

# Climate of Pennsylvania

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Unpublished climatological summaries have been prepared for a wide variety of users to fit specific applications.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

<http://www5.ncdc.noaa.gov/cgi-bin/climatenormals/climatenormals.pl>

**Visit our Web Site for other weather data:** [www.ncdc.noaa.gov](http://www.ncdc.noaa.gov)

Non-Subscription Request:  
Climate Services Branch  
National Climatic Data Center  
151 Patton Avenue  
Asheville, North Carolina 28801-5001  
Telephone: 828-271-4800  
Facsimile: 828-271-4876  
E-mail: [ncdc.orders@noaa.gov](mailto:ncdc.orders@noaa.gov)  
TDD: 828-271-4010

Hard Copy Subscription Request:  
NCDC Subscribing Service Center  
310 State Route 956  
Building 300  
Rocket Center, West Virginia 26726  
Toll-Free Telephone:  
866-742-3322

## **Climate of Pennsylvania**

Topographic Features- The erratic course of the Delaware River is the only natural boundary of Pennsylvania. All others are arbitrary boundaries that do not conform to physical features. Notable contrasts in topography, climate and soils exist. Within this, 45,126 square mile area lies a great variety of physical landforms of which the most notable is the Appalachian Mountain system composed of two ranges; the Blue Ridge and the Allegheny. These mountains divide the Commonwealth into three major topographical sections. In addition, two plains areas of relatively small size also exist, one in the southeast and the other in the northwest.

In the extreme southeast is the Coastal Plain situated along the Delaware River and covering an area 50 miles long and 10 miles wide. The land is low, flat and poorly drained. It was modified for industrial and commercial use due to its proximity to ocean transportation via the Delaware River. Philadelphia lies almost in the center of this area.

Bordering the Coastal Plain and extending 60 to 80 miles northwest to the Blue Ridge is the Piedmont Plateau, with elevations ranging from 100 to 500 feet and including rolling or undulating uplands, low hills, fertile valleys and well-drained soils.

The Southeastern Coastal Plain and Piedmont Plateau can experience long summers that are at times uncomfortably hot. Daily temperatures reach 90 degrees Fahrenheit (° F) on an average of 25 days during the summer season; however readings of 100° F or above are comparatively rare. From about July 1 to the mid-September, this area has uncomfortably warm periods, four to seven days in length, during which light wind movement and high relative humidity make conditions oppressive. In general, the winters are comparatively mild. On average, less than 100 days have minimum temperatures below the freezing point. Temperatures 0° F or lower occur at Philadelphia International Airport an average of one winter in two. Meanwhile, Harrisburg Airport averages one such day per year.

Average annual precipitation in the area ranges from about 37 inches in the lower Susquehanna Valley to about 46 inches in Chester County. Under the influence of an occasional severe coastal storm, a normal month's rainfall, or more, may occur within a period of 48 hours. The average seasonal snowfall is about 30 inches, and fields are ordinarily snow covered about one-third of the time during the winter.

Just northwest of the Piedmont and between the Blue Ridge and Allegheny Mountains is the Ridge and Valley Region, in which forested ridges alternate with fertile and extensively farmed valleys. The Ridge and Valley Province is 80 to 100 miles wide and is characterized by parallel ridges and valleys orientated northeast-southwest. The mountain ridges vary from 1,300 to 1,600 feet above sea level, with local relief of 600 to 700 feet.

The Ridge and Valley Province does not have a true mountain type of climate, but it does have many of the characteristics of such a climate. The mountain-and-valley influence on the air movements causes somewhat greater temperature extremes than are experienced in the southeast part of the State where the modifying coastal and Chesapeake Bay influence hold them relatively constant, and the daily range of temperature increases somewhat under the valley influences.

The effects of nocturnal radiation in the valleys and the tendency for cool air masses to flow down them at night result in a shortening of the growing season by causing freezes later in the spring and earlier than the fall than would otherwise occur. The growing (freeze-free) season in this section is longest in the middle Susquehanna Valley where it averages about 170 days, and shortest in Schuylkill and Carbon Counties, averaging less than 130 days.

The annual precipitation in this area has a mean value of three to four inches more than in the southeastern part of the State, but its geographic distribution is less uniform. The mountain ridges are high enough to have some deflecting influence on the general storm winds, while summer showers and thunderstorms are often shunted up the valleys.

