

Denver's 2021 Annual Climate Summary



Severe Storm Developing over Brighton, CO. July 2nd



Tornado North of Firestone, CO June 7th, 2020



2021 was a year of contrast. Denver experienced bitterly cold weather in February, a major blizzard in March, abundant rainfall in the spring, hot, dry weather and smoky skies in the summer and drought conditions in the fall which led to destructive fires in the early winter. The year started off mild and dry in January and turned much colder and snowy in February as an Arctic air mass plunged into the region. Denver experienced wet conditions during the late winter and spring and was pummeled by a major blizzard in the middle of March. As spring transitioned to summer, the weather turned hot and dry. The hot and dry weather persisted through the summer with dry, mild and breezy to windy conditions in the fall.

By late fall and early winter, drought conditions worsened across eastern Colorado as moisture and snowfall was scarce. Denver measured it's first measurable snowfall of 0.3 inches on December 10th which is the latest first snowfall on record. Denver also broke the record for the most consecutive days of non measurable snow. The extended period of very dry weather, above normal temperatures and breezy to windy conditions led to the destructive Marshall Fire in the cities of Superior and Broomfield. The year ended on a cold and snowy note as a storm system and cold front moved across Northeastern Colorado. Denver International Airport received its first meaningful snowfall of the season on December 31st, measuring 4.5 inches from the storm. After a promising start, the year ended with above normal temperatures and below normal precipitation.

Month	Mean Temp (F)	Dep (F)	Max Temp (F)	Day	Min Temp (F)	Day	Precip (IN)	Dep (IN)	Snowfall (IN)	Dep (IN)	Max Wind MPH	Day
January	33.9	3.2	63	13th	2	13th	0.22	-0.16	3.1	-3.3	58	13th,14th
February	25.4	-7.1	67	3rd	-16	15th	0.80	0.43	13.5	5.9	56	7th
March	39.4	-1	75	29th	16	15th	3.80	2.88	34.0	25.2	48	14th
April	46.2	-1.2	81	5th	15	20th	2.02	0.31	12.6	6.5	47	6th
May	56.1	-1.3	86	1st, 7th	32	12th	3.65	1.49	Trace	-1.2	62	2nd
June	71.6	3.4	101	15th	44	1st	0.84	-1.10	0.0	0.0	43	25th
July	76.7	1.6	102	8th	52	15th	0.34	-1.80	0.0	0.0	49	10th
August	75.4	2.5	98	9th	53	20th	0.27	-1.31	0.0	0.0	51	22nd
September	68.8	4	99	62	39	21st	0.28	-1.07	0.0	-0.8	46	11th
October	53.9	2.8	85	6th	24	20th	0.08	-0.91	Trace	-3.9	47	14th
November	46.3	6.9	80	6th	12	18th	0.07	-0.57	Trace	-7.3	43	10th
December	38.4	7.2	73	1st	4	18th	0.16	-0.19	4.8	1.8	60	15th
Annual	52.7	1.5	102	July 8th	-16	Feb 15th	12.53	-1.95	68.0	19.3	62	May 2nd

