Climate of New Jersey

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Unpublished climatological summaries have been prepared for a wide variety of users to fit specific applications.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.

State and Station Normals are available at:
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Climate of New Jersey

Topographic Features- New Jersey is located about halfway between the Equator and the North Pole, on the eastern coast of the United States. Its geographic location results in the State being influenced by wet, dry, hot and cold airstreams. This makes for daily weather that is highly variable.

The dominant feature of the atmospheric circulation over North America, including New Jersey, is the broad, undulating flow from west to east across the middle latitudes of the continent. These "prevailing westerlies" shift north and south and vary in strength during the course of the year, exerting a major influence on the weather throughout the State.

“The Garden State” is 166 miles long from north to south, and its greatest width is about 65 miles for a total land area of 7,836 square miles. While New Jersey is one of the smallest states in the Union, there is a marked difference in climate between Cape May in the south and the Kittatinny Mountains of northwestern New Jersey. The geology, distance from the Atlantic Ocean and prevailing atmospheric flow patterns produce distinct variations in the daily weather between each of the five regions (Northern, Central, Pine Barrens, Southwest and Coastal) found in the State. The regions are described below:

The **Northern Zone** covers about one-quarter of New Jersey and consists mainly of elevated highlands and valleys which are part of the Appalachian Uplands. Surrounded by land, this region can be characterized as having a continental type of climate with minimal influence from the Atlantic Ocean, except when the winds contain an easterly component. Prevailing winds are from the southwest in summer and from the northwest in winter.

A storm track extending from the heart of the Mississippi Valley, over the Great Lakes and along the St. Lawrence Valley is a major source of precipitation for this region. Coastal storms, with precipitation shields that reach well enough inland add to the precipitation totals.

The highlands and mountains in this area play a role in making the climate of the Northern Zone different from the rest of the State. Clouds and precipitation are enhanced by orographic effects. For instance, following a cold frontal passage, air forced to rise over the mountains, produces clouds, and even precipitation, while the rest of the State observes clear skies. The latter is due in part to subsiding air flowing off the highlands.

During the warm season, thunderstorms are responsible for most of the rainfall. Cyclones and frontal passages are less frequent during this time. Thunderstorms spawned in north and west in the states of Pennsylvania and New York often move into northern New Jersey, where they often reach maximum development in the evening. This region has about twice as many thunderstorms as the coastal zone, where the nearby ocean helps stabilize the atmosphere.

The **Central Zone** has a northeast to southwest orientation, running from New York Harbor and the Lower Hudson River to the great bend of the Delaware River in the vicinity of Trenton. This region has many urban locations with large amounts of pollutants produced by the high volume of automobile traffic and industrial processes. The concentration of buildings and paved surfaces serve to retain more heat, thereby affecting the local temperatures. Because of the asphalt, brick and concrete, the observed nighttime temperatures in heavily developed parts of the zone are regularly warmer than surrounding suburban and rural areas. This phenomenon is often referred to as a "heat island".

The northern edge of the Central Zone is often the boundary between freezing and non-freezing precipitation during wintertime. In summer, the northern reaches often mark the boundary between comfortable and uncomfortable sleeping conditions.

The name **Pine Barrens** is derived from the scrub pine and oak forests that dominate the interior southern portion of New Jersey. Sandy soils, which are porous and not very fertile, have a major effect on the climate of this region. On clear nights, solar radiation absorbed during the day is quickly radiated back into space, resulting in surprisingly low minimum temperatures. Atlantic City Airport, which is surrounded by sandy soil, can be 15 to 20 degrees Fahrenheit (° F) cooler than the Atlantic City Marina on the bay, which is only about 13 miles away.

The porous soil permits any precipitation to rapidly infiltrate and leave surfaces quite dry. Drier conditions allow for a wider range between the daily maximum and minimum temperatures, and make the area vulnerable to forest fires.

The **Southwest Zone** lies between sea level and approximately 100 feet above sea level. The close proximity to Delaware Bay adds a maritime influence to the climate of this region. The Southwest has the highest average daily temperatures in the State and without sandy soils, tends to have higher nighttime minimum temperatures than in the neighboring Pine Barrens.

This region receives less precipitation than the Northern and Central regions of the State as there are no orographic features and, it is farther away from the Great Lakes-St. Lawrence storm track. It is also far enough inland to be away from the heavier rains from some coastal storms, thus it receives less precipitation than the Coastal Zone.

