

Climate of Iowa

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Unpublished climatological summaries have been prepared for a wide variety of users to fit specific applications.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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Topographic Features- The State of Iowa comprises 56,288 square miles, primarily of rolling prairie, located in the middle latitudes between the Mississippi and Missouri rivers. The interior continental location is approximately 850 miles north of the Gulf of Mexico, 1450 miles east and northeast from the Pacific Ocean, 1050 miles west and northwest from the Atlantic Ocean and 1050 miles south-southwest of Hudson Bay. The extreme north-south distance across Iowa is 215 miles; the extreme east-west distance, 330 miles. Elevation changes are small across the State, varying from a maximum of 1670 feet in Osceola County in northwestern Iowa to 480 feet at the southeast tip of the State at the confluence of the Des Moines and Mississippi rivers. There is some rugged terrain in the northeast. Most of the State's natural lakes are located in the northwest.

Iowa's climate, because of its latitude and interior continental location, is characterized by marked seasonal variations. During the six warmer months of the year, the prevailing moist southerly flow from the Gulf of Mexico produces a summer rainfall maximum. The prevailing northwesterly flow of dry Canadian air in the winter causes this season to be cold and relatively dry. At intervals throughout the year, air masses from the Pacific Ocean move across the western United States and reach Iowa producing comparatively mild and dry weather. The autumnal 'Indian Summers' are a result of the dominance of these modified Pacific air masses. Hot, dry winds, originating in the Desert Southwest, occasionally reach into Iowa during the summer producing unusually high temperatures and crop desiccation.

Temperature- The average annual temperature ranges from 45 degrees Fahrenheit (° F) in the extreme north to 52 in the southeastern corner of the State. In July, the hottest month, daily temperatures range from morning lows of around 61 and afternoon highs of 82° F in the northeast corner of the State up to lows of 65 and highs of 87 in the southwest. In January, the coldest month, temperatures range from morning lows of 4 and afternoon highs of 22° F in the northwest corner of Iowa up to lows of 15 and highs of 32 in the southeast. Extreme temperatures have varied from 118° F at Keokuk on July 20, 1934 to -47° F at Washta on January 12, 1912 and again at Elkader on February 3, 1996. In almost every year, at some location in the State, a maximum exceeds 100° F and a minimum of less than -20 occurs. In half of all years, the State maximum exceeds 104 and the minimum -30. The average number of days with maximum temperatures 90° F or higher ranges from only eight days in extreme northeast Iowa up to 36 days in the southwest corner of the State. The number of days with minimum temperatures 0° F or lower ranges from about 28 days along the Minnesota border to around 12 days along the Missouri border.

Precipitation- Precipitation averages around 34 inches per year for the State, ranging from 26 inches in the extreme northwest to as much as 38 inches in the southeast. However, annual totals vary widely from year to year and locality to locality. Annual totals have varied from as little as 12.11 inches at Clear Lake in 1910 and Cherokee in 1958 to as much as 74.50 inches at Muscatine in 1851. For Iowa, during the period of reliable statewide records (since 1873) the

year 1993 was the wettest (48.22 inches) and 1910 the driest (19.93 inches). Nearly three-fourths of the annual precipitation is received during the April through September growing season. Measurable precipitation occurs on about 100 days per year. The number days on which amounts exceed 0.5 inch varies from about 15 days in the northwest to 25 days in the southeast. The greatest one day rainfall is 13.18 inches at Atlantic on June 14, 1998.

Seasonal snowfall averages 32 inches across Iowa and varies from around 40 inches in northeast Iowa to about 20 inches in the extreme southeast corner of the State. The snow season normally extends from late October through mid-April but significant snows have fallen as early as September 16 (1881) to as late as May 28 (1947). The average number of days per season with snow cover one inch or deeper varies from about 40 days along the Missouri border to around 85 days along the Minnesota border. In about half of all winters, a daily snowfall of five to six inches or more is recorded in southern Iowa and seven to eight inches or more in northern Iowa. December, January and February are normally the snowiest months, averaging about seven inches each. However, late winter and early spring storms in March and April have produced as much as 27 inches of snow in a single storm and 24-hour amounts have reached 24 inches. The snowiest winter of record (since 1887 - 1888) was 1961 - 1962 with a statewide average of 59.0 inches while the lowest State average, only 11.9 inches, occurred in the winter of 1965 - 1966. Seasonal snowfall totals have varied from 2.4 inches at Keokuk in 1965 - 1966 to 93.1 inches at Elkader in 1950 - 1951.