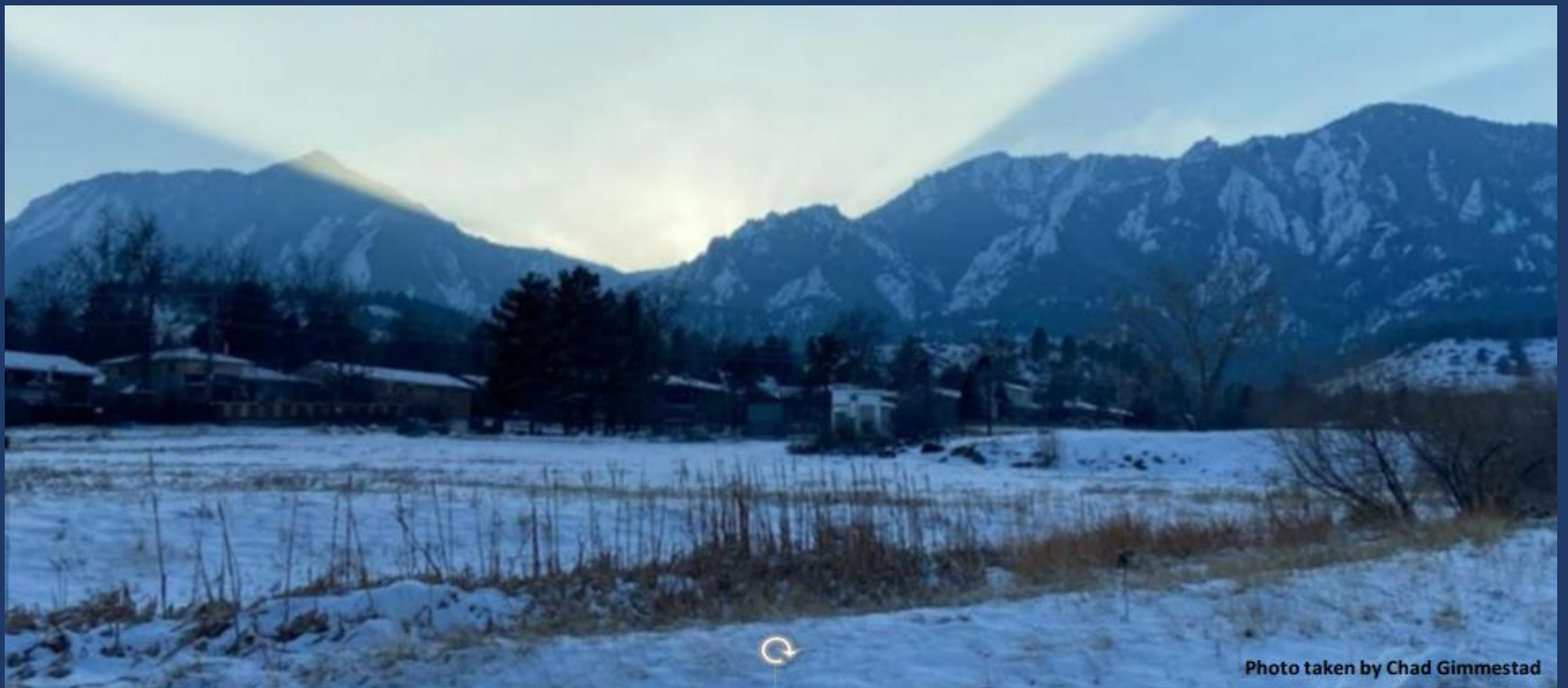


Photo taken by Chad Gimmestad

January was an uneventful month with above normal temperatures and slightly below normal precipitation. Most of the storm systems which moved across the Rocky Mountain Region either stayed to the north or south of Denver. As a result, the majority of the days were dry and mild with only a few cold days with light snowfall. Only three storm systems impacted the Front Range Urban Corridor during the month. Two of the systems brought much colder temperatures and light snow to Denver on the 9th and the 26th. The other system produced windy conditions across much of North Central and Northeastern Colorado from the evening of the 12th through the 15th. Wind gusts of 58 mph were recorded at the official observation site at Denver International Airport on the 13th and 14th.



February 2021, in Denver, was a cold and wet month overall. The month started out quite warm, and in fact, the highest temperature of the month occurred on the 3rd day when it was 67 degrees. Those first three days of the month accounted for the only real warm period for the entire month. For February 2021 there were 7 days with above normal daily average temperatures, 2 days right at normal and 19 days with below normal readings.

The first “real” significant cold arctic airmass to get into Denver during the entire 2020-2021 winter season finally arrived in February 2021. There was a 5 day stretch, February 12th through the 16th, where the daily low temperatures dropped to zero degrees or below. These are the only sub-zero temperatures for the 2020-21 winter season in Denver thus far.

Even the high temperatures during that stretch were cold, notably on the 14th where the high for the day was only 1 degree above zero. In fact, the temperature extremes for February 14th, 1 degree above zero and 14 degrees below zero, were both record values for that date. The average daily temperature that day was 6 degrees below zero, a 38 degree below normal departure for February 14th. The coldest temperature of the month was 16 degrees below zero and that occurred on February 15th. That reading was the coldest temperature recorded in Denver since a reading of 19 degrees below zero occurred on December 30, 2014.

February 2021 in Denver finished with 0.80 inch of precipitation, which is 0.43 inch above the normal of 0.37 inch for the month.

March 13-14, 2021 Snowstorm

A significant blizzard struck northeast Colorado March 13th and 14th, 2021. A deep storm system over the Desert Southwest tracked to the Four Corners area on Saturday, March 14, and then east/northeast across southern Colorado and into east central Colorado on Sunday, March 14. This is a very favorable track for significant winter storms for northeast Colorado, the Front Range, and the Denver metropolitan area, and this storm lived up to its full potential.

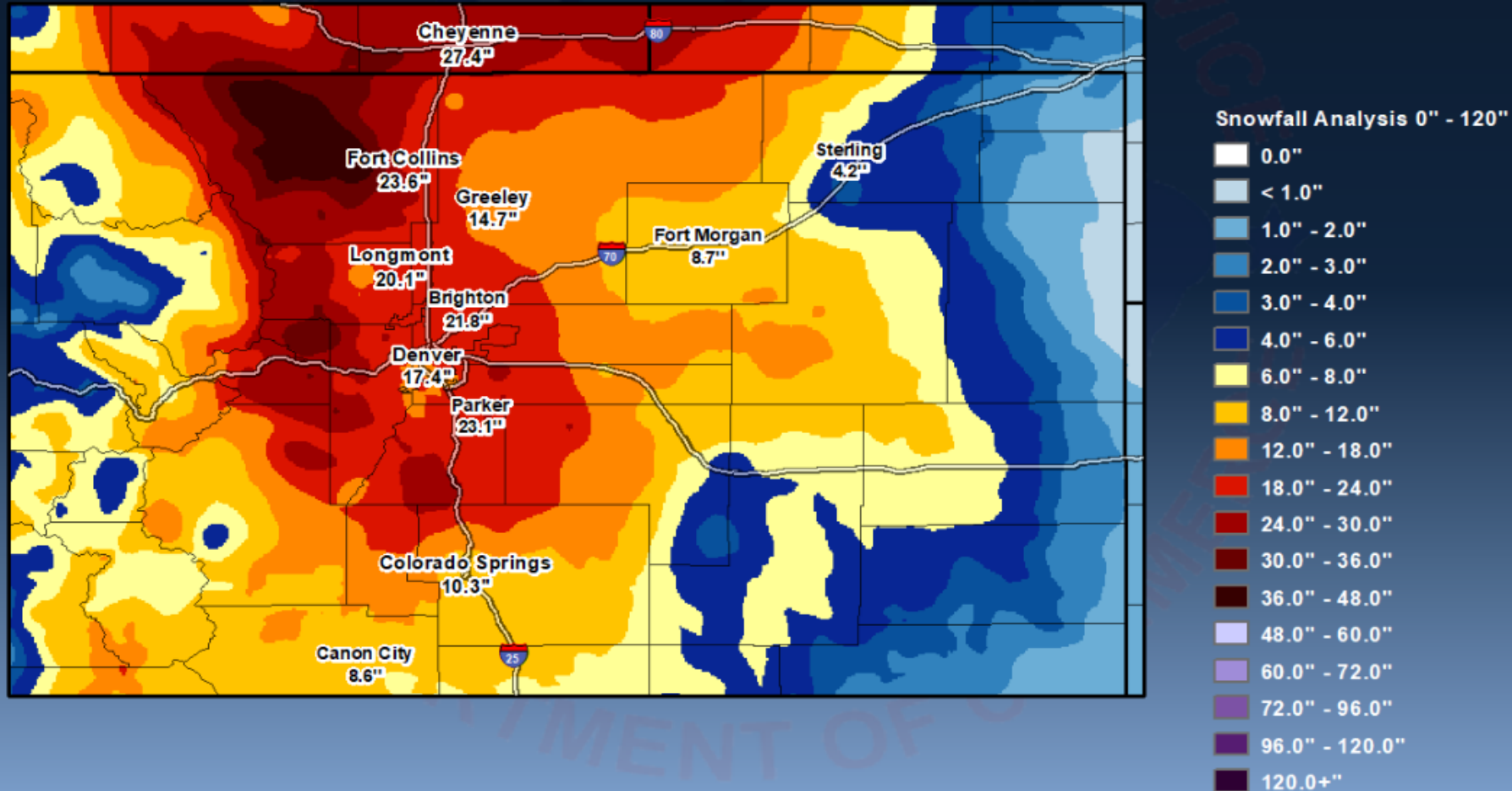
Areas of snow (rain on the eastern plains) developed ahead of the storm system and spread northward across Colorado Saturday. By Saturday night, the focus for the heaviest snow had shifted to the northern border area, with areas around Fort Collins and the northern Front Range Foothills receiving the heaviest snow. By early Sunday morning, between 10 and 17 inches of snow was already reported in the Fort Collins and Wellington areas, with around two feet in the foothills of Larimer County. The heavy, wet snow had accumulated on trees and powerlines, producing scattered power outages. Meanwhile, most of the Denver metro area had received between five and eight inches of snow. However, the heaviest snowfall was yet to come!

