

Northwest Florida Water Management District

The Northwest Florida Water Management District (NFWFMD) stretches from the St. Marks River basin in Jefferson County to the Perdido River in Escambia County. The district encompasses all of 15 counties as well as the portion of Jefferson County within the St. Marks River basin. Within its 11,305 square miles of land are parts of five major drainage basins: the Perdido-Escambia, the Blackwater-Yellow, the Choctawhatchee, the Apalachicola-Chipola, and the Ochlockonee-St. Marks. When areas of water are combined with land areas, the square miles within the district total 13,264. Tallahassee, the state capital, with an estimated 1990 population of 124,773, is the largest city. All of the other major urbanized areas—Pensacola, Destin, Ft. Walton Beach, Panama City—are on the coast. Small towns dot the interior of the region where most of the land is in agriculture or forestry. Within Northwest Florida are several large government land holdings including Eglin Air Force Base, the Apalachicola National Forest, the Blackwater River State Forest, and the St. Marks National Wildlife Refuge.

Northwest Florida has more rivers and streams than any other region in the state. Seven major rivers (Escambia, Blackwater, Yellow, Choctawhatchee, Chipola, Apalachicola, Ochlockonee) cross the district on their way to the coast. By volume of flow Northwest Florida has three of the five largest rivers in the state: the Apalachicola, Choctawhatchee, and Escambia. The Apalachicola, the largest river in the state, derives its flow from the extensive basins of the Flint and the Chattahoochee in Georgia, which converge at Lake Seminole, an impoundment created by the Jim Woodruff Dam.

Northwest Florida Water Management District is participating in a multiyear comprehensive study of the Apalachicola-Chattahoochee-Flint river system with the states of Alabama and Georgia and the U.S. Army Corps of Engineers. This study includes a freshwater needs assessment of the Apalachicola River and Bay to identify minimum flows of freshwater needed to sustain the current productivity of the river and bay. In 1997 the legislatures of Florida, Georgia, and Alabama adopted the Apalachicola-Chattahoochee-Flint River Basin Compact creating the Apalachicola-Chattahoochee-Flint River Basin Commission. The U.S. Congress ratified the compact in November 1997 and President Clinton signed the compact into law on November 20, 1997.

Most of the region's rivers are in their natural state and have few man-made structures that alter their floodplains and channels or control their flow rates. Rainfall, runoff, and groundwater discharge into the streams determine variations in flow. In the western portion of the region the rivers are generally highly colored with little sediment and few nutrients. Those in the eastern portion of the district are generally alluvial and nutrient rich.

Flooding can and does occur along major rivers, although damages are not usually widespread because of relatively sparse development and public ownership within floodplains. Caryville on the Choctawhatchee River, however, has experienced several disastrous floods during this century. Blountstown and a few other communities on the Apalachicola River flooded during the summer of

1994 from tropical storms Alberto and Beryl. Local flooding also occurs in some urban areas as a result of inadequate stormwater drainage.

Although surface water is plentiful, the Floridan and sand and gravel aquifers supply about 77 percent of the potable water needs in the region. For the most part the Floridan yields water of excellent quality that requires little or no treatment. In Escambia, Santa Rosa, and parts of Okaloosa counties, however, water from the Floridan is saline, and potable supplies are obtained from the sand and gravel aquifer overlying the Floridan. Only Bay County (Panama City metropolitan area) and Quincy (Gadsden County) use surface water for public supply. In Bay County, Deer Point Lake, a reservoir created in 1961, supplies about 19 million gallons of potable water per day. The city of Quincy depends on Quincy Creek for its potable water supply.

Both surface-water and groundwater quality are generally good in Northwest Florida, although localized problems do exist. Several rivers originate in Alabama and Georgia making them vulnerable to water quality degradation caused by actions in those states. The sand and gravel aquifer, like other surficial aquifers, is very susceptible to contamination. Investigations have found instances of groundwater contamination in southern Escambia County. In Jackson County, domestic wells in the Floridan aquifer were found to be contaminated with the agricultural pesticide ethylene dibromide (EDB). Several public water supply wells in Leon and Escambia counties were shut down because of contamination with dry-cleaning solvent. Continuing large withdrawals of groundwater in coastal areas have the potential to degrade groundwater quality by inducing saltwater intrusion. Abandoned wells pose an additional groundwater contamination threat. Between 1990 and 1995, over 4,700 abandoned wells were identified and plugged in the district.

Wellhead protection is an area of increasing concern and activity in the district, especially in the westernmost portions such as Escambia and Santa Rosa counties, which rely on the sand and gravel aquifer. Other places where wellhead protection is critical include recharge areas where the Floridan aquifer is at or near the surface such as in Leon, Wakulla, Jefferson, Jackson, Holmes, and Washington counties.

