Climate of South Carolina

Introduction

This publication consists of a narrative that describes some of the principal climatic features and a number of climatological summaries for stations in various geographic regions of the State. The detailed information presented should be sufficient for general use; however, some users may require additional information.

The National Climatic Data Center (NCDC) located in Asheville, North Carolina is authorized to perform special services for other government agencies and for private clients at the expense of the requester. The amount charged in all cases is intended to solely defray the expenses incurred by the government in satisfying such specific requests to the best of its ability. It is essential that requesters furnish the NCDC with a precise statement describing the problem so that a mutual understanding of the specifications is reached.

Unpublished climatological summaries have been prepared for a wide variety of users to fit specific applications. These include wind and temperature studies at airports, heating and cooling degree day information for energy studies, and many others. Tabulations produced as by-products of major products often contain information useful for unrelated special problems.

The Means and Extremes of meteorological variables in the Climatography of the U.S. No.20 series are recorded by observers in the cooperative network. The Normals, Means and Extremes in the Local Climatological Data, annuals are computed from observations taken primarily at airports.

The editor of this publication expresses his thanks to those State Climatologists, who, over the years, have made significant and lasting contributions toward the development of this very useful series.

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Topographic Features- South Carolina is located on the southeastern coast of the United States between the southern slopes of the Appalachian Mountains and the Atlantic Ocean. Its north-south extent is 220 miles, from 32 to 35.2° North latitude. The mountains in the extreme northwest part of the State are 240 miles from the coastline. The coastline is 185 long and is oriented southwest to northeast.

South Carolina shares some common topographic features with several eastern seaboard states. All of these features have a southwest to northeast orientation and extend across the whole State. The Blue Ridge Range of the Appalachian Mountains lies in the northwestern part of the State. Elevations vary from 1,000 to 2,000 feet with several peaks going over 3,000 feet. Sassafras Mountain, at 3,560 feet elevation, is the highest point in the State. The Mountain Region covers less than 10 percent of the State's area and to its southeast lies the Piedmont Plateau. The Plateau extends nearly to the center of the State with elevations decreasing northwest to southeast from 1,000 to 500 feet. There is a narrow hilly region where the Plateau descends to the Coastal Plain. In South Carolina this "fall line" region is known as the "Sand Hills"; elevations range from 500 to 200 feet. The width of the Sand Hills area is about 30 to 40 miles. Between the Sand Hills and the Atlantic Ocean lies the Coastal Plain. The Plain is broad and nearly level with elevations mostly between 200 and 50 feet. About 40 percent of the area of the State lies in the Coastal Plain.

All of the State's rivers drain southeast from the Mountain Region or Piedmont Plateau toward the ocean. There are three major and one minor river-basin systems. The Santee is the largest and drains the entire center portion of the State. The Savannah drains the western part of the State. Both of these systems extend all the way from the mountains to the ocean. The third major system is the Pee Dee, located in the northeastern section. Its tributaries drain parts of the Piedmont area of South Carolina and North Carolina. The Ashley-Cooper-Combahee-Edisto system comprises the short rivers lying between the Santee and Savannah. They drain a part of the Piedmont Plateau in western South Carolina known as the "ridge" and a part of the Sand Hills. Several large lakes and reservoirs have been created by damming the major rivers, mostly in the Plateau area. In addition to the large hydroelectric power plants located at these dam sites, nuclear power plants have been constructed on the Keowee River near the edge of the Mountain Region, on the Broad River in Fairfield County, on the Catawba River in York County and at Lake Robinson on the Black Creek in Darlington County.

The major coast indentations are Winyah Bay, Charleston Harbor, St. Helena Sound, Port Royal Sound and Tybee Roads at the mouth of the Savannah River. There are many low Sea Islands separated from the mainland by shallow straits, sounds and coastal streams. The Intracoastal Waterway can be found along much of the coastline.

Several factors combine to give South Carolina a pleasant, mild and humid climate. It is located at relatively low latitude (32 to 35° North) and most of the State is less than 1,000 feet in

elevation. The warm Gulf Stream current moves along the long coastline. The mountains to the north and west block or delay many cold air masses approaching from those directions. Even the deep cold air masses which cross the mountains rapidly are warmed somewhat as the air is heated by compression when it descends on the southeastern side. It is convenient for climatic discussion to divide the State into areas coinciding closely with the topographic features already discussed. Six areas can be defined, each of which is closely associated with the temperature and rainfall patterns:

The Outer Coastal Plain, elevations 0 - 50 feet, width 25 - 30 miles.

The Inner Coastal Plain, elevations 51 - 200 feet, width 40 - 45 miles.

The Sand Hills, elevations 201 - 500 feet, width 30 - 40 miles.