Prevailing winds are from the southwest, except in winter when west to northwest winds dominate. High humidity and moderate temperatures prevail when winds flow from the south or east. The moderating effect of the water also allows for a longer growing season. Autumn frosts usually occur about four weeks later here than in the high country in the northern part of the State and the last spring frosts are about four weeks earlier, giving this region the longest growing season in New Jersey.

In the **Coastal Zone**, continental and oceanic influences battle for dominance on daily to weekly bases. In autumn and early winter, when the ocean is warmer than the land surface, the Coastal Zone will experience warmer temperatures than interior regions of the State. In the spring months, ocean breezes keep temperatures along the coast cooler. Being adjacent to the Atlantic

Ocean, with its high heat capacity (compared to land), seasonal temperature fluctuations tend to be more gradual and less prone to extremes.

Sea breezes play a major role in the coastal climate. When the land is warmed by the sun, heated air rises, allowing cooler air at the ocean surface to spread inland. Sea breezes often penetrate five to10 miles inland, but under more favorable conditions, can affect locations 25 to 40 miles inland. They are most common in spring and summer.

Coastal storms, often characterized as "Nor'easters", are most frequent between October and April. These storms track over the coastal plain or up to several hundred miles offshore, bringing strong winds and heavy rains. Rarely does a winter go by without at least one significant coastal storm and some years see upwards of five to 10. Tropical systems are also a special concern along the coast. In some years, they contribute a significant amount to the precipitation totals of the region. Damage during times of high tide can be severe when tropical systems or Nor'easters affect the region.

Some general observations about New Jersey temperatures and precipitation include:

Temperature- Differences between the northern and southern parts of the State are greatest in the winter and least in summer. All stations except for the highest peaks in northwestern portion of the State have registered readings of 100° F or higher. All stations have records of 0 or lower.

Being in the northernmost portion of the State, and with small mountains up to 1,800 feet in elevation, the Northern Zone normally exhibits a colder temperature regime than other climate regions of the State. This difference is most dramatic in winter when average temperatures in the Northern Zone can be more than 10 degrees cooler than in the Coastal Zone.

Average number of freeze-free days in the northern highlands is 163. The central and southern interior has 179 freeze-free days. Meanwhile, an average of 217 such days are found along the seacoast.

The Northern Climate Zone usually has the shortest growing season, about 155 days. The average date for the last killing spring frost is May 4. The first frost in fall is around October 7. The exact dates vary within the region as well as from year to year. Some valley locations have observed killing frost in mid-September and as late as mid-June.

Areas to the south of the Central Zone tend to have nearly twice as many days with temperatures above 90° F than the 15 to 20 commonly observed in central New Jersey.

Precipitation- Average annual precipitation ranges from about 40 inches along the southeast coast to 51 inches in north-central parts of the State. Many areas average between 43 and 47 inches.

Measurable precipitation falls on approximately 120 days annually. Fall months are usually the driest with an average of eight days (per month) with measurable precipitation. Other seasons average between nine and 12 days per month with measurable precipitation.

Snow may fall from about October 15 to April 30 in the highlands and from about November 15 to April 15 in southern counties. Annual snowfall averages 40 to 50 inches in the northern zone as compared with an average of 10 to 15 inches in the extreme south.

Most areas receive 25 to 30 thunderstorms per year, with fewer storms near the coast than farther inland. Approximately three tornadoes occur each year, and in general, they tend to be weak.

Climate and the Economy- The climate of New Jersey is a great asset to the State. A variety of crops can be grown and these find ready markets in nearby cities such as Philadelphia and New York. Many types of fruit are grown within the State including blueberries and cranberries.

Its location along the heavily populated "Megalopolis", make it a heavily visited state. On annual basis, tourists annually spend at least $17 billion in New Jersey. More than 350,000 jobs depend on tourism and related industries. Most visitors are attracted by the state's ocean resorts which include Cape May, Atlantic City and Wildwood. Atlantic City, bolstered by its large casinos, averages 30 million visitors annually.

Many travelers also are lured by the mountains, lakes and scenic areas including the Delaware Water Gap and the Pine Barrens. New Jersey has 36 state parks.

Acknowledgments and Further Information

This narrative borrows liberally from David Ludlum's *New Jersey Weather Book*, Rutgers University Press, New Brunswick, New Jersey, 1983. It also includes information from *Climate of New Jersey*, by the National Climatic Center, Asheville, North Carolina, June 1982.

Each of these sources, plus NJ Climate Publications provide a considerable amount of information on New Jersey's climate. For more data see the NJ Climate Data Page.
http://climate.rutgers.edu/stateclim_v1/njclimdata.html