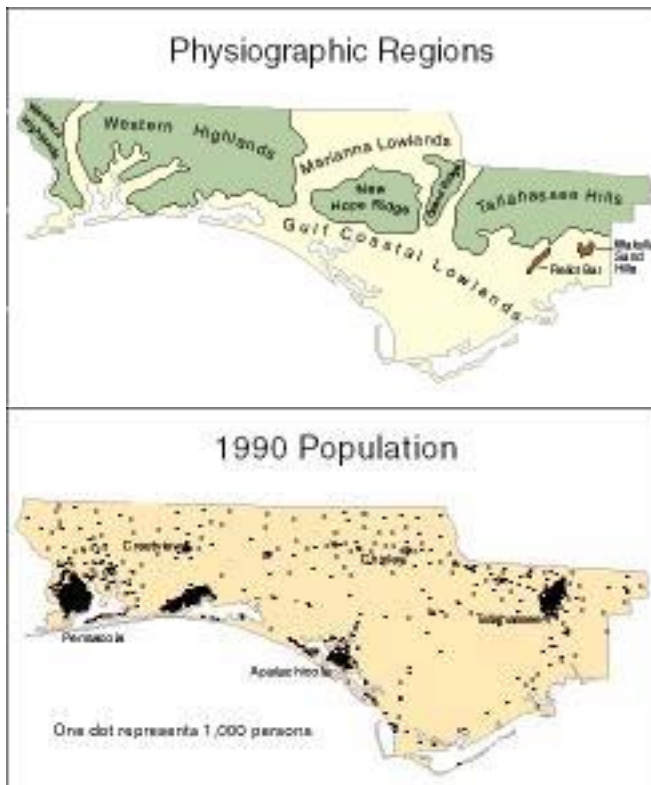
Pollution of bays, rivers, and lakes from stormwater runoff is a serious problem in the region and throughout Florida. For example, Lake Jackson in Leon County, once a pristine lake famous for its trophy-size largemouth bass, has been adversely affected since the early 1970s by stormwater runoff. The Pensacola Bay system has also been affected by stormwater runoff as well as by point-source pollution. By the late 1960s and early 1970s the system experienced decreased fish landings, fish kills, and severe reductions in seagrass beds. The water management district is working with local governments to monitor stormwater and to develop stormwater management plans.

Before human alteration, most of Northwest Florida was open pine woods on rolling hills and flat lands. In the valley bottoms and along creeks were hardwood forests. Since 1984, the district has acquired approximately 150,000 acres through Save Our Rivers and Preservation 2000 for preservation and, in many cases, for restoration to more natural conditions. Included are river floodplains,

headwater wetlands, coastal marshes, first-magnitude springs, and bottomland hardwood and associated upland forests. Within the region are eight first-magnitude springs, most of which are popular recreation spots. Wakulla Springs, the most notable, has an annual average discharge of 250 million gallons per day. More than 85 percent of the floodplains along the Choctawhatchee and Escambia rivers have been acquired by the district.

Although an adequate supply of water is, for the most part, available for existing and future demands throughout most of the region, the district's governing board has designated two Water Resource Caution Areas: the coastal portion of Santa Rosa, Okaloosa, and Walton counties and the Upper Telogia Creek drainage basin in Gadsden County. By 1980, Floridan aquifer water levels in the Ft. Walton Beach area in southern Okaloosa County had declined as much as 100 feet below sea level. Large amounts of water are withdrawn from the upper Telogia Creek basin for irrigation.

Water management activities in Northwest Florida are limited by the current taxing structure. All of the state's five water management districts have the authority to levy ad valorem (property) taxes. Four of the five districts are allowed by the Florida Constitution to levy up to one mill. NFWMD is limited to 1/20th (.05) of a mill, which is 5 cents for every \$1,000 of taxable property value. Most of the district's funding comes from cooperative projects, grants, and legislatively funded programs such as Save Our Rivers and Preservation 2000.



SUWANNEE RIVER WATER MANAGEMENT DISTRICT

The Suwannee River Water Management District (SRWMD) covers 7,640 square miles in north central Florida including all or part of 15 counties. The area is one of the least populated in the state, with a 1995 population of about 280,000. Florida's rapid population growth during the last several decades bypassed north central Florida, indirectly helping keep the region's natural resources healthy. The region's water-related problems are of a smaller scale and more localized than those in more urbanized and developed parts of the state and nation. The region has become increasingly attractive to retirees and second-home developers from other parts of the state and nation. This presents a challenge for the region: providing for continued growth and development while protecting water and related resources.

