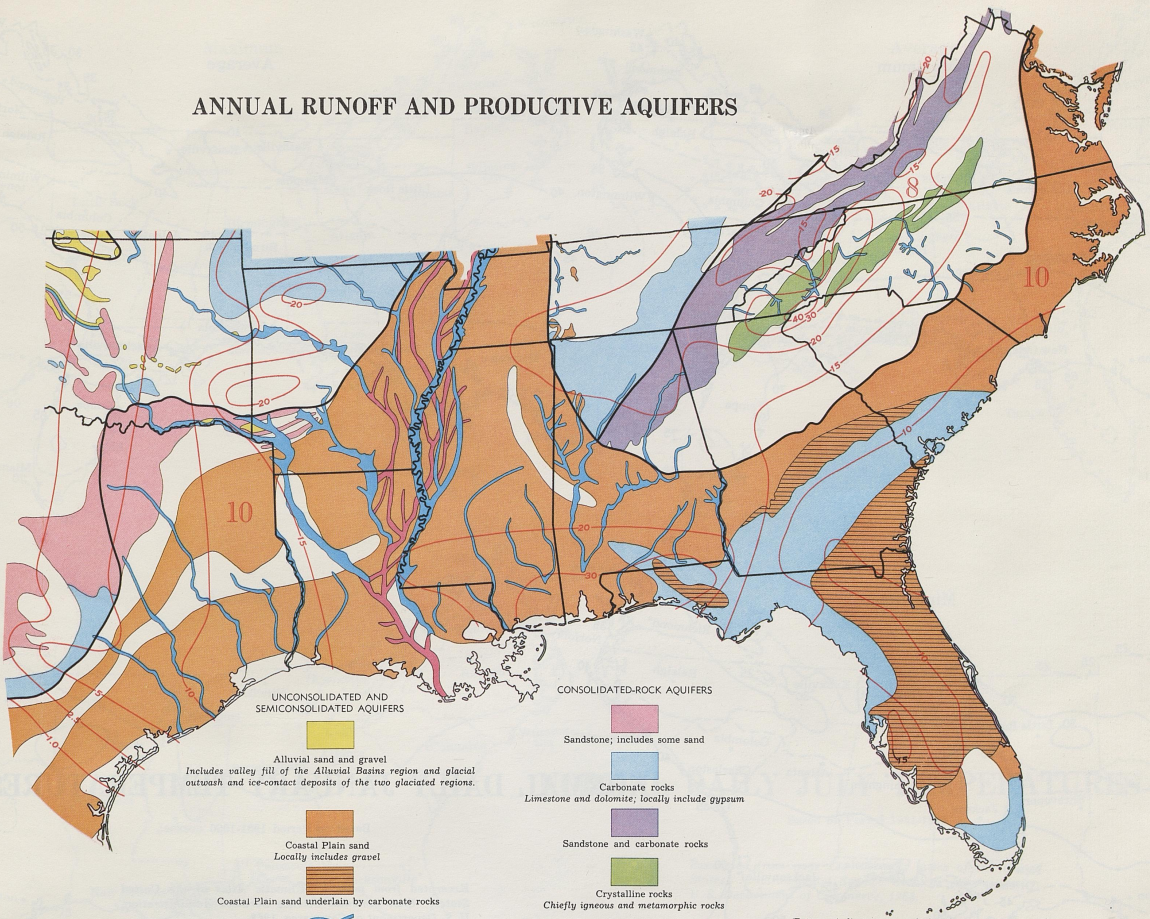


Mean Annual
WATER DEFICIT

Redraft of portions of map in "3 Water Balance Maps of Eastern North America" by C. W. Thornthwaite, John R. Mather, and Douglas B. Carter, published by Resources for the Future, Inc., 1958.



ANNUAL RUNOFF AND PRODUCTIVE AQUIFERS



UNCONSOLIDATED AND SEMICONSOLIDATED AQUIFERS

Alluvial sand and gravel
Includes valley fill of the Alluvial Basins region and glacial outwash and ice-contact deposits of the two glaciated regions.