Early Sunday morning, the heavy snow quickly spread southward across the rest of the I-25 Urban Corridor and Front Range, including the entire Denver metropolitan area. Snow was falling at the rate of one to two inches per hour. Winds also began to increase at this time, with north winds along the I-25 Corridor increasing to 20-30 mph with gusts around 40 mph. Blizzard conditions developed all up and down the Front Range late Sunday morning as winds continued to increase, and the snow became even heavier, falling at the rates of two to three inches per hour. Peak wind gusts recorded in the afternoon included; 48 mph at Denver International Airport, 49 mph at Centennial and Fort Collins/Loveland Regional Airports, and as high as 66 mph along I-25 north of Wellington, Colorado. Travel became nearly impossible due to the significant snow accumulations, blowing snow, deep drifting, and without conditions. Snow drifts reached a depth of three to seven feet. All major interstates were closed except for those areas immediately in/near Denver and Fort Collins. Denver International Airport runways were closed from noon Sunday until 2 pm on Monday, with over 2,000 flights canceled.

National Weather Service

Snowfall Analysis 03/12/2021 05:00AM MDT to 03/15/2021 06:00PM MDT

Analysis Data Source: NOHRSC and Regional Observations (Values Estimated at Locations)



Created:
03/19/2021 07:47AM

April 2021, in Denver saw below normal temperatures and slightly above normal precipitation. After a wet and snowy March, April started out dry and very warm as upper level high pressure dominated the Rocky Mountain Region. Temperatures the first 5 days of the month were in the 70s and low 80s with record to near record temperatures from the 3rd through the 5th.

An upper level trough of low pressure which moved across Colorado brought cooler temperatures along with some precipitation and light snow to Denver on the 6th. Dry weather returned on the 7th and continued through the 14th as Colorado was under the influence of dry northwesterly flow aloft. Temperatures fluctuated between above normal and below normal values during this period as occasional cold fronts moved across the area.

Denver experienced colder unsettled weather from the 15th through the 22nd as a series of storm systems moved across the state. During this time, Denver received all of its measurable monthly snowfall in three events.

Warm and drier weather returned on the 24th and continued through the 26th as upper level high pressure rebuilt over the Rocky Mountain Region. A potent storm system moving across the Southern and Central Rockies produced ample precipitation to North Central and Northeastern Colorado from the 27th through the 28th. Most of the precipitation from this system fell from the afternoon of the 27th into the early morning of the 28th with numerous location measuring over one inch of precipitation. Areas northeast of Denver saw the heaviest rainfall along with some severe weather with rainfall amounts over three inches in some locations. The heaviest rain occurred over southwestern Phillips County where 8 inches was measured. The official measurement site at Denver International Airport measured just under an inch. Snow fell across the higher elevations with some foothill and mountain locations measuring over one foot of snow with this system.

The month ended as it started with dry weather and temperatures in the upper.





May was a wet month as rainfall was 150% to 300% of normal across much of the area. The only exception was west of the divide where precipitation remained below normal. Temperatures ended up slightly below normal. Severe weather wise, the most active days occurred on the 22nd and 23rd as several tornadoes were reported across portions of northeast Colorado. Damage was very limited with only a few power poles knocked down across Logan county on the 23rd.



June 7th Weld County, Colorado Tornado Northeast of Firestone

After a cool and wet Spring, the weather turned hot and dry most of June as upper level high pressure dominated the Four Corners Region. However, the first couple of days started off with below normal temperatures as an upper level trough of low pressure moved across the Rocky Mountain Region.