The defining natural feature of the region is the Suwannee River. From its source in the Okefenokee Swamp in southeastern Georgia, the Suwannee winds its way to the Gulf of Mexico 12 miles above Cedar Key. Two major tributaries also originate in Georgia. The Alapaha River joins the Suwannee southwest of Jasper, and the Withlacoochee flows into the Suwannee a few miles downstream at Ellaville. The Santa Fe River flows west from its headwaters in the Santa Fe Lakes area to join the Suwannee near Branford.

The Suwannee begins as a narrow stream and then broadens and flows through extensive swamps and marshes. The Suwannee River estuary is a complex of diverse natural communities and a major nursery for commercially important fish and invertebrates. Other major stream systems within the district include the Waccasassa, Steinhatchee, Fenholloway, Econfina, and Aucilla. The region's surface waters—lakes and springs as well as rivers—are a major recreational resource for residents and tourists. Groundwater is the major source of water for public supply, agriculture, industry, and domestic use.

Population distribution within the region is influenced by topography and patterns of land tenure. Most of the population is in the higher, drier counties east of the Suwannee River, concentrated around Lake City and Live Oak and along the northern and western edge of Gainesville. Other population centers are Starke, Alachua, and Chiefland east of the river, and Madison and Perry west of the river. Along the Suwannee River the largest incorporated towns are White Springs and Branford, each with a population of about 700. To the west of the Suwannee River are extensive low, wet areas and large tracts of land owned by timber companies. In portions of this western region, mile upon mile of back roads can be traveled without sign of permanent human habitation.

The district's rural character and low population density often lead to the conclusion that the economy of the region is based primarily on agriculture. In reality, agricultural wages and employment rank far behind those for other employment categories. Only about three percent of all employed persons in 1994 worked in farm-related jobs. The two largest industries that have long provided an important economic base for the region are forest products and phosphate mining. One of the larger employment sectors is government—about

52 percent of the 14-county workforce is employed by federal, state, regional, and local government agencies. Most of this employment is with local school boards, the University of Florida, and correctional facilities. The region's increasing number of retirees has given rise to a trend toward a service-oriented economy that is expected to continue.

The district's nine-member governing board, appointed by the governor and confirmed by the senate, has the authority to levy ad valorem taxes and to implement rules and regulations for the management of groundwater and surface water within the district. One board member must reside in the Aucilla River basin; the coastal area between the Suwannee and Aucilla rivers; the Withlacoochee (north) and Alapaha river basin and the Suwannee River basin north of the Withlacoochee River; the Suwannee River basin south of the Withlacoochee River (excluding the Santa Fe River basin); and the Santa Fe River basin, Waccasassa River basin, and coastal area between the Withlacoochee (south) and Suwannee rivers. The other four members are appointed at large.

Topography, Physiographic Features, and Climate

The topography in the region overall is subdued, although some dramatic effects have been produced by solution activity and ancient marine processes. Elevations range from at or near sea level in the coastal swamps, lowlands, and river valleys to over 200 feet above mean sea level (msl) in the Northern Highlands and Tallahassee Hills.

The Northern Highlands, considered to be the most distinct physiographic feature in north central Florida, include several subdivisions, one of which is the Tallahassee Hills. All the highlands appear to be disconnected remnants of a once-continuous residual highland (Yon 1966). The line of demarcation separating the Northern Highlands from the Gulf Coastal Lowlands is the Cody Scarp, termed the "most persistent topographic break in the state" by Puri and Vernon (1964). The Suwannee River is the only major stream that does not go underground crossing this transition zone. The Santa Fe and Alapaha re-emerge miles downstream, while smaller streams such as Rose Creek and Pareners Branch disappear into the Floridan aquifer system.

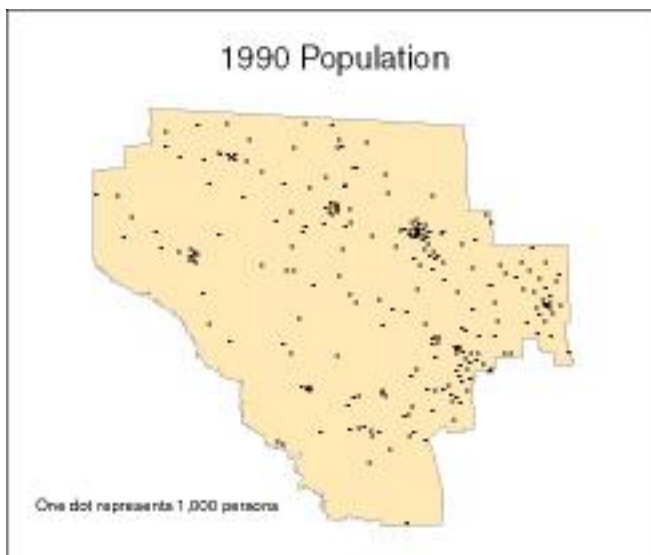
The Gulf Coastal Lowlands consist of a series of Pleistocene surfaces and shorelines with limestone at or near the land surface. Karstic topography produced by intense solution activity is prominent. Important remnant features in the Gulf Coastal Lowlands are the Bell and Brooksville ridges. Towards the east the Brooksville Ridge becomes a rolling plain with sinkholes. The western edge is probably bounded by a marine terrace scarp (White 1970). Bell Ridge, an outlier of the Brooksville Ridge, consists of two irregularly shaped ridges approximately 20 miles long with crests ranging from 80 to 100 feet above msl.