About 85 percent of the 45 to 65 thunderstorms Iowa experiences annually occur between April and September with the peak month being June. At times, these thunderstorms become severe producing hail, high winds, torrential rains and an occasional tornado. Tornado occurrences average about 46 per year spread over 16 days with May and June being the peak months of tornado occurrence. Hail occurs most frequently in May; however, nearly half of the crop-hail damage comes in July when crops are more susceptible to yield-reducing damage. In the average year, hail destroys about 1.4 percent of Iowa's corn crop and 4.5 percent of its soybean crop. Hail losses are greatest in the northwest where hail storms are typically more severe and also somewhat more frequent than in the southeast. In any one location, hail will occur on about two to four days per year.

Floods are most frequent in June which has the highest average rainfall of any month (4.64 inches). Mid-March through early April is another favored time for flood occurrence when snowmelt, combined with rain and frozen soils, can produce significant flooding on the major rivers. Ice jams, caused when river ice begins to break up in the spring, can also contribute to flooding. Flash flooding from heavy thunderstorm rainfall is most frequent in the overnight hours from June through September. Flooding in mid-winter is very rare owing to low precipitation totals (January averages only 0.95 inch) and a high percentage of precipitation falling as snow.

Drought occurs periodically in Iowa with the most severe in historical times occurring in the 1930's. Other major droughts, usually characterized by deficient rainfall combined with unusually high summer temperatures, occurred in 1886, 1893 - 1894, 1901, 1954 - 1956, 1976 - 1977 and 1988 - 1989. Although droughts are not the spectacular weather events that floods,

blizzards or tornadoes can be, historically they produce more economic damage to the State than all other weather events combined.

Winds at 10 meters/32.8 feet above ground level average about 11.5 mph. Highest average wind speeds are usually recorded in March and April with the annual minimum occurring in July and August. Winds of 55 mph or greater are recorded about once every other year at any one site while sustained speeds of 75 mph or greater occur about once every 22 years. The highest wind gusts typically occur with thunderstorms during the late spring and summer and are of very short duration. The typical thunderstorm severe wind event affects only a very small geographic area. However, a variety of thunderstorms, known as the *derecho* (Spanish for straight) can produce very widespread high winds with mid-summer being the preferred time of *derecho* occurrence. However, storm systems can generate widespread wind gusts in excess of 50 mph for several hours duration with the spring and fall being the most common time for these non-thunderstorm wind events.

Sunshine increases from northeast to southwest. The percent of possible sunshine varies from about 45 percent in December to 72 percent in July. This seasonal variation in cloudiness combined with length of daylight and sun angle changes results in Iowa receiving over four times as much solar energy in July than in December.

The growing season (time between the last spring frost and the first autumn frost) lasts about 162 days, extending from April 26 to October 5 in central Iowa. It is about 15 days shorter along the Minnesota border and 20 days longer in the southeast.

Climate and the Economy- Overall, Iowa's climate and rich soils, are nearly ideal for the production of grain crops such as corn and soybeans. Rainfall is greatest during the growing season when it is needed most. Summer temperatures are high enough for optimal corn and soybean growth, but yet not usually so high as to cause severe crop stress. Much of the summer rains come in the form of fairly brief thunderstorms, which are most frequent at night, thus allowing ample sunshine during the daylight hours. Finally, the fall months are normally relatively dry thus allowing optimal dry-down of the crops and ready access to the fields for harvesting. The cold winters usually result in the soils being frozen from early December through late March. The freezing of the soils also benefits annual crops in that the freeze-thaw process acts to 'stir' the soil and reduce soil compaction. Finally, although Iowa's spring and summer thunderstorms do occasionally become severe, the benefits of the rainfall these storms generate far outweigh the damage caused by their high winds and hail.