Coastal Plain sand
Locally includes gravel

Coastal Plain sand underlain by carbonate rocks

Watercourse

Alluvial valley traversed by perennial stream from which recharge can be induced

Surficial alluvial valley no longer traversed by perennial stream (abandoned watercourse), or buried alluvial valley

CONSOLIDATED-ROCK AQUIFERS

Sandstone; includes some sand

Carbonate rocks
Limestone and dolomite; locally include gypsum

Sandstone and carbonate rocks

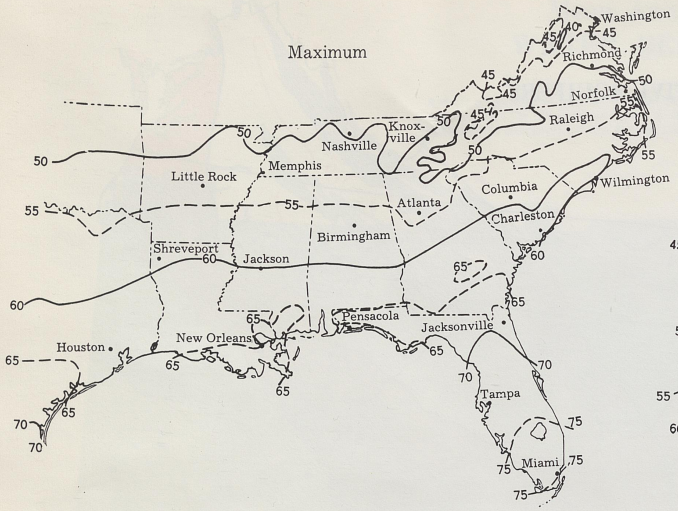
Crystalline rocks
Chiefly igneous and metamorphic rocks

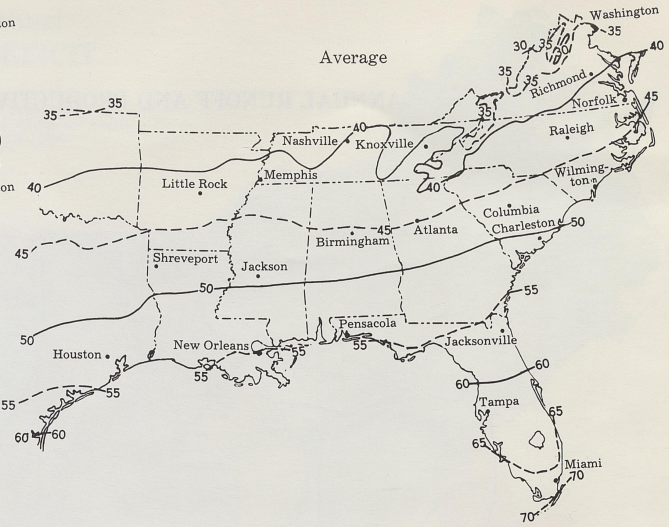
8/10 Boundary of ground-water region

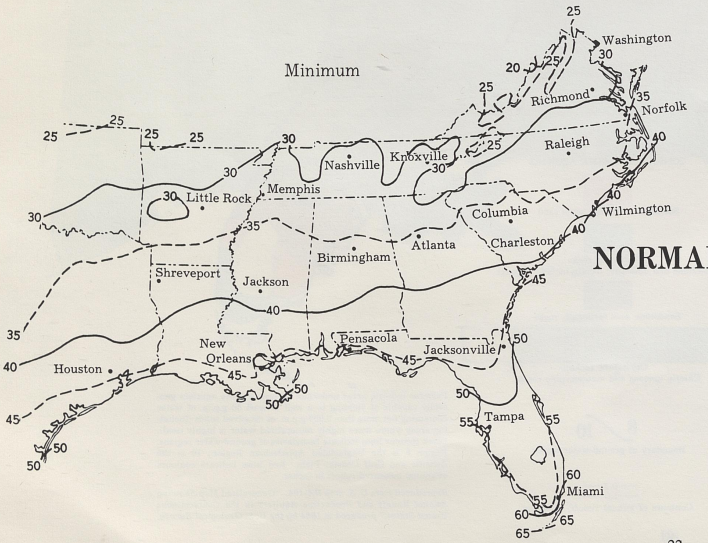
0.5 1.0 Contours of annual runoff, in inches

Patterns indicate areas underlain by one or more aquifers generally capable of yielding to a well at least 50 g.p.m. of water containing not more than 2,000 p.p.m. of dissolved solids (including areas where more highly mineralized water is highly used). Black contour lines indicate boundaries of ground-water regions. Region 8 is the Unglaciated Appalachian Region; 10 is the Atlantic and Gulf Coastal Plain. Red lines indicate contours of annual measured runoff in inches.

Reproduced from U. S. map HA-194. "Generalized Map Showing Annual Runoff and Productive Aquifers in the Conterminous United States," produced in 1964 by the U. S. Geological Survey.