The Coastal Swamp consists of mud and silt over limestone and supports both freshwater swamp and salt marsh. The relative absence of sand barriers and beaches along the coastline is the result of a shallow, sloping sub-marine surface, lack of wave activity, and inadequate sand supply (Tanner 1960).

Remnant dunes, of either aeolian (wind-deposited) or marine origin, can be found inland from Cedar Key to Steinhatchee.

The climate of the region is humid subtropical. Average annual temperatures range from 68½F in Madison County to 72½F at Cedar Key in Levy County. During the winter, temperatures in the 40–50½F range are typical, although freezing temperatures associated with cold fronts are common. Precipitation throughout the district varies from 58 inches annually at Perry to 52 inches annually at Madison, with 50 percent of this amount falling during the summer months (June through September). Summer rainfall is associated with localized thunderstorm activity. In winter, fronts bring sweeping bands of rain and cooler temperatures. Frontal rains are usually more evenly distributed areally and are of longer duration than summer rainfall. Since evaporation and plant transpiration are significantly lower during the winter, these frontal rains are important for recharging groundwater.

Rainfall during spring and summer, although unevenly distributed, is normally sufficient for plant growth. However, spring and summer droughts of varying severity occur, but not in any predictable patterns. Dry conditions in the late 1970s and early 1980s, combined with improvements in irrigation technology, led to an increase in the use of center-pivot and other irrigation systems. Although demands on the Floridan aquifer system are greatest during drought, a period of record-low groundwater levels in 1990–1991 throughout most of the region did not cause any significant water shortages.



ST. JOHNS WATER MANAGEMENT DISTRICT

St. Johns River Water Management District is located in northeastern and east central Florida, extending south from the Georgia border to cover 12,400 square miles, almost 21 percent of the state's total area. Within its boundaries are the entire St. Johns and Nassau River basins, the Indian River Lagoon and Northern Coastal basins, and the Florida portion of the St. Marys basin. The district includes all or part of 19 counties and has a population of approximately 3.7 million, or 25 percent of the state's total.

It is a diverse region, with rural counties dominated by pine plantations in the Nassau and St. Marys river basins, major urban areas including Jacksonville and large portions of the Gainesville and Orlando metropolitan areas, and world-famous Atlantic coast beaches. It has the oldest continuously occupied European settlement in the U.S. and the first National Audubon Sanctuary; a major citrus-producing region and one of the largest cattle-producing areas in the nation; the largest stand of sand pine and the most biologically diverse estuary in North America (shared with the South Florida Water Management District).

This district contains the longest river in the state, over one-third of the state's lakes including the second largest, and 12 of the 20 exceeding 10 square miles, one of four National Estuary Programs, and numerous springs and spring runs, most notably Silver Springs with outflow among the largest in the world. Florida's most popular tourist attraction in the late 1800s was a steamship tour up the St. Johns and Ocklawaha rivers to Silver Springs.

In the 1960s, as part of construction of the Cross-Florida Barge Canal, the lower Ocklawaha was dammed and about 20 miles of the river were flooded, creating Rodman Reservoir. Upstream portions of the Ocklawaha had been channelized earlier in the century, and marshlands along the river and lakes in the Ocklawaha chain had been drained for farming. The district has purchased large tracts of these drained marshes, stopped the pumping of polluted water from farms and reflooded the fields. The marshes are returning and with them wintering waterfowl, wading birds, and other wildlife.

Major efforts are underway to restore Lake Apopka, one of the most polluted lakes in the state and the main headwater for the Ocklawaha river and chain of lakes. Removal of excess nutrients presently in the lake is being addressed through harvest of gizzard shad and construction of a marsh filtration system on former muck farmland. Direct discharges from sewage treatment plants and citrus processing plants have stopped.

