

Climate of Utah

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Unpublished climatological summaries have been prepared for a wide variety of users to fit specific applications.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- The topography of Utah is extremely varied with most of the State being mountainous. A series of mountains, which run generally north and south through the middle of Utah, and the Uinta Mountains, which extend east and west through the northeast portion are the principal ranges. Crest lines of these mountains are mostly above 10,000 feet. Less extensive ranges are scattered over the remainder of the State. The lowest area is the Virgin River Valley in the southwestern part with elevations between 2,500 and 3,500 feet, while the highest point is the Kings Peak in the Uinta Mountains, which rises to 13,528 feet.

Practically all of eastern Utah is drained by the Colorado River and its principal tributary within the State, the Green River, although neither rises within its borders. Western Utah is almost entirely within the Great Basin, with no outlet to the sea. The largest rivers in this area are the: Bear, Weber, Jordan, Provo, and Sevier, the first three of which empty into Great Salt Lake. The Provo River flows into Utah Lake, Utah's largest freshwater lake. The Jordan River flows from the north end of Utah Lake northward eventually emptying into the Great Salt Lake. The Sevier River drains the west-central area and empties into Sevier Lake, a brackish saline basin in southwest Utah.

The main streams in the eastern portion of the State flow through canyons, or very narrow mountain valleys and finally into desert canyons. Some meadows, usually in native grass, and only a few small highways and railroads, as well as residential areas, are above flood levels. Highest flow occurs in streams in this region in May and June during spring runoff from melting snow.

The most serious floods in Utah have occurred in the Great Salt Lake Basin, particularly in the Weber River drainage on the western slopes of the Wasatch Mountains. During the past 100 years approximately 300 flash floods, resulting from high intensity rainfall and 135 snowmelt floods, have been recorded. Some have been very limited in area and extent of damage, while others have been highly destructive in cities, towns and agriculture areas. However, severe floods are not likely to occur in any given locality more than once in several years or several decades.

The Great Salt Lake, in northwestern Utah, lies in the Great Basin, the largest closed basin in North America. Part of this drainage is below 4,500 feet in elevation, with the Lake being 4,200 feet. Great Salt Lake is the largest lake at this elevation in the world. In glacial times it was a fresh water lake occupying an area 346 miles long and 145 miles wide; but due to increased evaporation and reduced precipitation, it gradually shrank in size and the salinity increased. Since this large body of water now has no drainage outlet, the salt content is high, averaging about 25 percent. Thus the lake, which never freezes over, provides a moderating effect throughout the year on temperatures in the immediate vicinity.

Essentially, Utah's climate is determined by: its distance from the equator, its elevation above sea level, the location of the State with respect to the average storm paths over the Intermountain Region, and its distance from the principal moisture sources of the area, namely, the Pacific Ocean and the Gulf of Mexico. Also, the mountain ranges over the western United States, particularly the Sierra Nevada, Cascade Ranges and the Rocky Mountains have a marked influence on the climate of the State. Pacific storms, before reaching Utah, must first cross the Sierra or Cascades. As the moist air is forced to rise over these high mountains, a large portion of the original moisture falls as precipitation. Thus, the prevailing westerly air currents reaching Utah are comparatively dry, resulting in light precipitation over most of the State.

Temperature- There are definite variations in temperature with altitude and with latitude. Naturally, the mountains and the elevated valleys have the cooler climate, with the lower areas of the State having the higher temperatures. There is about a three degree Fahrenheit ($^{\circ}$ F) decrease in mean annual temperature for each 1,000- foot increase in altitude, and approximately 1.5 to two degrees decrease in average yearly temperature for each one degree increase in latitude. Thus, weather stations in the southern counties generally have average annual temperatures six to eight degrees higher than those at similar altitudes over the northern counties.