With the exception of 3 days, Denver experienced above normal temperatures from the 3rd through the 24th with only 0.05 inches of measureable precipitation through this period. There was a three day stretch from the 15th through the 17th in which the max temperature reached or exceeded the century mark. This is tied for the 5th longest 100 degree streak in Denver weather history.

There was a pattern change toward the end of the month which brought relief to the hot and dry weather. On the 25th, a strong upper level ridge of high pressure built over the Pacific Northwest. This pattern allowed cool, unsettled weather to form over the Rocky Mountain Region. Cold fronts and rounds of afternoon thunderstorms brought much cooler temperatures along with much needed precipitation to North Central and Northeastern Colorado from the 25th through the end of the month.



July was another warm and dry month following similar June CO weather again dominated by upper level ridging over the region most of the month.

The plume of monsoonal moisture stayed west of Metro Denver most of the month, with periods of heavy rain and flash flooding and debris flows across the mountain burn scars.

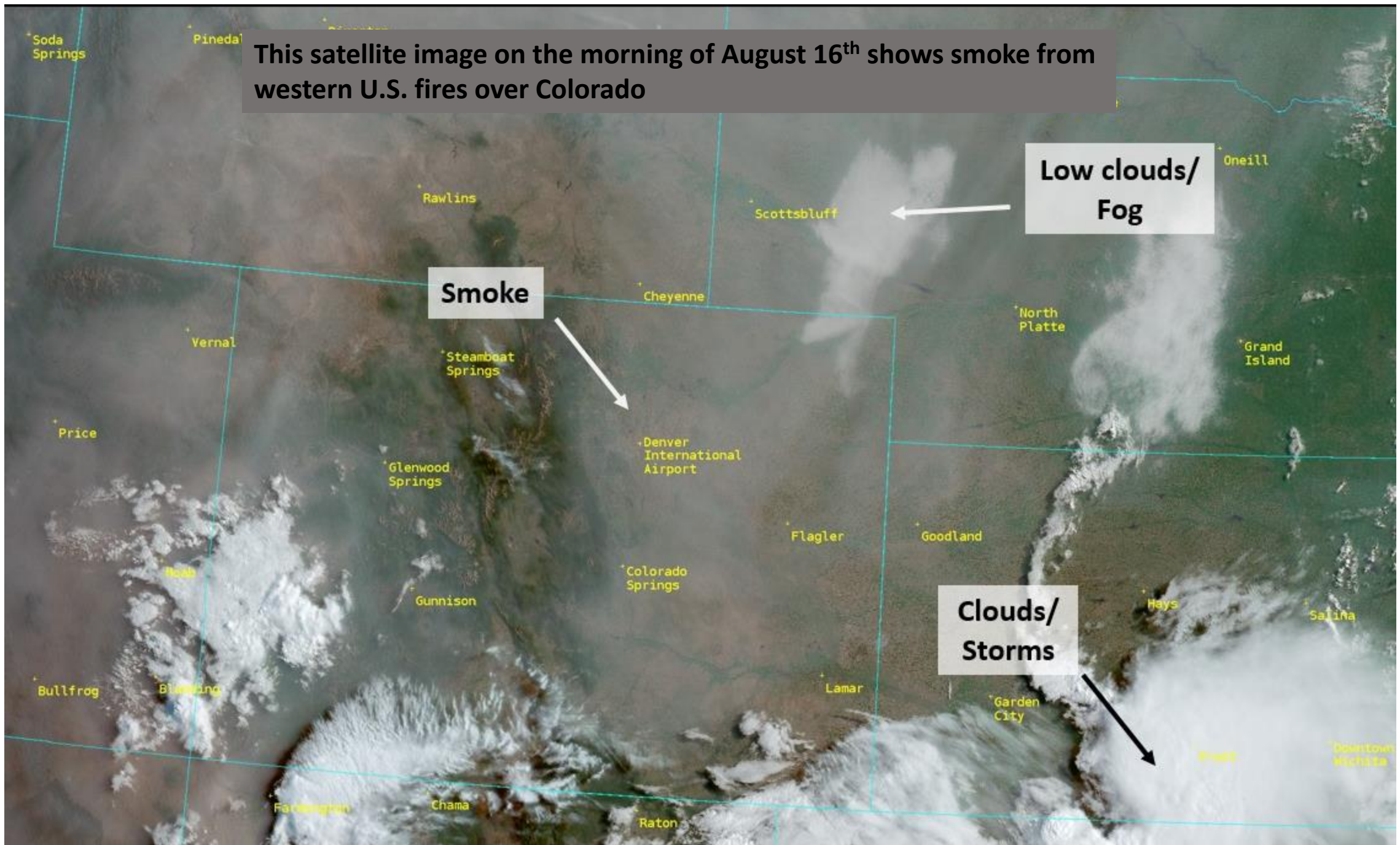
There were a few days, towards the beginning and end of the month, in which the plume shifted east over the Front Range Urban Corridor. However, the heavier rains associated with this plume managed to miss the official observing site at Denver International Airport.

In addition, smoke from wildfires across the west, especially the Pacific Northwest concentrated under the ridge creating persistent haze, reduced visibility and poor air quality across North Central and Northeastern Colorado much of the month.



Denver experienced another hot and dry August as an upper level ridge of high pressure dominated the Rocky Mountain Region much of the month. Smoke from large forest fires across the western United States produced smoky and hazy skies across much of the region throughout the month. Monsoonal moisture produced periods of locally heavy rainfall across the region. However, the heavier rains were mainly confined to the high country and the plains northeast and southeast of Denver.