For further reduction of nutrient inputs to Lake Apopka and restoration of its wetlands, funding has been provided by the Florida legislature and the federal Wetland Reserve Program for acquisition of the remaining muck farms. To encourage the return of game fish populations, native aquatic vegetation species that were originally in the lake are being planted in the shallow water near the shoreline. The plants provide food, protection from predators, and spawning sites for fish and other wildlife, and their root systems help stabilize the loose sediments on the lake bottom, improving water clarity.

As in the Ocklawaha basin, the upper St. Johns River floodplain was diked and drained. One of the largest wetland restoration projects in the world is repairing the resulting environmental damage. The Upper St. Johns River Basin (USJRB) Project is a cooperative effort with U.S. Army Corps of Engineers that encompasses 235 square miles and incorporates flood control, habitat, and water quality components, restoring 150,000 acres of floodplain wetlands.

The USJRB project also benefits the Indian River Lagoon (IRL) by reducing the amount of upper basin runoff diverted there. That runoff carries excess freshwater that changes the salinity of the lagoon, affecting animals such as oysters and clams, and delivers nutrients (nitrogen and phosphorus) that can cause the overgrowth of algae, resulting in the death of seagrasses. Protection and restoration of seagrass beds and reconnection of mangroves and marshes diked off from the lagoon for mosquito control are major IRL issues being addressed by the district.

Many restoration projects are made possible by the district's land acquisition program. Highest priority in the 1980s was given to purchase of the land needed for the upper basin project, where the most severe loss of floodplain had occurred. SJRWMD now owns property in all its major basins except Florida Ridge, most of which is in the Southwest Florida Water Management District. These lands are acquired for flood protection, water supply protection, water body preservation, restoration, and habitat protection. They provide the added benefit of public recreation, with 98 percent open to the public.

Joint purchases and management agreements with local governments and other agencies supplement funds available to the district. Less-than-fee acquisitions, or purchase of conservation easements, have been used to stretch those funds where the cost of the development rights is significantly less than the total purchase price of the land.

Passage of the Bluebelt Act by the 1996 Legislature recognized the importance of land owner agreements to refrain from developing significant recharge areas. The Floridan aquifer is SJRWMD's main source for public supply, and the district will delineate significant recharge areas for any of its counties willing to offer reduced tax assessments in exchange for their protection, as authorized by the act. Orange County was the first county in Florida to offer this opportunity to its residents.

In some parts of the district, use of the Floridan aquifer is limited because of poor quality. High chloride content generally occurs east of the St. Johns River where intensive agricultural, industrial, and urban uses as well as abandoned free-flowing wells have reduced groundwater supplies and contributed to saltwater contamination. In those areas the surficial aquifer is tapped as a potable water source, and in some cases blended with water from the Floridan. In addition, reverse osmosis is increasingly being used to provide drinking water.

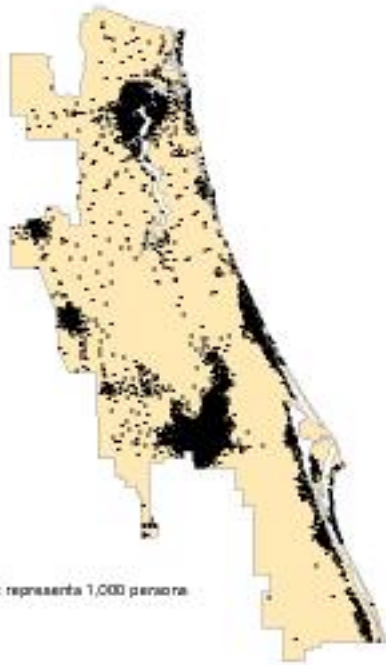
Physiographic Regions



Topography



1990 Population



One dot represents 1,000 persons

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

The Florida legislature created the Southwest Florida Water Management District (SWFWMD) in 1961 to be the local sponsor of the Four River Basins, Florida Project. The U.S. Army Corps of Engineers initiated this major flood control project after Hurricane Donna severely damaged southwest Florida in 1960. The project includes flood control structures and 6,000 square miles of water detention areas. SWFWMD continues to cooperate with the corps in maintaining and operating portions of this flood control system.

The district's responsibilities expanded in the mid to late 1960s when regulatory programs for regional wellfields serving the Tampa Bay metropolitan area were initiated, and again in 1972 when the Florida legislature passed the Water Resources Act. This act significantly furthered the transition from strictly flood control to a more broad-based policy of resource management and service to the public.