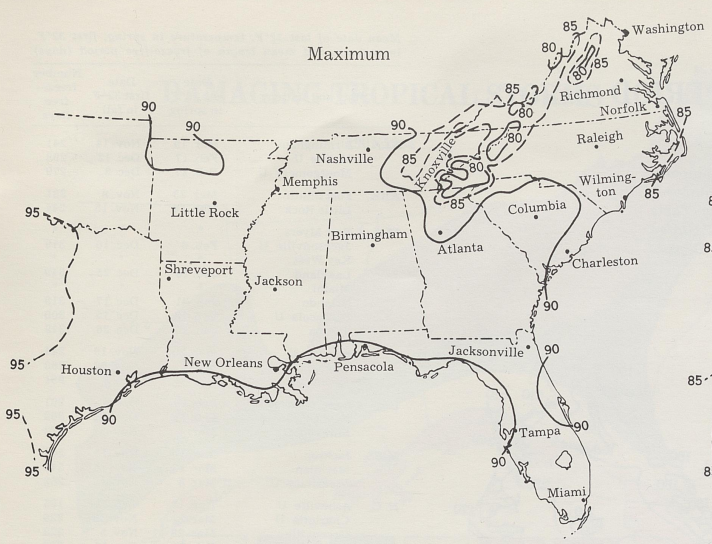


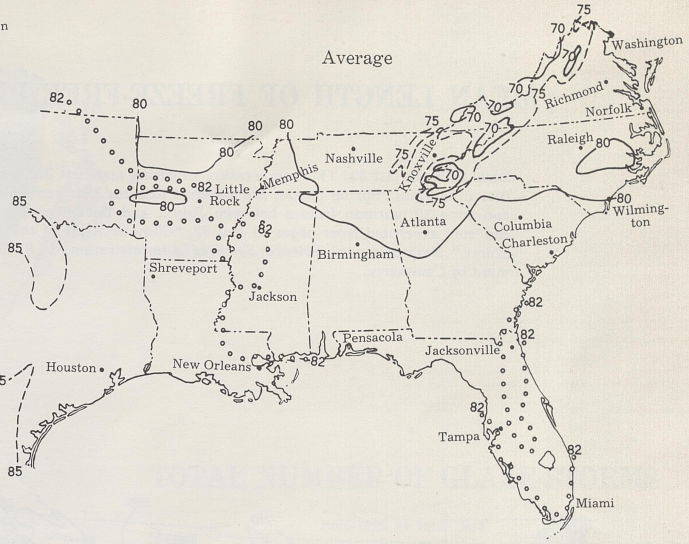


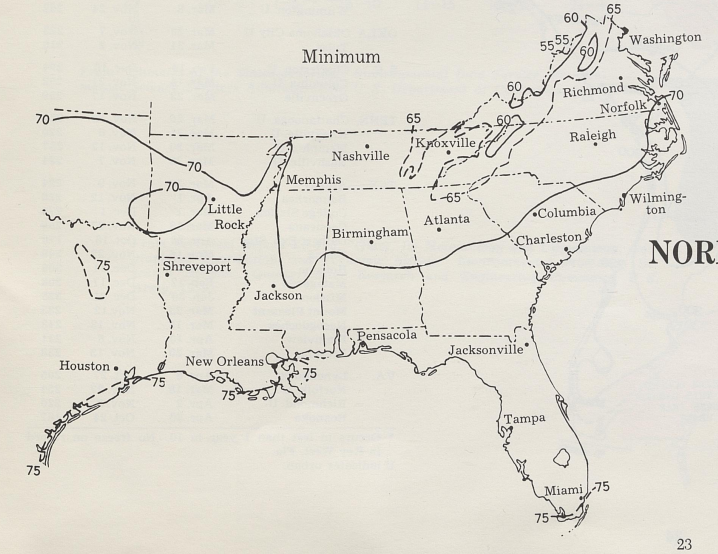
NORMAL DAILY JANUARY TEMPERATURES (°F)

Based on Period 1931-1960

Excerpted from page 1, "Climatic Atlas of the United States," Environmental Science Services Administration, U. S. Department of Commerce, 1968.