This satellite image on the morning of August 16th shows smoke from western U.S. fires over Colorado



Smoke

**Low clouds/
Fog**

**Clouds/
Storms**



September 2021 finished with above normal temperatures and below normal precipitation. Much of the month was dominated by an upper level ridge of high pressure which led to several hot days with high temperatures reaching or exceeding the 90 degree mark. Occasional upper level troughs and associated cold fronts resulted in a few cooler days with below normal temperatures and light precipitation during the middle and end of the month across north central and northeastern Colorado.



October 2021 was an uneventful month with dry weather and above normal temperatures. The month started off with near normal temperatures and some light precipitation as a weak upper level low moved across Colorado. Denver experienced dry and warm conditions from the 3rd through the 9th as upper level high pressure dominated the Rocky Mountain Region. Cooler unsettled weather returned on the 10th and continued through the 15th as a series of storm systems moved across the Northern and Central Rockies. These storm systems stayed north of Colorado bringing heavy snow to portions of Wyoming with cooler temperatures and mainly dry conditions across the Front Range Urban Corridor.



Upper level high pressure dominated the Rocky Mountain Region much of November resulting in warm and dry conditions across Metro Denver. An occasional upper level trough and associated cold front brought brief periods of cooling and very light precipitation. The month ended up being the 3rd warmest November on record as well as being tied for the 9th driest and 2nd least snowiest November on record. Other than the much above normal temperatures and lack of precipitation, the only notable weather events during the month were a couple of windy days which occurred on the 10th and the 14th.



Snow Squall passing over the Flatirons near Boulder, CO on the morning of the 15th

Denver experienced dry weather and above normal temperatures through much of December. Towards the middle of the month, a pattern change allowed several Pacific storm systems to move across the region, bringing periods of heavy snow and much needed precipitation to the mountains. Despite copious amounts of moisture associated with these systems, areas east of the mountains saw mainly gusty winds and dry weather due to a downsloping flow. During this stretch, there was one notable weather event that occurred on the 15th. A strong upper level low ejecting out of the Desert Southwest moved across North Central and Northeastern Colorado during the day. A Snow squall associated with this system raced across North Central and Northeastern Colorado during the morning hours with strong winds developing across the Front Range Urban Corridor and Plains during the late morning and early afternoon.

Denver's Latest First Measurable Snow Dates & Consecutive Days of Non-Measurable Snowfall

Denver's Latest First Snowfall Dates (at least 0.1")				
Rank	Date	Snow	Total Seasonal Snow	ENSO Phase
1	12/10/2021	0.3	???	Extended Moderate La Nina
2	11/21/1934	1.0	48.3	Unknown
3	11/19/1931	1.0	55.4	Unknown
4	11/17/2016	1.7	21.8	Moderate La Nina
5	11/16/1894	2.6	37.0	Unknown
6	11/15/2010	1.5	22.8	Strong La Nina
-	11/15/1988	2.5	50.1	Strong La Nina
-	11/15/1987	6.1	62.3	End Strong El Nino
-	11/15/1902	4.0	45.6	Unknown
10	11/14/2008	0.1	38.1	Extended Moderate La Nina
-	11/14/1964	4.2	55.9	Moderate La Nina
-	11/14/1944	0.1	51.6	Unknown