Temperatures above 100° F occur occasionally in summer in nearly all parts of the State. However, low humidity makes these high temperatures more bearable than in more humid regions. During the warmer season of the year, air conditioning is used in a large portion of the commercial establishments over the State, but only in a small portion of family dwellings. Due to the dryness of the air, evaporative coolers operate very efficiently. Maximum temperatures can occasionally exceed 110° F. The highest temperature recorded in Utah was 117° F at St. George only July 5, 1985.

Subzero temperatures during the winter and early spring are uncommon in most areas of the State, and prolonged periods of extremely cold weather are rare. This is primarily due to the mountains to east and north of the State, which act as a barrier to intensely cold continental Arctic air masses. The lowest temperature of record is -69° F at Peter's Sink on February 1, 1985.

Utah experiences relatively strong insolation during the day and rapid nocturnal cooling, resulting in wide daily ranges in temperature. Even after the hottest days, nights are usually cool over the State.

On clear nights the colder air drains onto the valley bottoms, while the foothills and bench areas remain relatively warm. For this reason, the higher lands at the edges of the valleys are devoted ordinarily to the more valuable and delicate fruits, berries and vegetables, while the hardier grains and vegetables are planted in the bottom land.

Owing to the varied topography of the State, there are no orderly extensive zones of equal length of growing season between the last freeze in the spring and the first in the fall. There are however, from 4.5 to five months of freeze-free growing weather in the State's principal agricultural areas. A difference of two weeks in the growing season is often noted in the same valley between the bottom lands and the adjacent farming lands at the foot of the mountains.

Precipitation- Precipitation varies greatly, from an average of less than five inches annually over the Great Salt Lake to more than 40 inches in some parts of the Wasatch Mountains. The average annual precipitation in the leading agricultural areas is between 10 and 15 inches, making irrigation essential for optimal growing conditions. Reservoirs for snowmelt usually provide the water resources need for successful agriculture. The areas of the State below 4,000 feet, all in the southern part, generally receive less than 10 inches of rain a year.

Northwestern Utah, over and along the mountains, receives appreciably more precipitation in a year than is received at similar elevations over the rest of the State, primarily due to terrain and the direction of normal storm tracks. The bulk of the moisture falling over that area can be attributed to the movement of Pacific storms through the region during the winter and spring months. In summer, northwestern Utah is comparatively dry. The eastern portion receives rain from summer thunderstorms, which are usually associated with moisture-laden air masses from the Gulf of Mexico.

Snowfall is moderately heavy in the mountains, especially over the northern part. This is conducive to a large amount of winter sports activity, including skiing and hunting. While the principal population centers along the base of the mountains receive more snow, as a rule, than many middle and northeastern sections of the United States, a deep snow cover seldom remains long on the ground.

Runoff from melting mountains snow usually reaches a peak in April, May or early June, and sometimes causes flooding along the lower streams. However, damaging floods of this kind are infrequent. Flash floods from summer thunderstorms are more frequent, but they affect only a small, local area.

Sunny skies prevail most of the year in Utah. There is an average of about 65 to 75 percent of the possible amount of sunshine at Salt Lake City during spring, summer, and fall. In winter, Salt Lake City has about 50 percent of the possible sunshine.

During the late fall and winter months, anticyclones tend to settle over the Great Basin for as long as several weeks at a time. Under these conditions, smoke and haze accumulate in the lower levels of the stagnant air over the valleys of Utah. This haze or fog can last for several weeks.

Climate and the Economy- Utah is not a large agricultural state, even though a few crops can be grown. Mining and manufacturing are the two basic industries. Each year the State is ranked high in the quantity of minerals it produces, mainly copper, lead, zinc, gold and silver. Because of the dry climate, several companies have found it feasible to produce salt from brine of the Great Salt Lake.

Tourists come to Utah to: visit historic Salt Lake City, see the Great Salt Lake, tour the various national parks, and fish in the cool mountain streams. Persons traveling in the winter should be prepared for cold weather and snow. When crossing the desert areas, people should carry fresh water as a safeguard.