The Lower Piedmont Plateau, elevations 501 - 700 feet, width 45 - 50 miles.

The Upper Piedmont Plateau, elevations 701 - 1,000 feet, width 30 miles.

The Mountain Region, elevations greater than 1,000 feet, width 15 miles.

Temperature- Some factors affecting temperatures are elevation, latitude and distance inland from the coast. All three of these work together in South Carolina. Lower temperatures can be expected in the Upper Piedmont and Mountain Regions, where latitude, elevation and distance inland all have large values. Higher temperatures are found along the southern coast. Annual average temperatures are almost 10 degrees lower in the extreme Upper Piedmont than along the coast between Charleston and Savannah. Except for small-scale and local irregularities, there is a gradual decrease in annual average temperature northwestward from 67 at the coast to 58° F at the edge of the mountains. Within the Mountain Region, variations are great over short horizontal distances. Thus, variations in temperature are due almost entirely to elevation differences. Low temperatures are common in the Mountain Region or extreme Upper Piedmont during the winter. The lowest on record is -19° F at Caesars Head January 21, 1985. The air over the coastal water is cooler than the air over the land in summer and warmer than the air over land in winter and this has a modifying effect on the temperatures near the coast. Maximum summer temperatures of 111° F have been reached a few times at inland locations for the State record. Maximum temperatures in summer are reduced slightly in areas where afternoon cloudiness and rain are persistent. Such an area is found along the Outer Coastal Plain where sea breezes produce clouds and rain during the day, but dissipate at night. Another effect is the drainage of cold air, mostly October - April, into some of the river valleys causing low temperatures to be several degrees colder than they would be otherwise. One example of this takes place in a rather deep section of the Broad River valley from Lockhart to just north of Columbia.

The growing season for most crops is limited by the fall and spring freezes. The freeze-free period, the time elapsing between the last temperature of 32° F in the spring and the first in the fall, is quite important to agriculture. The average length of the freeze-free period varies from about 200 days in the coldest area to about 280 days along the south coast, but in the area where

most of the major crops are grown it is from 210 to 235 days. The average date of the last freezing temperature in spring ranges from early March in the south to the first of April in the north. The fall dates range from late October in the north to late November in the south. Freezes have occurred as much as four weeks later than the average date in spring and three weeks earlier than the average date in the fall. The minimum temperature is 32° F or less on 50 to 70 days in the Upper Piedmont and 10 days near the coast. Counties in the Inner Coastal Plain and the Sand Hills area have maximum temperatures of 90° F or more on about 80 days. There are 30 such days along the coast and 10 to 30 in the mountains.

Summers are rather hot and air conditioning is desirable at elevations below 500 feet. Fall and spring are mild, but winters are rather cool at elevations above 500 feet. Heating of homes and businesses, in varying amounts, is necessary in all parts of the State.

Precipitation- Rainfall is adequate in all parts of the State. Annual rainfall averages up to 80 inches in the highest elevations of the Mountain Region to less than 45 inches in parts of the Inner Coastal Plain and the Sand Hills. The Mountain Region receives amounts 56 inches or more, the Upper Piedmont has 47 to 55 inches, the Lower Piedmont averages 45 to 48 inches, the Outer Coastal Plain is relatively wet with amounts of 46 to 53 inches, while the Inner Coastal plain receives 44 to 49 inches. The Sand Hills area is a relatively wet strip with a small dry area imbedded in it a few miles south of Columbia. The immediate south coast is also on the dry side. In winter (December - February), rainfall decreases from six to seven inches per month in the mountains to three or 3½ inches along the coast. In summer (June - August), there is a maximum of six to eight inches per month along the Outer Coastal Plain, less in the Inner Coastal Plain, a maximum again of five to seven inches in the Sand Hills, only 3½ to 4½ inches per month in the Lower Piedmont, while the Upper Piedmont and Mountain Regions receive four to seven inches per month. In September and early October, the northeast coast gets some additional rain from occasional tropical systems, but fall is actually a dry season with amounts decreasing to less than two inches along the south coast by November. March is a month of heavy rain in all parts of the State ranging from four inches in the Coastal Plain to 7½ inches in the Mountain Region. The pattern of a dry Lower Piedmont and a wet Sand Hills begins to appear in April and continues into May at which time the sea breeze maximum in the Outer Coastal Plain begins to appear. This arrangement persists through the summer and begins to break down in early October. May is the driest month in the spring with less than 3½ inches everywhere except the mountains. Rainfall increases gradually and reaches a peak in March when cyclone and cold front activity are a maximum. There is a general decrease again to a dry period from late April through early June. From the latter part of June through early September is a wet period primarily due to thunderstorm and shower activity, which reaches its peak in July, the wettest summer month. The maximum rainfall stretches a little into the fall along the coast due to occasional tropical activity.