Period of record: 1874-02-01 to 2021-12-08

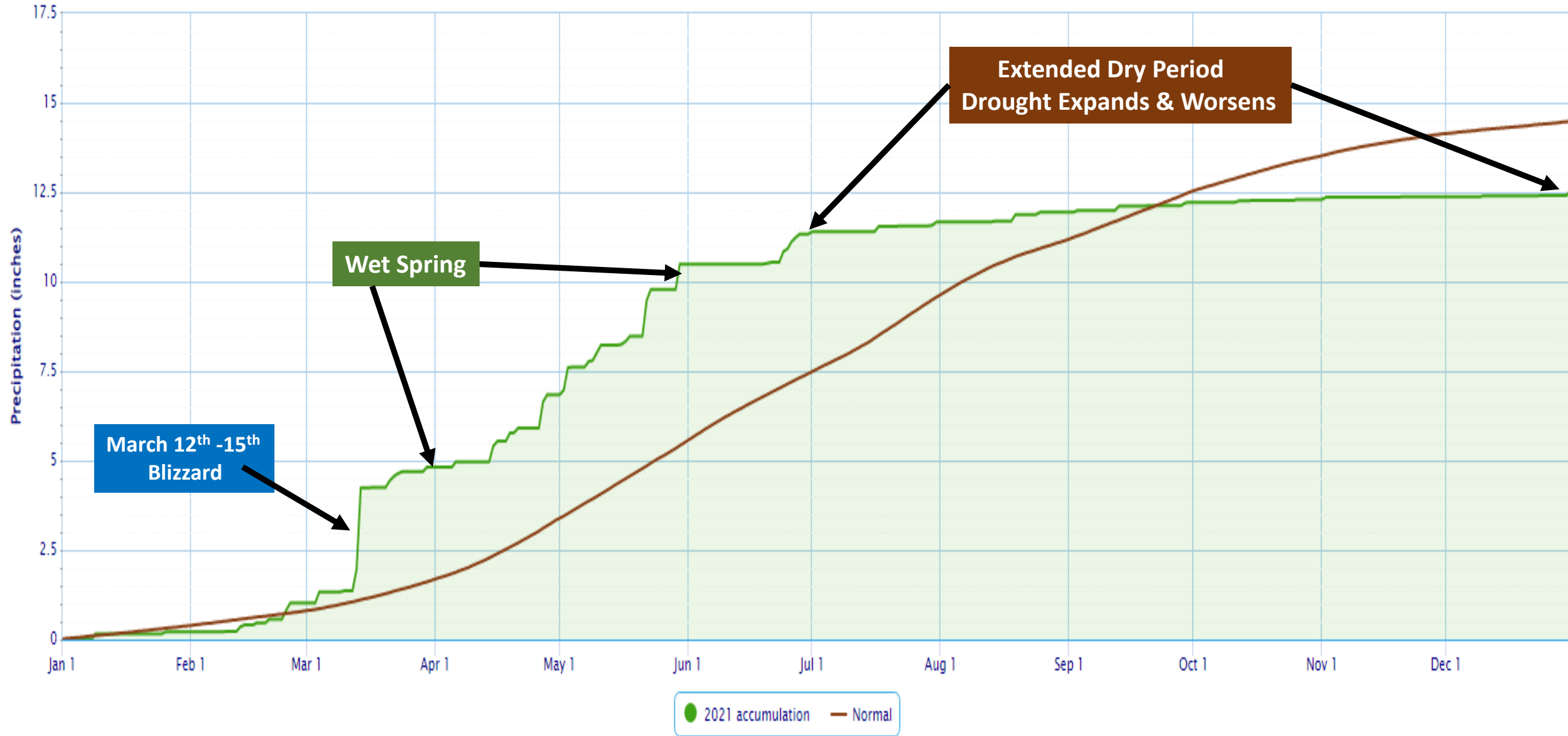
Consecutive Days of Non Measurable Snowfall (<0.1") in Denver				
Rank	# of Days	Time Period	Total Seasonal Snow	ENSO Phase
1	232	4/22/2021 to 12/09/2021	???	Extended Moderate La Nina
-	232	3/5/1887 to 10/22/1887	25.5	Unknown
3	225	3/27/1888 to 11/6/1888	20.8	Unknown
4	220	3/23/1889 to 10/28/1889	38.5	Unknown
5	219	4/5/1886 to 11/9/1886	28.2	Unknown
6	212	3/19/1925 to 10/16/1925	64.7	Unknown
7	211	4/1/1992 to 10/28/1992	60.3	Nuetral
-	211	4/3/1977 to 10/30/1977	46.5	Extended Moderate El Nino
-	211	4/13/1940 to 11/9/1940	42.2	Unknown
10	210	4/20/1894 to 11/15/1894	37.0	Unknown

Period of record: 1874-02-01 to 2021-12-08

Accumulated Precipitation - Denver Area, CO (ThreadEx)



Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Maximum 182-Day Mean Avg Temperature for Denver Area, CO (ThreadEx)

Click column heading to sort ascending, click again to sort descending.

Rank	Value	Ending Date	Missing Days
1	60.3	1933-12-29	0
-	60.3	2021-12-29	0
3	59.4	1939-12-29	0
4	58.8	1934-12-29	0
5	58.7	1981-12-29	0
6	58.6	1980-12-29	0
7	58.1	1954-12-29	0
8	58.0	1949-12-29	0
9	58.0	2020-12-29	0
10	57.9	1910-12-29	0
Period of record: 1872-01-01 to 2021-12-29			

