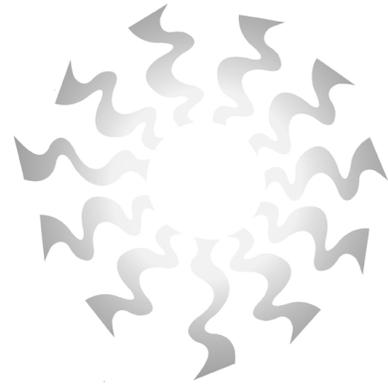


Water and Weather

When talking about weather in Texas, there is an old saying, *“If you don’t like the weather now, wait a minute and it will change.”* While this may be a bit of an exaggeration, the weather in San Antonio and South/Central Texas can change dramatically. San Antonio and the rest of Texas is heavily dependent on weather patterns for their continuing water supplies.



During the summer, the San Antonio climate becomes tropical like with prevailing south and southeast winds. Although the summers are long and usually dry, the moderating effects of the Gulf of Mexico prevent extremely high temperatures. Daily maximum temperatures above 90°F are prevalent over 80% of the time. In many years, summer conditions continue into September and sometimes even to October. The highest of record was 111°F September 5, 2000. Occasionally, cool fronts may move through the area, dropping overnight lows into the 50s and 60s; however, the cooling is brief, and in a day or two the minimum temperatures are back to the 70s. Although July and August can have limiting rain, sometimes rather heavy rain events can come in July and August, especially with the remnants of tropical storms or stalled out cool fronts.

San Antonio is situated between a semi-arid area to the west and a much wetter and more humid area to the east. Such a location allows for large variations in monthly and annual precipitation amounts. The normal annual precipitation for San Antonio is about 30 inches, although it may range from near 10 to near 50 inches from one year to another. The extremes vary from 10.11 inches in 1917 to 52.28 inches in 1973. A year of normal precipitation is sufficient for the production of most crops, although during the drier years irrigation is essential. On average, the heaviest rains fall in May and September, while the driest months, on average, are December through March, and July. Since rainfall is sporadic, the wettest and driest month in any one year may occur in any season and vary widely from year to year. Precipitation from April through September usually occurs as a result of thunderstorms.

Hail of damaging intensity has occurred. Small hail is frequent with springtime thunderstorms but has also been observed during other seasons. Measurable snow usually occurs only once in three or four years. Snowfall of 2 to 4 inches occurs about every ten years

Since San Antonio is located only 140 miles from the Gulf of Mexico, tropical storms occasionally affect the city with strong winds and heavy rains. One of the fastest winds recorded, 74 mph, occurred as a tropical storm moved inland east of the City in August 1942. Strong winds also come as a result of microbursts from thunderstorms. A microburst during the afternoon of July 10, 1979, caused a wind gust of 77 mph. Strong winds also come from squall lines, and strong cold fronts. On March 27, 1994, a squall line blasted through the city during the early morning hours, causing a wind gust of 104 mph at Randolph AFB, on the northeast side of the city. On May 27, 1997 a squall line swept through the city from the north and northeast, and caused a wind gust of 122 mph at Kelly AFB in a thunderstorm. Although tornadoes are rare, they have occurred, and they have most often been associated with the dissipating tropical storms.

Relative humidity is above 80% during the early morning hours most of the year, dropping to near 50% in late afternoon

During winter, the area is alternately influenced by a continental climate, when winds blow from the north and west and by a modified maritime climate and when south and southeast winds blow from the Gulf of Mexico. Mild weather prevails during most of the winter. Below freezing temperatures occur on average about 20 days each year with the average first freeze occurring around December 1st and the average last freeze occurring in late February. The coldest winters overall have come from those winters of frequent cold fronts. The coldest low of record was 0°F on January 31, 1949. Although daytime highs are restrained in cloudy winters, overnight lows can be potentially higher, sometimes sparing the area from the much colder minimums that come under clear skies. During sunny winters, the South Texas sun warms daytime temperatures to pleasant levels, while nights are cooler. Daily temperature variations can be as much as near 40°F to 50°F degrees. Very warm days occur when dry west winds in a mild airmass allow winter temperatures to climb to spring or summerlike levels, such as 90°F December 25, 1955; 89°F January 30, 1971; 100°F February 21, 1996 and 100°F March 6, 1991.

(Information courtesy of National Weather Service)

Historical records show the variable rates and magnitude of rainfall across the state.

- Presidio, in West Texas, had only 1.6 inches of rainfall in 1956.
- Clarksville, in Northeast Texas, experienced 109 inches of rainfall in 1873.
- Officially, the most rainfall recorded in a single day was 29 inches in Albany, in North Central Texas, in August of 1978.
- From 1950-1956, Texas experienced a drought so severe that 94% of its counties were declared national disaster areas. It ended with serious flooding in 1957.
- Flash floods between the West Texas towns of Sheffield and Langtry, in June of 1956, produced an 86 foot-high wall of water that tumbled down the Pecos River Canyon.

