

Climate of Montana

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Unpublished climatological summaries have been prepared for a wide variety of users to fit specific applications.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- Montana, with an area of 147,138 square miles, is the fourth largest state of the Union. Climatic variations are large. The half of the State southwest of a line from the southeastern corner to the Canadian border north of Cut Bank in Glacier County is very mountainous, while the northeastern half is very much like Great Plains country, broken occasionally by wide valleys and isolated groups of hills. The extent of climatic variations is indicated by the range in elevation from 1,800 feet above sea level where the Kootenai River enters Idaho to 12,799 feet at Granite Peak near Yellowstone. Half the State lies higher than 4,000 feet above sea level.

The Continental Divide traverses the western half of the State in roughly a north-south direction. To the west of the Divide, Montana is drained by the: Kootenai, Clark Fork and Flathead rivers into the Pacific Ocean through the Columbia River. Many of the tributary streams in this region have their origin in the high western slopes of the Rockies. Most streams traverse narrow canyons, at least through parts of their length, affording many valuable waterpower sites. A relatively small area located between the Hudson Bay Divide and the Rocky Mountains is drained by the St. Mary River, which finds its way to Hudson Bay through the Saskatchewan River. The remainder of the State is drained by the Missouri river, which begins at Three Forks. It then travels northward through deep canyons in the Big Belt Mountains, and flows through the lower lying northeastern portion of the State. The Yellowstone River, the principal tributary of the Missouri in Montana and which has its source in Wyoming, drains the southeastern section of the State and has its confluence with the Missouri just east of the Montana-North Dakota line.

The Continental Divide exerts a marked influence on the climate of adjacent areas. West of the Divide the climate might be termed a modified north Pacific coast type, while to the east, climatic characteristics are decidedly continental. On the west side of the mountain barrier winters are milder, precipitation is more evenly distributed throughout the year, summers are cooler in general, and winds are lighter than on the eastern side. There is more cloudiness in the west in all seasons, humidity runs a bit higher, and the growing season is shorter than in the eastern plain areas.

Temperature- Cold waves, which cover parts of Montana on the average of six to 12 times a winter, are usually confined to the sections northeast of Glacier Park- Miles City line. A few of these cold waves cover the entire area east of the Divide or even the whole State. These cold waves do not now hold the dangers they did years ago before modern transportation, roads, communications, and even heating plants developed to their present levels. However, with temperatures well below 0 degrees Fahrenheit (° F) accompanied by strong winds with blowing snow, these cold waves can be very inconvenient and even dangerous to the careless or inexperienced. In small areas ideally situated for radiational cooling, temperatures can reach lower than -50° F. The coldest ever observed was -70° F at Rogers Pass, 40 miles northwest of

Helena, on January 20, 1954. This is the coldest of record for the contiguous U.S. In contrast, the low at Helena that morning was -36° F.

During the summer months hot weather occurs fairly often in the eastern parts of the State. The highest ever observed was 117° F at Glendive on July 20, 1893, and Medicine Lake on July 5, 1937. Temperatures of over 100° F sometimes occur in the lower elevation areas west of the Divide during the summer, but hot spells are less frequent and of shorter duration than in the plains sections. Hot spells nowhere become oppressive, however, because summer nights almost invariably are cool and pleasant.

Winters, while usually cold, have few extended cold spells. Between cold waves there are periods, sometimes longer than 10 days, of mild but often windy weather. These warm, windy winter periods occur almost entirely along the eastern slopes of the Divide and are popularly known as “Chinook” weather. The so-called “Chinook” belt extends from the Browning-Shelby area southeastward to the Yellowstone Valley north of Billings. Through this belt, “Chinook” winds frequently reach speeds of 25 to 50 mph or more and can persist, with little interruptions, for several days. In January, the coldest month, temperature averages range from 11 for the Northeastern Division to 22° F for the South Central Division. In some areas east of the Divide, January and February can average 0° F or lower, but such occurrences range from infrequent to about once in 10 to 15 years in the coldest spots. Most Montana lakes freeze over every winter, but Flathead Lake, between Polson and Kalispell, freezes over completely only during the coldest winters, about one year in 10. All rivers carry floating ice during the late winter or early spring. Few streams freeze solid: water generally continues to flow beneath the ice. During coldest winters “anchor” ice, which builds from the bottom of shallow streams, on rare occasions causes some flooding.