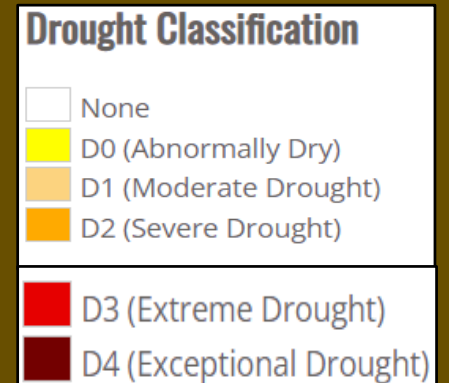
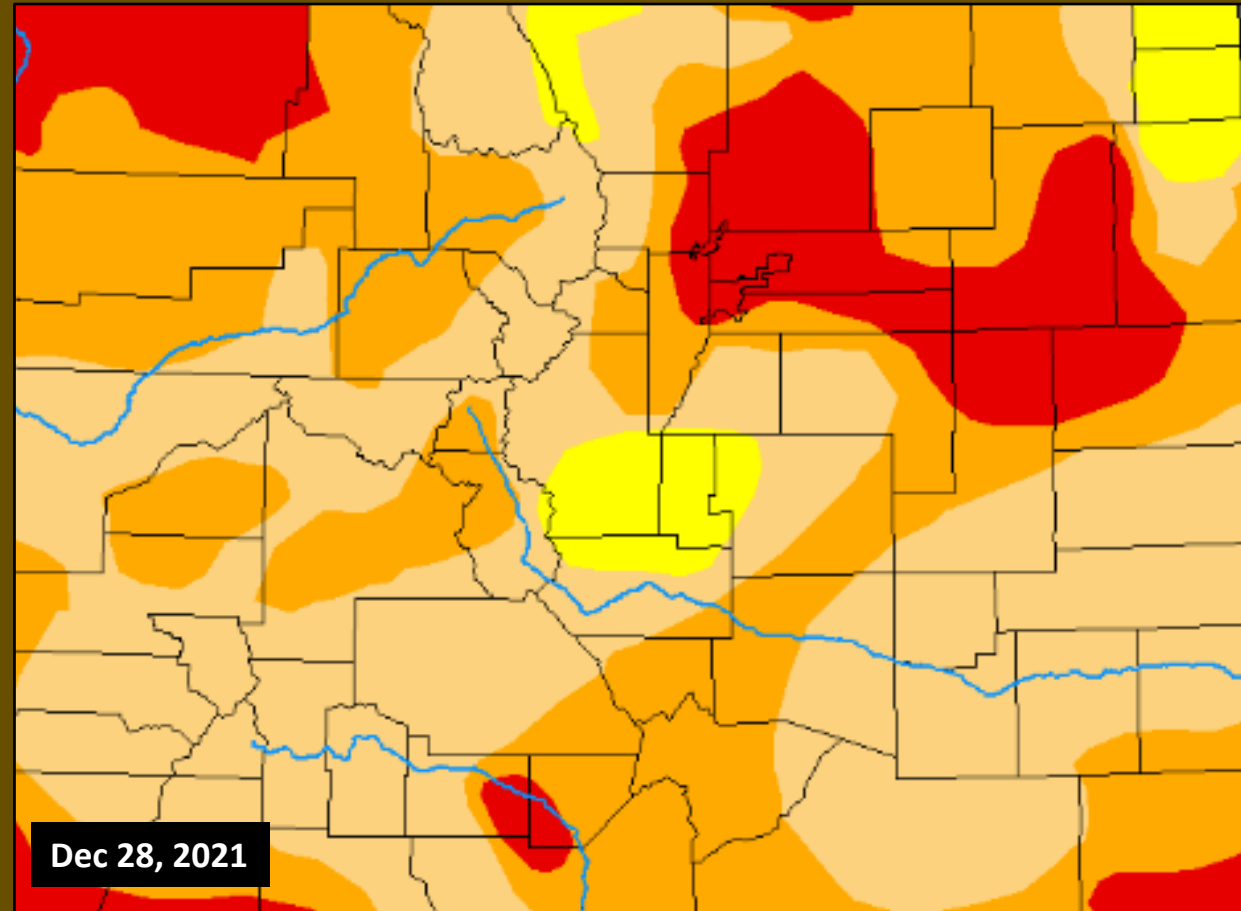
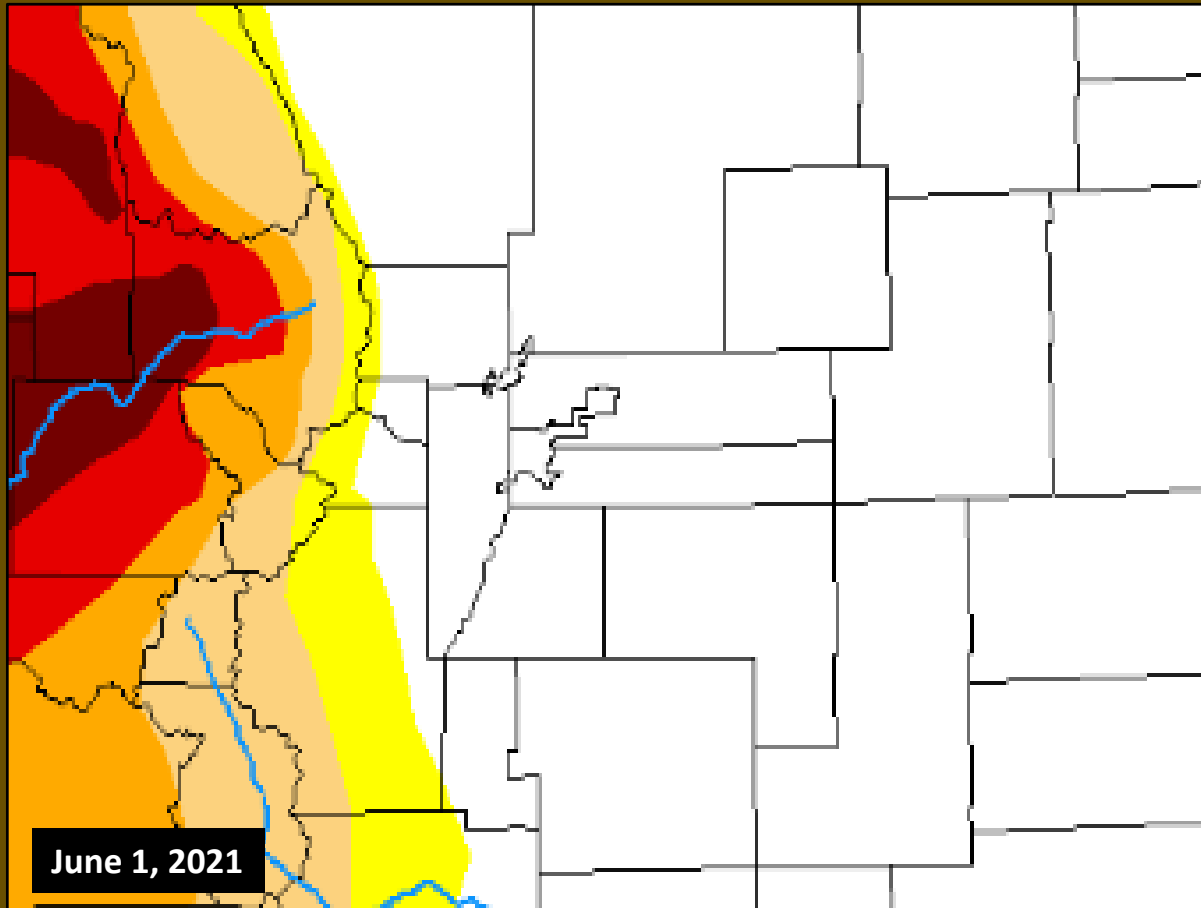
Minimum 182-Day Total Precipitation for Denver Area, CO (ThreadEx)

Click column heading to sort ascending, click again to sort descending.