SWFWMD is governed by an 11-member board appointed by the governor and confirmed by the senate. Board members, who must live in the district, serve staggered four-year terms. The district's primary funding source is ad valorem taxes, although revenues are also derived from state and federal appropriations, permit fees, interest earnings, and other sources. The taxing capabilities of the district are established by the legislature within the limits set by the Florida Constitution. The limit for SWFWMD is one mill, or one dollar per thousand dollars of assessed value.

SWFWMD is further divided into nine hydrologic subdistricts, or basins, eight of which have separate basin boards. Activities within the Green Swamp Basin are the responsibility of the governing board. Members of the basin boards are also appointed by the governor, confirmed by the senate, and serve three-year terms. These boards identify water-related issues and problems in their basins, and provide programs and budgets to address these concerns. At present, SWFWMD is the only water management district with this form of basin system.

The one-mill taxing capability of the district is divided evenly between the governing board (0.5 mill) and the district's eight basin boards (0.5 mill).

SWFWMD includes all or part of 16 counties on the west-central coast of Florida, from Charlotte County on the south to Levy County on the north. It extends from the Gulf of Mexico east to Polk and Highlands counties. Several major and rapidly growing urban areas lie within this area, as does much of Florida's most productive agricultural lands (especially for citrus) and major phosphate areas. The region also contains the Green Swamp, headwaters for the Peace, Hillsborough, Withlacoochee, and Ocklawaha rivers, and many lakes, springs, and streams.

The significance of Tampa Bay, Sarasota Bay, and Charlotte Harbor estuaries has been recognized through the National Estuary Programs. These vital estuarine systems have also been designated as state priorities through the Surface Water Improvement and Management Program (SWIM). It is often along, and in, these very sensitive ecosystems that development pressure and

population growth have been most demanding and have had adverse environmental impacts.

Physiography and Topography

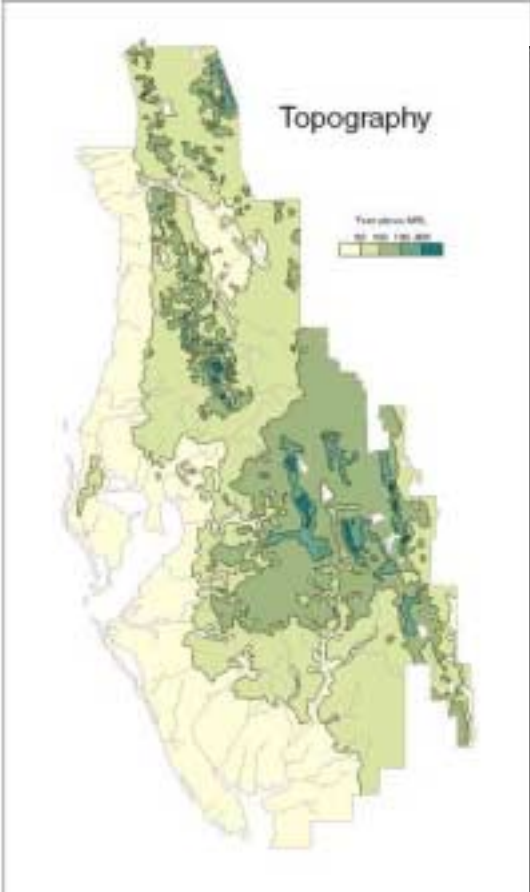
Land in the region ranges in elevation from sea level along the Gulf coast to more than 290 feet above mean sea level at several places along the Lake Wales Ridge. Higher elevations are associated in particular with three ridges, the Brooksville, Lakeland, and Lake Wales ridges, aligned with the Florida peninsula. The Polk Upland region has gently rolling, sometimes hilly, terrain. The Tsala-Apopka Plain is part of the Withlacoochee River valley. The Withlacoochee River originates in the Green Swamp and flows northward before turning west through the Dunnellon Gap.

The high sandy ridges are remnants of ancient sand dunes, the only portion of peninsular Florida not inundated in a series of advancing and receding ocean levels. This unique isolation created and supports ecosystems not found anywhere else in the world. The high sandy soils are also a high recharge area for the Floridan aquifer. In the northern part of the region, the Floridan rises close to, and is often exposed at, the surface. This exposed aquifer is the source of the several first-magnitude springs in Hernando and Citrus counties.

The Gulf Coastal Lowlands and the DeSoto Plain are flat areas with wetlands interspersed with pine-palmetto flatwoods. In the southern part of Southwest Florida, soils in these flat areas are typically acidic because of the dominant types of vegetation and the lack of underground drainage. Rivers in this area are characterized as “black water,” so called because the acidic soil causes a high tannic content (tea-colored water) in the surface water runoff.

