

# Climate of Arizona

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Unpublished climatological summaries have been prepared for a wide variety of users to fit specific applications.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

Topographic Features- Arizona covers 113,909 square miles, with about 350 square miles of water surface. The State has three main topographical areas: (1) a high plateau averaging between 5,000 and 7,000 feet in elevation in the northeast; (2) a mountainous region oriented southeast to northwest with maximum elevations between 9,000 and 12,000 feet above mean sea level; and (3) low mountain ranges and desert valleys in the southwest. From the White Mountains across the Mogollon Rim to the San Francisco Peaks, ponderosa pine forests are found. The Kaibab Plateau north of the Grand Canyon continues this timbered strip into southern Utah. The highest point in the State is Humphreys Peak, north of Flagstaff, with an elevation of 12,633 feet. The desert valleys of southwestern Arizona are an extension of the Sonora Desert of Mexico, with elevations as low as 70 feet above sea level in the lower Colorado River Valley.

The higher elevations of the State average between 25 and 30 inches of liquid precipitation (rain plus the water equivalent from melted snow) annually, while some areas near Yuma, in the desert southwest, average less than three inches per year. Tucson and Phoenix average 12 inches and eight inches, respectively. The plateau country in the northeastern corner of the State receives approximately 10 inches of precipitation annually. Since vegetation in this area consists of sagebrush and native grasses, it is used primarily for grazing. Higher ridges here are covered with junipers and pinion pines.

Nearly the entire State is in the Colorado River drainage basin which empties into the Gulf of California. The Grand Canyon lies within the State, extending southwestward for 217 miles from the junction of the Little Colorado with the main stream. The Grand Canyon varies in width from four to 18 miles, and depths from the rim to the river bed range from 2,700 to 5,700 feet. This is an outstanding example of arid or semiarid land erosion by a major river whose source is in a more rainy area.

Temperature- Cold air masses sometime penetrate the State bringing temperatures well below 0 degrees Fahrenheit ( $^{\circ}$  F) in the high plateau and mountainous regions of central and northern Arizona. The lowest readings can dip to  $-35^{\circ}$  F. Hot temperatures are common throughout the summer months at the lower elevations. Temperatures exceeding  $125^{\circ}$  F have been observed in the desert area. Great extremes occur between day and night temperatures throughout Arizona. The daily range between minimum and maximum temperatures can be as much as  $50$  to  $60^{\circ}$  F during the drier portions of the year. During winter months the lower desert valleys may have daytime temperatures average 70, with night temperatures falling to or slightly below freezing. In the summer, the forests in the central part of the State may have afternoon temperatures of  $80^{\circ}$  F, while night temperatures drop to  $35$  to  $40^{\circ}$  F.

The length of the growing season (freeze-free period) varies tremendously over Arizona. Some of the higher areas in the northern and eastern portions of the State average less than three

freeze-free months while lower desert valleys sometimes have several years in succession without a freeze.

Precipitation- Throughout Arizona, precipitation is governed to a great extent by elevation and the season of the year. From November through March, storm systems from the Pacific Ocean cross the State. These storms occur frequently in the higher mountains of the central and northern parts of the State and sometimes bring heavy snows. Snow accumulation may reach depths of 100 inches or more. The melting of this snow during the spring serves to maintain a supply of water in the main rivers of the State. Reservoirs on these streams supply water to the desert areas in the lower Salt and Gila river valleys, which are extensively farmed.

Summer rainfall usually begins early in July and lasts until mid-September. Moisture-bearing winds sweep into Arizona from the southeast, with their source region in the Gulf of Mexico. Another important source of moisture for southern Arizona is the Gulf of California. Summer rains occur in the form of thunderstorms which result largely from excessive heating of the ground and the lifting of moisture-laden air along main mountain ranges. Thus, the heaviest thunderstorms are usually found in mountainous regions of the central and southeastern portions of Arizona. These thunderstorms are often accompanied by strong winds and periods of blowing dust. Hail occurs infrequently.

The average number of days with measurable precipitation per year varies from near 90 in the Flagstaff area to 20 at Yuma. A large portion of Arizona is classified as semiarid and long periods often occur with little or no precipitation. The air is generally dry and clear, with low relative humidity and a high percentage of sunshine. April, May and June are the months with the greatest number of clear days, while July and August, as well as December, January and February have the cloudiest weather and lowest percent of possible sunshine. Humidities, while low when compared to most other states, are higher throughout much of Arizona during July and August, which is the thunderstorm season. A humidity study found values ranging from 55 percent at Flagstaff to around 33 percent at Yuma. Yearly averages of percent of possible sunshine range from 86 percent to 92 percent. Due to high temperatures, the dryness of the air and the high percentage of sunshine, evaporation rates in Arizona are high. Mean annual lake evaporation varies from about 80 inches in the southwestern part of the State to about 50 inches in the northeast. Phoenix and Tucson average over 70 inches of evaporation per year.

Flood conditions occur infrequently, although heavy thunderstorms during July and August at times cause floods that do considerable local damage. Floods on the main rivers are mostly limited to the upper basins above storage dams. Heaviest runoff usually occurs in connection with the arrival of moist tropical air which has its origin in dissipated tropical systems. Heavy rains associated with these systems usually come during August or September and occur, on average, once every 10 years. High winds accompanying heavy thunderstorms during July and August sometimes reach peak gusts of about 100 miles per hour in local areas. Four tornadoes are reported on the average each year.

Climate and the Economy- There are more than one million acres of land devoted to agriculture in the State. Water for the Phoenix area is obtained from storage reservoirs behind Roosevelt Dam on the Salt River, from Horseshoe Dam and Bartlett Dam on the Verde, Carl Pleasant Dam

on the Agua Fria and Coolidge Dam on the Gila River. The Yuma area receives its water from the Colorado River. Pumping of water from wells is common in the desert valleys. Extended drought periods sometimes cause curtailment of farming due to lowered water reserves.

Agricultural activities in Arizona include cattle and sheep raising. Some dry-farming is done in northern counties and in the central mountain valleys of the State. This dry-farming is limited primarily to the raising of grains and beans, as well as some fruit. Irrigated crops in the desert valley areas are the most important in the economy of the State. Cotton, alfalfa, grain, citrus fruit, melons, head lettuce and many truck vegetables are grown throughout the year. Fruits and vegetables find ready markets throughout the country.

Numerous national monuments furnish recreational facilities throughout Arizona. The South Rim of the Grand Canyon is a very popular attraction throughout the entire year. The roads are kept open to the South Rim throughout the winter months. Winter sports are popular in some of the mountainous regions of the State. Forests throughout central Arizona provide hunting of elk, deer, wild turkey, while desert areas are abundant in smaller game which includes: javelina, desert mule deer, quail and dove. Fishing is practiced throughout the year in the mountain streams and in numerous reservoirs, as well as, in the Colorado River.

The climate has attracted large industrial operations. Manufacturers have established proving grounds in Arizona, in order to take advantage of the diversity of climate within relatively short distances.

Mild winter temperatures and the absence of snowfall in the desert areas of southern Arizona attract many winter tourists and full-time residents to the State. Both have proven to be of real economic significance.