Solid forms of precipitation include snow, sleet and hail. Hail is not too frequent, but does occur with thunderstorms especially from March through early May. These thunderstorms usually accompany squall lines or cold fronts. Snow and sleet may occur separately or together or mixed with rain during the winter months. Snow may fall from one to three times in winter. Seldom do accumulations remain on the ground except in the mountains. Statewide snows of significant amounts occur when a cyclonic storm moves northeastward along or just off the coast. Intense

storms of this type can bring record snowfall to the Sand Hills and the southern edge of the Lower Piedmont. Freezing rain occurs from one to three times per winter in the northern half of the State. This rain, which freezes on contact with the ground and other objects, can cause hazardous driving conditions, breakage of limbs, treetops and various types of wires, including the poles on which they are strung. Timber losses can be heavy and power and telephone service seriously disrupted over a large area during such storms.

Major drought occurs about once in 15 to 30 years with less serious severe and less widespread droughts about once in seven or eight years. Droughts associated with La Niña over multiple years occurred in the 1950s and in the late 1990s and early 2000s. Two extreme droughts of shorter duration and associated with El Niño occurred in 1925 and 1986. Irrigation is used for most of the truck vegetable crops and tobacco, as well as, by the major peach growers. The field crops of corn, cotton, soybeans and others are largely non-irrigated and dry weather takes a heavy toll when it extends over several weeks during the growing season.

The percent of possible sunshine received varies over the State in a way similar to the variation in cloudiness and precipitation. Values in winter range from 50 to 60 percent, in summer from 60 to 70, with the dry periods in spring and fall receiving 70 to 75 percent. The variation in relative humidity with time of day is considerably greater than day to day and month to month variations. Highest values of 80 to 90 percent or more are reached about sunrise and the lowest values of 45 to 50 percent occur an hour or two after local noon. There is about a 10 percent difference between winter and summer, with summer having the higher humidity. The prevailing surface winds tend to be either from northeast or southwest due to the presence and orientation of the Appalachian Mountains. Winds of all directions occur throughout the State during the year, but the prevailing directions by seasons are spring-southwest, summer-south and southwest, autumn-northeast, and in winter-northeast and southwest have almost the same frequency. Average surface wind speeds for all months range between six and 10 mph. Prevailing winds at levels above the mountain effect are between southwest and northwest in the winter and spring, from south to southwest in summer, and from southwest to west in autumn.

Severe weather comes to South Carolina occasionally in the form of violent thunderstorms, tornadoes and hurricanes. Although thunderstorms are common in the summer months, the violent ones generally accompany the squall lines and active cold fronts of spring. In addition to lightning, thunderstorms can bring high wind, hail and sometimes spawn a tornado. Most tornadoes occur from March through June, with April being the peak month. A smaller maximum is found in August and September. Many are waterspouts or tornadoes that accompany tropical systems and are detected near the coast with some never reaching land. Tropical storms or hurricanes affect the State about one year out of two. Most of the tropical storms do little damage and frequently bring rains at a time when they are needed. Most of the hurricanes affect only the Outer Coastal Plain. If they do come inland, they usually decrease in intensity quite rapidly. Considerable flooding accompanies hurricanes, which come very far inland, and high tides, which occur along the coast to the north and east of the storm centers.

Minor flooding occurs somewhere in the State every year. It can occur on any of the many streams and rivers. A certain amount of control can be affected on the larger rivers that have dams. A major flood occurs about once every seven or eight years. They are not generally a

threat to human life but are very damaging to crops and livestock. They also disrupt logging operations and damage homes, stores and other structures.

Climate and the Economy- Agriculture continues to be important, but its role in the State's economy has declined as manufacturing and service industries increase. Since the 1940s, the number of farms in the State has decreased by approximately 85 percent, and the State's land area used in agriculture has decreased from one-half to one-fourth. Textiles remain the State's leading industry in spite of severe foreign competition. Other major industries include wearing apparel, paper, machinery and chemicals. Foreign capital investment has brought additional industries to the Plateau section. Important crops are tobacco, corn, soybeans, peaches, truck crops and small grains, but cotton has declined. Livestock and poultry production have taken a more prominent role in the agricultural economy. There are many wooded areas and lumbering is an important activity. The coastal commercial seafood industry includes shrimp, crabs and oysters. The port of Charleston is very important in shipping the State's products abroad and bringing in needed items from other countries. The State is naturally suited to many kinds of recreational activities with its beautiful beaches along the coast, abundant streams, rivers, lakes and forests in the interior, and mountains in the northwest. Parks and recreation areas have always been ample and are now being increased in number and improved. About the only kinds of recreation not available are those that require ice or snow; however, one has only to travel relatively short distances to reach the winter sports areas in the Appalachian Mountains.