Seasonal snowfall of the Ridge and Valley Province varies considerably within short distances. It is greatest in Somerset County, averaging 88 inches in the vicinity of Somerset, and least in Huntingdon, Mifflin and Juniata Counties, averaging about 37 inches.

North and west of the Ridge and Valley Region and extending to the New York and Ohio borders is the area known as the Allegheny Plateau. This is the largest natural division of the State and occupies more than half the area. It is crossed by many narrow valleys and is drained by the: Delaware, Susquehanna, Allegheny and Monongahela river systems. Elevations are generally 1,000 to 2,000 feet; however, some mountain peaks extend to 3,000 feet.

The Allegheny Plateau has a continental type of climate, with changeable temperatures and more frequent precipitation than other parts of the State. In the more northerly sections, the influence of latitude, together with higher elevation and radiation conditions, serve to make this the coldest area of Pennsylvania. Occasionally, winter minimum temperatures are severe. The daily range is fairly large, averaging 20° F in mid-winter and 26 degrees in midsummer. In the southern counties, the daily range is a few degrees higher and the same may be said of the normal annual range. Because of the rugged topography, the free-free season is variable, ranging from a few as 100 days in the north to 175 days in the south.

Annual precipitation has a mean of about 41 inches, ranging from less than 35 in parts of Tioga and Bradford counties to more than 45 in parts of Crawford, Warren and Wayne counties. The seasonal snowfall averages 54 inches in northern areas, while southern sections receive several inches less. Fields are normally snow covered three-fourths of the time during the winter. Although average annual precipitation is about equal to that for the State as a whole, it usually occurs in smaller amounts at more frequent intervals; 24-hour rains exceeding 2.50 inches are comparatively rare.

Bordering Lake Erie is a narrow 40-mile strip of flat, rich land three to four miles wide called the Lake Erie Plain. This region has a unique and agriculturally advantageous climate typical of the

coastal areas surrounding much of the Great Lakes. Both in spring and autumn the lake water exerts a retarding influence on the temperature regime and the freeze-free season is extended about 45 days. In the autumn, this prevents early freezing temperatures, which is a critical factor in the growing of fruit and vegetables.

Annual precipitation totals about 42 inches, which is fairly evenly distributed throughout the year. Snowfall exceeds 72 inches per year, on average, with heavy snows sometimes experienced late in April.

Eastern and central Pennsylvania drain into the Atlantic Ocean, while the western portion of the State lies in the Ohio River Basin, except for the Lake Erie Plain which is drained by a number of small streams into Lake Erie. The Delaware River drains the eastern portion and flows into Delaware Bay. The Susquehanna River drains the central portion and flows into Chesapeake Bay. In the western portion, the Allegheny and the Monongahela rivers have their confluence at Pittsburgh to form the Ohio River.

Floods may occur during any month of the year in Pennsylvania, although they do occur with greater frequency in March and April. The floods may result from heavy rains during any season. Generally, the most widespread flooding occurs during the winter and spring when associated with heavy rains, or heavy rains combined with snowmelt. Serious local flooding sometimes results from ice jams during the spring thaw. Heavy local thunderstorm rains cause severe flash flooding in many areas. Tropical systems or their remnants occasionally produce flooding rains, especially in the eastern portion of the State. Floods may be expected at least once a year. However, floods of notable severity and magnitude occur about one year in eight.

Pennsylvania is generally considered to have a humid continental type of climate, but the varied physiographic features have a marked effect on the weather and climate of the various sections within the State. The prevailing westerly winds carry most of the weather disturbances that affect Pennsylvania from the interior of the continent, so that the Atlantic Ocean has only a limited influence upon the State's climate. Coastal storms do, at times, affect the day-to-day weather, especially in eastern sections.

Temperatures- Across the State, temperatures generally remain between zero and 100° F and average from near 47 in the north-central mountains to 57° F annually in the extreme southeast. The highest temperature of record, 111° F, was observed in Phoenixville on July 9 and 10, 1936, while the record low of -42° F occurred at Smethport on January 5, 1904.