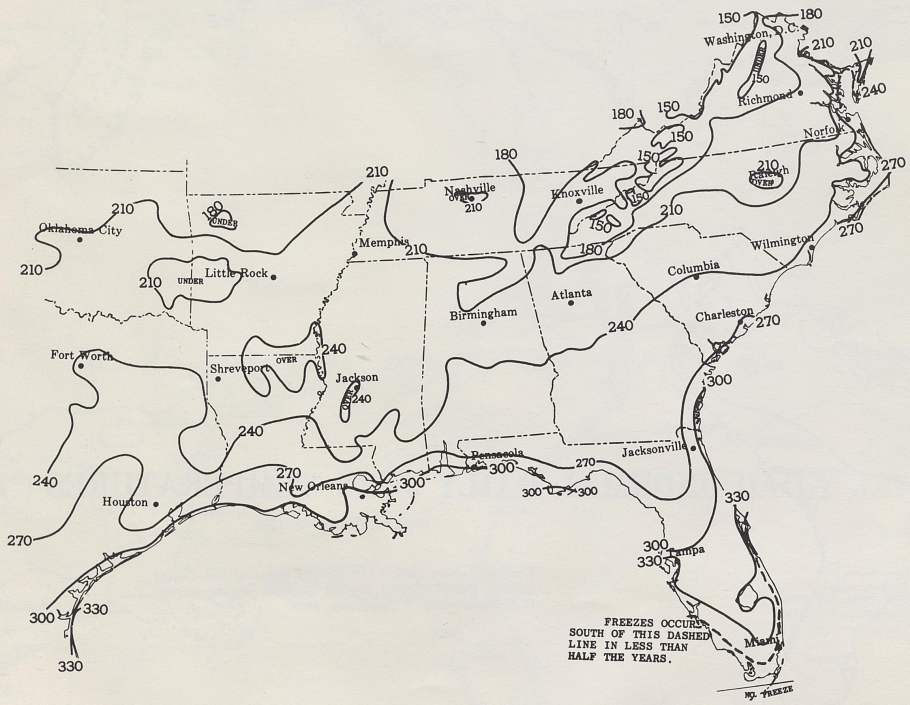
NORMAL DAILY JULY TEMPERATURES (°F)

Based on Period 1931-1960

Excerpted from page 13, "Climatic Atlas of the United States," Environmental Science Services Administration. U. S. Department of Commerce, 1968.

MEAN LENGTH OF FREEZE-FREE PERIOD

Days between last 32° (F.) temperature in spring and first 32° temperature in autumn. Spring freezes are assumed to occur between January 1 and June 30; autumn freezes between July 1 and December 31. *Table and map excerpted from pages 31 and 32, "Climatic Atlas of the United States," Environmental Science Services Administration, U. S. Department of Commerce.*



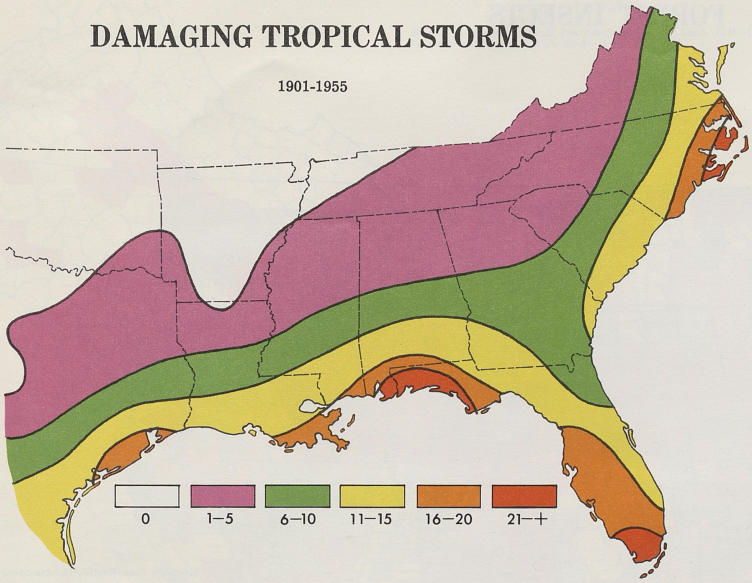
Mean date of last 32°F. temperature in spring, first 32°F. in autumn, and mean length of freeze-free period (days)