The northern part of Southwest Florida has karst geology. In karst areas, water-soluble limestone below the earth’s surface may dissolve, causing the land surface to sink or collapse, and often, to fill with water. This condition, most common in the northern and eastern regions of the district, produces sinkholes. They can range from 20 feet in diameter to half a square mile or more.

Under karst conditions, surface water and groundwater are closely interrelated. Lake levels are often a direct reflection of groundwater levels; spring flow and seepage constitute the base flow of many streams; freshwater wetlands slow and store floodwaters and enhance infiltration to groundwater; and stream discharges to estuaries are critical for maintenance of salinity regimes. As development increases on the sandy ridges and karst areas of this region, so to has nutrient loading to the groundwater. This nutrient loading is thought to be a factor in increased algal blooms occurring in the northern coastal springs.



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

The 17,000-square-mile South Florida Water Management District encompasses all or portions of 16 counties. Forty percent of the population and 31 percent of the land area of the state are within its boundaries. The district contains two watersheds or drainage basins: the Big Cypress Basin (Collier County and part of Monroe County) and the larger Okeechobee Basin, which begins at the headwaters of the Kissimmee River and ends in Florida Bay.

In its natural state, South Florida can be described in one word—wet. Rainfall occurs at an annual average rate of about 54 inches; 67 percent of that amount, or about 36 inches, occurs between May and September. The combination of concentrated periods of rainfall and flat terrain produces a continually swampy, flooded condition throughout much of the region during the wet season, a subtropical characteristic which, for a long time, made South Florida a less-than-desirable spot for human settlement. Over the last 100 years or so the South Florida environment has been substantially modified to accommodate urban, residential, and agricultural development, often to the detriment of the remaining areas of subtropical wilderness.

The first large-scale regional drainage project in South Florida began in 1881, when Hamilton Disston bought 4 million acres of land from the state for twenty-five cents per acre. In 1882, a Lake Okeechobee outlet to the Gulf coast, via the Caloosahatchee River was completed. In the same year, Southport Canal was cut between Lake Tohopekaliga and Lake Cypress. The St. Cloud Canal, which connects Lake Tohopekaliga to East Lake Tohopekaliga, was completed next. By fall of 1883, Disston's company had drained land and opened navigation channels from the Kissimmee Lakes to the Gulf of Mexico.

Disston's land reclamation project revived the depressed railroad industry in Florida which, in turn, brought new settlement, new industry, and new growth. The region's development, however, proceeded in a very haphazard manner—a reflection of the variety of private interests trying to make a profit from South Florida. Funding to sustain large land reclamation projects became harder to acquire as the nineteenth century drew to a close, and drainage efforts by private business ended as well.

In 1907, the state legislature created the Everglades Drainage District. From 1913 to 1927, six major canals and several smaller waterways, 440 miles of levees, and 16 locks and dams were constructed. Hurricanes in 1926 and 1928 halted construction by the Everglades Drainage District, but gave rise to the Okeechobee Drainage District (1929). The Okeechobee district was created to prevent a recurrence of the flooding produced by wind tides on Lake Okeechobee and constructed floodway channels, control gates, and major levees along the lake's shores.

Droughts occurred between 1931 and 1945, bringing saltwater intrusion along the coasts and causing extensive fires in the muck soils of the Everglades. This period came to a dramatic end with the hurricane of 1947. In 1948, Congress authorized the Central and Southern Flood Control Project to provide flood

protection and adequate water supply, prevent saltwater intrusion, encourage agricultural and urban development, and preserve fish and wildlife. The Central and Southern Florida Flood Control District (CSFFCD) was established in 1949 by the Florida legislature to act as local sponsor for the federal project. The CSFFCD acquired lands for, and assumed operation and maintenance of, each section of the project as it was completed.

From 1949 through 1969, the U.S. Army Corps of Engineers and the CSFFCD built and operated the project works. At the same time, South Florida's population surged, and industrial and residential consumption became significant components, in addition to the existing agricultural demands, of water use within South Florida.

The National Environmental Protection Act, passed in 1969, requires the corps and the CSFFCD to consider damage to the environment when making management decisions. Growing concern for preservation of the environment prompted, in 1971, a Governor's conference on Florida's water management issues. The conference produced legislative action, the Water Resources Act of 1972, which broadens the authority and responsibility of the CSFFCD, and requires control and regulation of water supplies and their use. In 1976 the CSFFCD became the South Florida Water Management District (SFWMD), to reflect the changing scope of the district's responsibilities.