(Information courtesy of the Texas Water Development Board)

Droughts

Droughts are poorly understood. In fact, drought is a normal and reoccurring feature of climate. However, many falsely consider it a rare and random event. It occurs in virtually all climatic zones although we hardly know that one is in progress until we observe its effects -- withering crops, plummeting water levels, parched fields, and the implementation of water conservation measures. Droughts don't have a definite starting or ending point. A 1987 Texas Water Commission report described droughts as "*enigmatic*," "*difficult to define*," and "*not easily characterized*." We know droughts will recur, but we don't know where, when and for how long.

Drought originates from a lack of precipitation over an extended period of time, usually a season or more. This usually results in a water shortage for some activity, group, or environmental sector. Climatic factors such as high temperature, high wind, and low relative humidity are often associated with drought in many regions of the world and can significantly increase its severity.

In a broad sense, drought occurs whenever water supplies are inadequate for human needs. Most often, these water shortages stem from a severe shortage of rainfall but they can be made worse by high water demands and inadequate distribution systems. Rainfall does not need to be below average for droughts to take hold. Evaporation, transpiration, and runoff all drain the amount of moisture provided by rainfall.

Why do droughts occur so often in Texas? It's really hard to tell. Part of the answer may be that Texas lies on the fringe of "the Great American Desert" and straddles the 30° North latitude

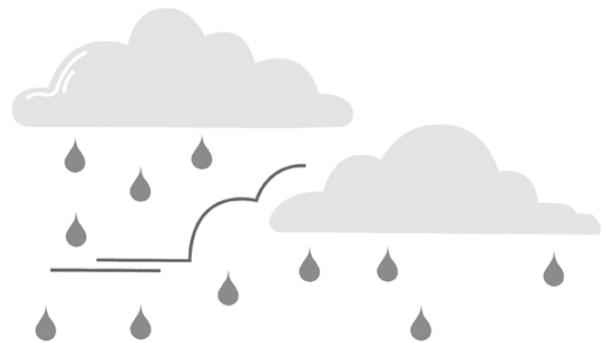
where many deserts in the world can be found. People, plants, and animals living in deserts become adapted to these environments. Those living in areas that border deserts face unexpected droughts and suffer most because they are the most unprepared. Because the High Plains and Trans-Pecos regions of Texas are near the Chihuahuan Desert, it is likely that these areas may be the most vulnerable to prolonged winter droughts.

No one knows for sure how many droughts have occurred in Texas throughout history, but what we do know suggests that droughts have visited often and come with a vengeance. Some of the earliest droughts include one in the 15th century along the Canadian River that decimated a native American tribe, an event in 1756 that dried up the San Gabriel River, and an 1822 drought that caused the first crops planted by Stephen F. Austin to wither and die. From 1822 through the 20th century, at least one drought has hit some part of Texas each decade. Throughout the 1950s, Texans endured a 7-year uninterrupted drought (1950-56), which some say was the worst in 700 years. From 1949-51, Texas rainfall dropped by 40% and West Texas experienced severe declines. By 1952, more than half the state received 20 to 30 inches less rainfall than normal. In 1952, Texas' monthly rainfall average fell to just 0.03 inches -- the lowest level since the Weather Bureau began collecting records in 1888. For the first time since 1914, Lubbock did not even record a trace of rain. Even hardy west Texas mesquite trees began to die. By 1953, 75% of Texas recorded below normal amounts of rainfall. Seven million parched acres scarred Texas and Oklahoma. That summer in the High Plains, bulldozers were used to remove drifts of blowing soil from highways.

(Information courtesy of Texas Water Resources Institute, Texas A&M University & National Drought Mitigation Center, University of Nebraska-Lincoln)

Floods

Floods are common and costly natural disasters. When rivers overflow their banks, or flood, they can cause damage to property and crops. In the United States, the average annual cost of flood damage is more than \$2 billion and about 100 people lose their lives to floods each year.



Floods usually are local, short-lived events that can happen suddenly, sometimes with little or no warning. They usually are caused by intense storms that produce more runoff than an area can store or a stream can carry within its normal channel. Rivers can also flood when dams fail, when ice jams or landslides temporarily block a channel, or when snow melts rapidly. In a broader sense, normally dry lands can be flooded by high lake levels, by high tides, or by waves driven ashore by strong winds. Small streams, particularly in the Southwest, are subject to flash floods (very rapid increases in runoff), which may last from a few minutes to a few hours. On larger streams, floods usually last from several hours to a few days. A series of storms might keep a river above flood stage (the water level at which a river overflows its banks) for several weeks.

Weather patterns have a strong influence on when and where floods happen. Cyclones, or storms that bring moisture inland from the ocean, can cause floods in the winter and early spring in the western United States. Frontal storms form at the front of large, moist air masses moving across the country and can cause floods in the northern and eastern parts of the United States during the winter and spring. Hurricanes are intense tropical storms that can cause floods in the Southeast during the late summer and fall.