State and station	Date last 32°F. in spring	Date first 32°F. in fall	Number freeze-free days
ALA. Birmingham	Mar. 19	Nov. 14	241
Mobile U	Feb. 17	Dec. 12	298
Montgomery U	Feb. 27	Dec. 3	279
ARK. Fort Smith	Mar. 23	Nov. 9	231
Little Rock	Mar. 16	Nov. 15	244
FLA. Fort Myers	*	*	*
Jacksonville U	Feb. 6	Dec. 16	313
Key West	*	*	*
Lakeland	Jan. 10	Dec. 25	349
Miami	*	*	*
Orlando	Jan. 31	Dec. 17	319
Pensacola U	Feb. 18	Dec. 15	300
Tampa	Jan. 10	Dec. 26	349
GA. Atlanta U	Mar. 20	Nov. 19	244
Augusta	Mar. 7	Nov. 22	260
Savannah	Feb. 21	Dec. 9	291
LA. Lake Charles	Feb. 18	Dec. 6	291
New Orleans	Feb. 13	Dec. 12	302
Shreveport	Mar. 1	Nov. 27	272
MISS. Jackson	Mar. 10	Nov. 13	248
Meridian	Mar. 13	Nov. 14	246
Vicksburg U	Mar. 8	Nov. 15	252
N. C. Asheville U	Apr. 12	Oct. 24	195
Charlotte U	Mar. 21	Nov. 15	239
Greenville	Mar. 28	Nov. 5	222
Hatteras	Feb. 25	Dec. 18	296
Raleigh U	Mar. 24	Nov. 16	237
Wilmington U	Mar. 8	Nov. 24	262
OKLA. Oklahoma City U	Mar. 28	Nov. 7	223
Tulsa	Mar. 31	Nov. 2	216
S. C. Charleston U	Feb. 19	Dec. 10	294
Columbia U	Mar. 14	Nov. 21	252
Greenville	Mar. 23	Nov. 17	239
TENN. Chattanooga U	Mar. 26	Nov. 10	229
Knoxville U	Mar. 31	Nov. 6	220
Memphis U	Mar. 20	Nov. 12	237
Nashville U	Mar. 28	Nov. 7	224
TEX. Albany	Mar. 30	Nov. 9	224
Balmorhea	Apr. 1	Nov. 12	226
College Station	Mar. 1	Dec. 1	275
Corsicana	Mar. 13	Nov. 27	259
Dalhart Exp. Sta.	Apr. 23	Oct. 18	178
Dallas	Mar. 18	Nov. 22	249
Houston	Feb. 5	Dec. 11	309
Matagorda	Feb. 12	Dec. 17	308
Mission	Jan. 30	Dec. 21	325
Mount Pleasant	Mar. 23	Nov.12	233
Nacogdoches	Mar. 15	Nov. 13	243
Plainview	Apr. 10	Nov. 6	211
Presidio	Mar. 20	Nov. 13	238
VA. Lynchburg	Apr. 6	Oct. 27	205
Norfolk U	Mar. 18	Nov. 27	254
Richmond U	Apr. 2	Nov. 8	220
Roanoke	Apr. 20	Oct. 24	187

* Occurs in less than 1 year in 10. No freeze on record in Key West, Fla.
U indicates urban.

DAMAGING TROPICAL STORMS

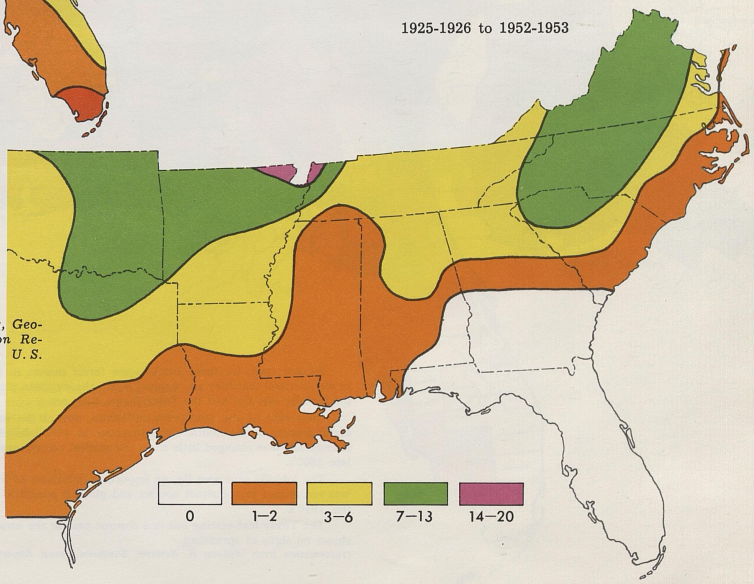
1901-1955



From "Climates of the States—Florida," Environmental Data Service, Environmental Science Services Administration, U. S. Department of Commerce, 1967.