Rank	Value	Ending Date	Missing Days
1	1.08	2021 -12 -29	0
2	2.09	1962-12-29	0
3	2.15	1939-12-29	0
4	2.29	2003-12-29	0
5	2.48	1948-12-29	0
6	2.67	1917-12-29	0
7	2.77	1879-12-29	0
8	2.82	1943-12-29	0
9	2.86	1964-12-29	0
10	2.88	1901-12-29	0
Period of record: 1872-01-01 to 2021-12-29			

Colorado Drought Classification Maps from the U.S. Drought Monitor

Wet weather during the late winter and spring months resulted in vastly improved drought conditions across North Central and Northeastern Colorado. Drought Conditions expanded eastward across the plains and worsened during the summer fall due to warm to hot temperatures and very dry weather.



May 2021 Lush Green Vegetation



Flatirons near Boulder, CO.

These photos show the stark contrast between the lush vegetation along the base of The Flatiron's in the spring to the very dry conditions in the fall.

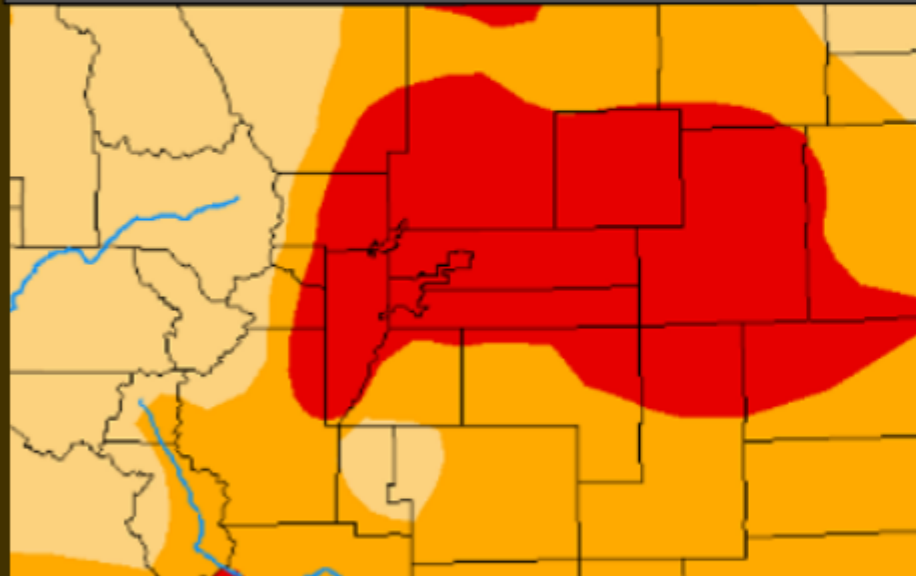
November 2021 Drought Conditions



Flatirons near Boulder, CO.

The persistent dry and breezy conditions resulted in worsening drought conditions across the Front Range Urban Corridor and Plains. During the mid morning hours of December 30th, very strong winds developed over the foothills and adjacent plains. This was the result of a mountain wave that developed as very strong westerly winds raced over the Front Range Mountains and descended down the foothills and nearby plains. The mountain wave remained nearly unchanged through the rest of the day, resulting in very persistent and extremely high winds that focused very close to the base of the foothills, along Highway 93 and points east to around Superior and at times, Louisville.

Drought Conditions Dec 28, 2021 from the U.S. Drought Monitor



Drought Classification



High Wind Reports December 30th, 2021

Arvada 115 MPH 1206 PM

Rocky Flats Hwy 93 and 72 110 MPH 1123 AM

3 SSW Boulder 108 MPH 0225 PM

2.8 NE White Ranch Open Spac 103 MPH 0126 PM

1 NE Crisman 102 MPH 1120 AM

2 NW Rocky Flats 98 MPH 1155 AM

3 NW Marshall 90 MPH 0125 PM

Glen Haven 89 MPH 0827 AM

470w014 Wadsworth 81 MPH 0348 PM

Livermore 79 MPH 0846 AM

1.7 NE Rocky Flats (CDPHE) 78 MPH 1215 PM

Boulder 75 MPH 0215 PM

Winter Park Eagle Wind 73 MPH 0345 AM

I-70 at C470 73 MPH 1224 PM

Wondervu 72 MPH 0956 AM

Atoc - Univ. Colorado Campus 71 MPH 1050 AM

Genesee 71 MPH 1212 PM

Lafayette 70 MPH 1001 AM

Lyons 3W 70 MPH 1042 AM

Longmont 68 MPH 1147 AM

Louisville 68 MPH 0200 PM

Marshall Fire – This view is from Boulder looking southeast just after noon (Credit to Twitter user @Boldmethod for research and event write-up purposes only)



At approximately at 11:41 am, The Marshall Fire started and raced quickly eastward due to the very strong winds and extremely dry grasses. By noon, some of the strongest winds from this wind event were occurring, with a peak gust of 115 mph reported at the base of the foothills, just east of the intersection of Highway 93 and Highway 72. Between 12 noon and 2 pm, the stronger winds were shifting slightly east, through all of Superior and most of Louisville. At 2 pm (plot below), a wind gust to 68 mph was recorded near Coal Creek Golf Course in Louisville, a community that would see devastation with hundreds of homes burned. The fire had already moved through much of Superior, and was spreading quickly through the Louisville area.

View of the east side of Marshall Fire. This picture was taken from Broomfield



Winds eventually calmed down through the late afternoon and evening hours, but unfortunately much of the destruction had been done.