In July, the warmest month, temperature averages range from 74 for the Southeastern Division to 64° F for the Southwestern Division. This summer warmth is fairly steady, very seldom severe, and is tempered by normal nighttime minima in the 50s and 60s. Miles City, one of the State’s warmest places in July, has a July average minimum temperature of 60 and an average maximum of 90° F. Generally, adequate moisture permits rapid plant and crop development during most growing seasons.

Precipitation- Precipitation varies widely and depends largely upon topographic influences. Areas adjacent to mountain ranges in general are the wettest, although there are a few exceptions where the “rain-shadow” effect appears. Generally, half of the average rain falls from May through July. This is perhaps the main reason why Montana is consistently one of the largest producers of dry-land grain crops. The western Division of the State is the wettest and the North Central the driest. There are a few valleys in the western division that are relatively dry, as reflected by Deer Lodge and Lonepine averages of 10.60 inches and 11.46 inches, respectively. Probably the driest part of the State is along the Clark Fork of the Yellowstone River in Carbon County. At station eight miles south-southwest of Belfry, the average precipitation is 6.50 inches. The highest average in the State is 35.45 inches at a station 18 miles north of Troy.

Annual snowfall varies from quite heavy, 300 inches, in some parts of the mountains in the western half of the State, to around 20 inches at some stations in the two northern Divisions east

of the Continental Divide. Most of the larger cities have annual snowfall values between 30 and 50 inches. Most snow falls during the November - March period, but heavy snowstorms can occur as early as mid-September or as late as May 1 in the higher elevations. In eastern sections early or late season snows are not very common. Mountain snowpacks in the wetter areas often exceed 100 inches in depth as the annual snow season approaches its end around April 1 to 15. The greatest volume of flow of Montana's rivers occurs during the spring and early summer months with the melting of the winter snowpack. Heavy rains falling during the spring thaw constitute a serious flood threat. Ice jams, which occur during the spring breakup, usually in March, cause backwater flooding. Flash floods, although restricted in scope, are probably the most numerous floods. They result from locally heavy rainstorms in the spring and summer.

Severe storms of several types can occur, but the most troublesome are hailstorms which cause crop and property damage averaging about \$5 million annually. This is not unusually large for an area of 147,000 square miles, however, and their occurrence is limited mainly to July and August, infrequently in June and September.

Tornadoes develop infrequently and occur almost entirely east of the Divide, largely in the eastern third of the State. Severe windstorms of a general nature are rare but can occur locally, mainly east of the Divide, from a few to several times a year. Drought in its most severe form is practically unknown, but dry years do occur in some sections. All parts of the State rarely suffer from dryness at the same time. The only exceptions on record occurred during the 1930s. Drought infrequently lasts two or three years in one or two of the State's climatic subdivisions.

Climate and the Economy- Water supplies in the mountainous southwestern half are generally ample and of excellent quality. In the northeastern half of the State water supplies are generally dependable, but the water has a variable "hard" quality, particularly where wells are used. There are numerous irrigation projects for which water supplies are usually sufficient. Irrigated crops which do well are potatoes, sugar beets, sorghums, alfalfa and many varieties of grain. Smaller quantities of other fairly hardy crops are grown under irrigation. Wide open areas of rangeland provide excellent quality grass for an extensive livestock industry. Between livestock and other agriculture, Montana has developed into an important food supply State. In spite of figures that may indicate winters on the cold side, growing seasons are four months or more in length in much of the agricultural area.