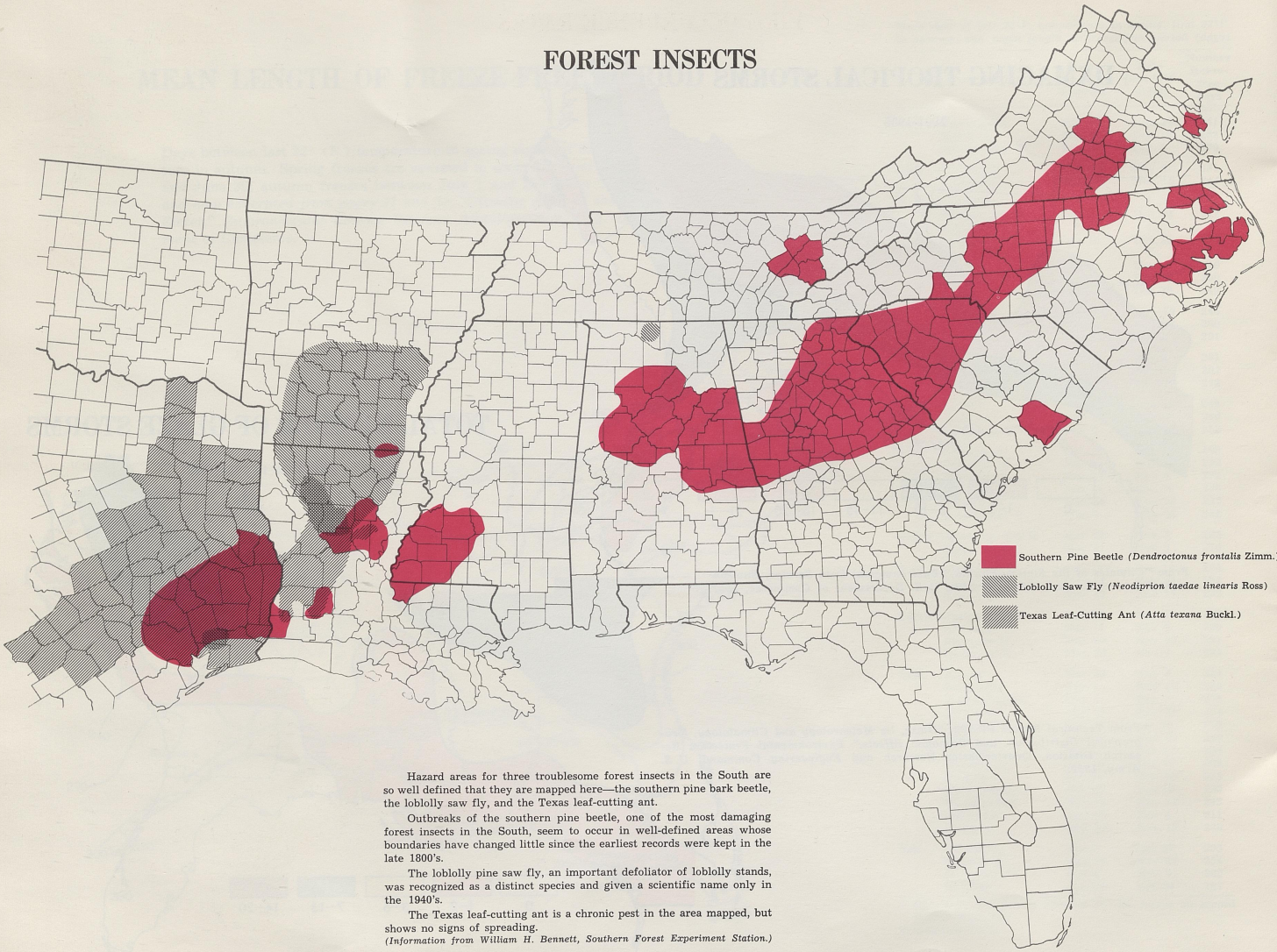
TOTAL NUMBER OF GLAZE STORMS

1925-1926 to 1952-1953



From Technical Report EP-105, "Glaze, Its Meteorology and Climatology, Geographical Distribution, and Economic Effects," Environmental Protection Research Division, Quartermaster Research and Engineering Command, U. S. Army, 1959.

FOREST INSECTS



Hazard areas for three troublesome forest insects in the South are so well defined that they are mapped here—the southern pine bark beetle, the loblolly saw fly, and the Texas leaf-cutting ant.

Outbreaks of the southern pine beetle, one of the most damaging forest insects in the South, seem to occur in well-defined areas whose boundaries have changed little since the earliest records were kept in the late 1800's.

The loblolly pine saw fly, an important defoliator of loblolly stands, was recognized as a distinct species and given a scientific name only in the 1940's.