Excavation, construction of barriers, and other mechanical means to channel and retain water have been supplemented by the use of improved planning, operational, and regulatory processes to control human use of water. Recent efforts have focused on developing water management plans for four planning districts within the SFWMD and for Lake Okeechobee to address water supply, water quality, flood control, and enviTopography, Physiographic Features, and

Climate

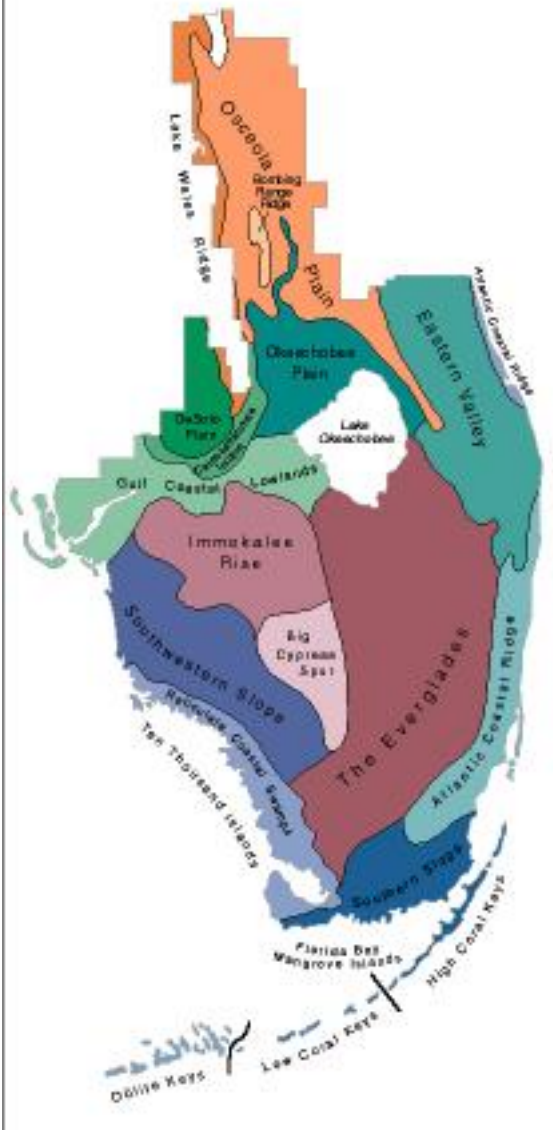
Nearly all the land in South Florida is less than 100 feet above mean sea level (msl). Land surface generally slopes from north to south. The coastal regions and most of the peninsula south of Lake Okeechobee are very flat and lie below 25 feet msl, except near Immokalee and parts of the Atlantic Coastal Ridge. North of Lake Okeechobee, the Lake Wales Ridge juts down the center of the peninsula and is mostly above the 100-foot contour. East of this ridge, the Okeechobee Plain rises from approximately 20 feet at the lake to 30 to 40 feet at the edge of the Osceola Plain, which rises in elevation from 60 feet to 90 feet.

Two major physiographic features, Lake Okeechobee and the Everglades, are discussed separately in this chapter. The Kissimmee River valley (also discussed separately) crosses the Osceola and Okeechobee plains and is a major source of surface water to Lake Okeechobee and the Everglades. Rainfall in the northern portion of the Osceola Plain recharges the Floridan aquifer. The Immokalee Rise provides recharge to the water table and sandstone aquifers in Lee and Collier counties. Water from the Atlantic Coastal Ridge and Everglades recharges the Biscayne aquifer in Dade and Broward counties and provides surface water flows to Florida Bay. The Big Cypress Swamp in eastern Collier and southern Hendry counties contributes primarily to surface-water flow to

coastal estuaries along the southwest coast of Collier County and Everglades National Park. The Florida Keys have no major source of freshwater except for rainfall and limited storage in the shallow aquifer of the larger islands. Coastal marshes and mangrove swamps, which are subject to tidal influx of saltwater, border the southern end of the peninsula.

South Florida, with its distinct wet and dry seasons, is the only savanna climate in the continental United States. Within this region, rainfall varies considerably. Average wet season (May 1–October 31) rainfall ranges from 46 inches near the southeast coast to 36 inches in the Kissimmee valley. Average dry season rainfall varies from 17 inches along the southeast coast to 10 inches on the southwest coast. The driest month is December, when average monthly rainfall ranges from less than 1.25 inches near Everglades City to 2.50 inches near West Palm Beach. The wettest month is September, when average rainfall ranges from 9.5 inches at West Palm Beach and Homestead to 6 inches near Okeechobee. The area occasionally experiences extended periods of below average rainfall, such as occurred during the drought of 1988–91. South Florida is also subject to tropical storms and hurricanes, which can produce significant amounts of rain. During such years, rainfall for the year can total over 80 inches.

Physiographic Regions



Population
1990



One dot represents 1,000 persons.