Summers are generally warm, averaging about 70 along Lake Erie to 75° F in southeastern counties. High temperatures, 90° F or above, occur on an average of 10 to 20 days per year in most sections; but occasionally southeastern localities may experience a season with as many as 30 such days, while the extreme northwest averages as few as four such days. There are places such as adjacent to Lake Erie and at higher elevations where readings of 100° F have never been reached. Daily temperatures during the warm season usually have a range of about 20° F over much of the State, while the daily range in winter is several degrees less. During the coldest months, temperatures average near freezing with daily minimum sometimes 0° F or lower. Freezing temperatures occur on the average 100 or more days annually with the greatest number

of occurrences in the mountainous regions. At a few sites, freezing temperatures have occurred during all months of the year and below 0° F readings from November to April, inclusive.

Precipitation- Precipitation is fairly evenly distributed throughout the year. Annual amounts generally range between 35 and 54 inches, while the majority of places receive 38 to 46 inches. Greatest amounts usually occur in spring and summer months, while February is the driest month, having about two inches less than the wettest months. Precipitation tends to be somewhat greater in eastern sections due primarily to coastal storms which occasionally frequent the area. During the warm season, these storms bring heavy rain, while in the winter they are accompanied by heavy snow and/or rain. Thunderstorms, which average between 30 and 35 occurrences per year, are concentrated in the warm months and are responsible for most of the summertime rainfall, which averages from 11 inches in the northwest to 13 inches in the east. Occasionally dry spells develop and persist for several months during which time monthly precipitation may total less than a quarter inch. These periods rarely affect the entire State at the same time, nor are they confined to any particular season of the year. Winter precipitation is usually three to four inches less than summer rainfall and is produced most frequently from northeastward-moving storms. When temperatures are low enough, these storms cause heavy snowfalls which may be 20 inches or greater. Annual snowfall ranges widely from year to year and from place to place. The snowfall in some years is quite variable averaging less than 10 inches across the State while other years may see total falls of over 100 inches in northern and/or mountainous areas. Annual snowfall averages from about 20 inches in the extreme southeast to over 100 inches in parts of Erie County several miles inland from the Lake Erie. Measurable snow generally occurs between November 20 and March 15, although snow has been observed as early as early October and as late as late May, especially in the northern counties. Greatest monthly amounts usually fall in December and January; however, greatest amounts from individual storms generally occur in March as the moisture supply increases with the annual rise of temperature.

Sometimes tropical systems or their remnants affect the State. Damages as a result of hurricane winds are rare and are usually confined to extreme eastern portions. However, nature's most violent storms, tornadoes, occur about 10 times annually in Pennsylvania. June is the month with the highest frequency, followed by July and August. Principal areas of tornado concentration are in the extreme northwest, the Southwest Plateau and the Southeastern Piedmont. Many of the tornadoes Pennsylvania has experienced have caused relatively minor damages. However, several have claimed lives and dealt severe economic setbacks. The most destructive activity occurred on May 31, 1985 when 65 people were killed by a total of 21 tornadoes. There were 707 people injured, over 1,000 homes destroyed and \$380 million (1985 figure) in damage. A rare F-5, the strongest tornado, nearly leveled the town of Wheatland in Mercer County. It is the only F-5 observed in the State and is one of the most powerful tornadoes ever observed east of the Mississippi River.

Climate and the Economy- The Piedmont area's hilly terrain combined with the prevailing climate have aided this area in becoming the leading agricultural section of the State. Good pastures, productive land and short distance to markets resulted in dairying becoming one of the leading agricultural activities. Another activity is the growing of fruit, primarily apples and peaches. Gentle hillside slopes provide an excellent place for fruit trees, as the cold air drainage

helps to prevent unseasonable freezing temperatures on these slightly elevated lands. The area has many orchards. The climate and soils in the Lancaster County area are especially well-suited for the growing of cigar leaf tobacco. This area led the Nation in production of cigar leaf tobacco. The Ridge and Valley section has led to a well-developed canning industry, which is concentrated in the middle Susquehanna Valley. Meanwhile, the Lake Erie Plain's fine alluvial soils and favorable climate permit intensive vegetable and fruit cultivation, which is typical of the much larger area surrounding Lake Erie.

The Allegheny Plateau is heavily wooded and among the most rugged in the State. Numerous lakes and swamps characterize this once glaciated area, creating a very picturesque landscape; this is particularly outstanding in the more northerly counties. The combination of lakes and forests at elevations high enough to keep summer temperatures comfortable and its location close to heavily populated cities have made the Pocono Mountain area a leading tourist and recreational center.