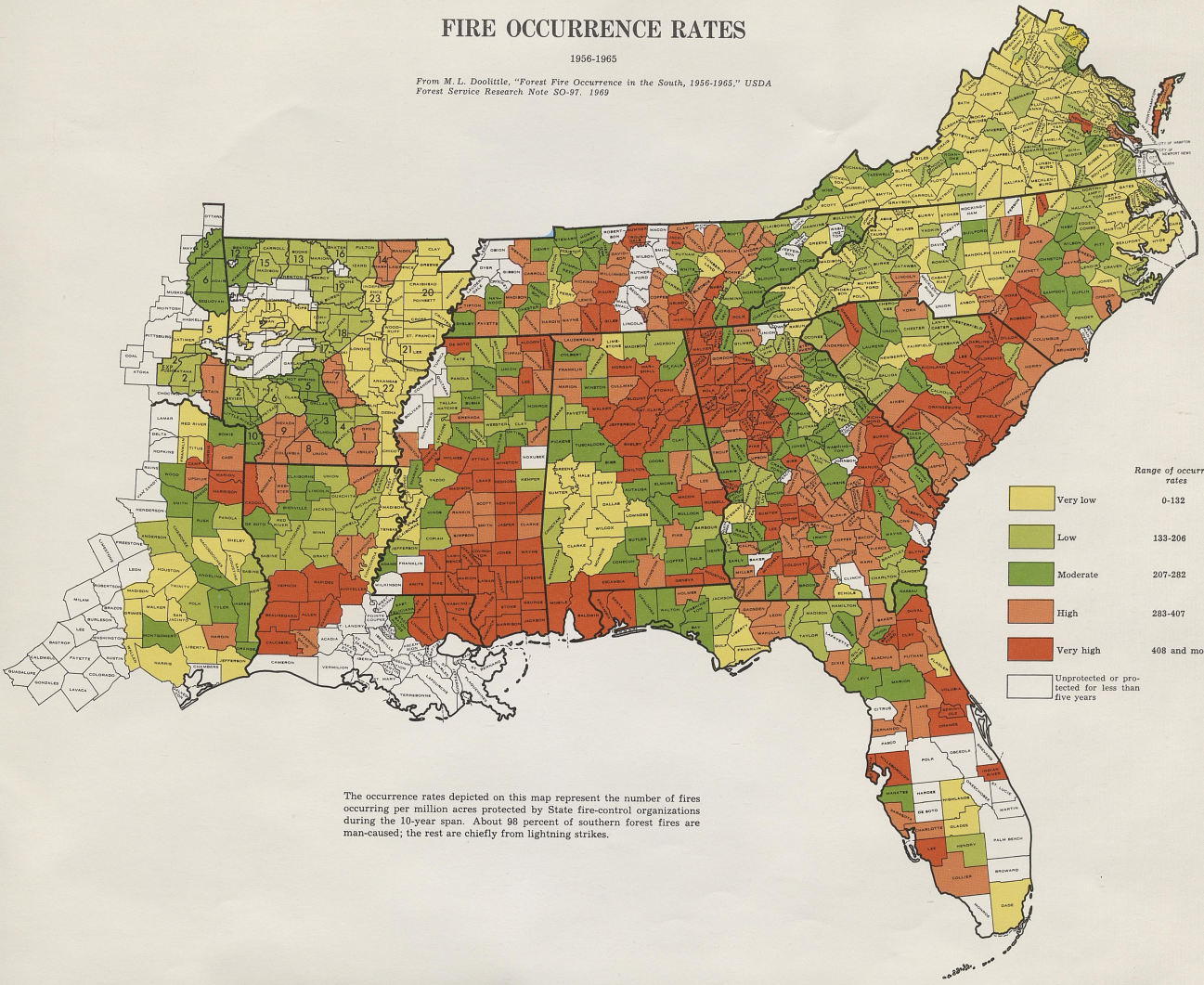
The Texas leaf-cutting ant is a chronic pest in the area mapped, but shows no signs of spreading.

(Information from William H. Bennett, Southern Forest Experiment Station.)

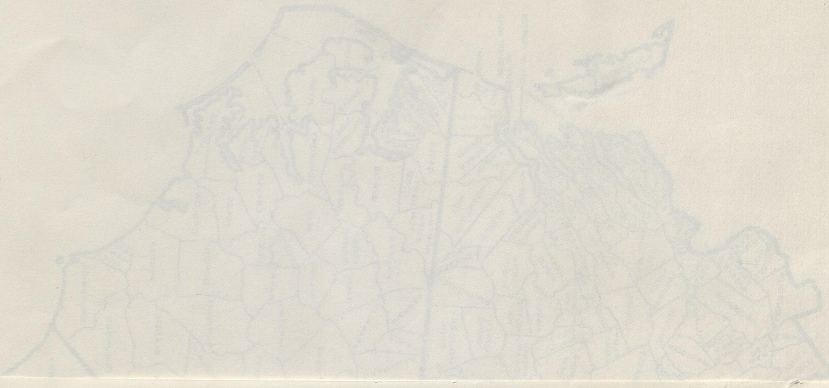
FIRE OCCURRENCE RATES

1956-1965

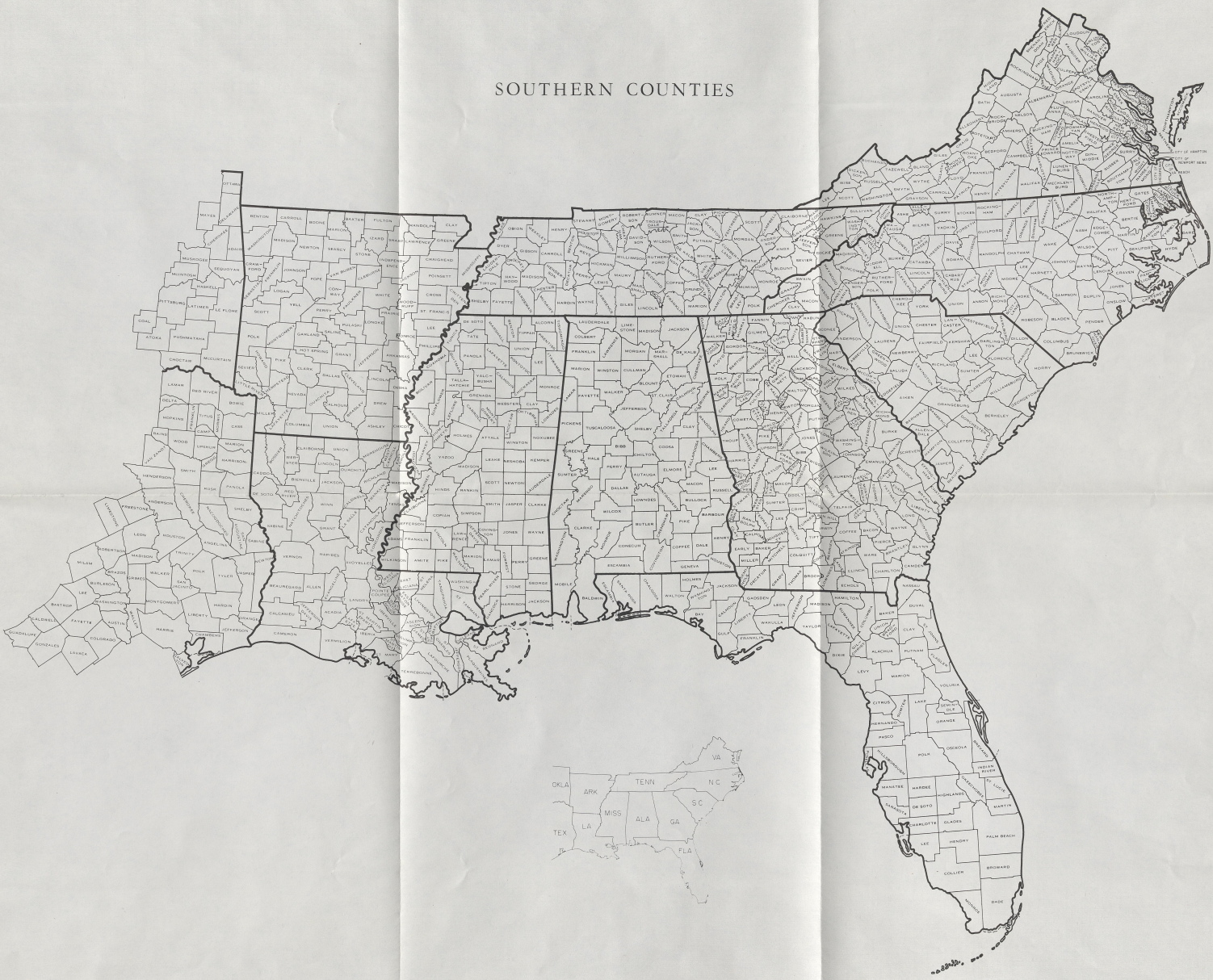
From M. L. Doolittle, "Forest Fire Occurrence in the South, 1956-1965," USDA Forest Service Research Note SO-97. 1969



The occurrence rates depicted on this map represent the number of fires occurring per million acres protected by State fire-control organizations during the 10-year span. About 98 percent of southern forest fires are man-caused; the rest are chiefly from lightning strikes.



SOUTHERN COUNTIES

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