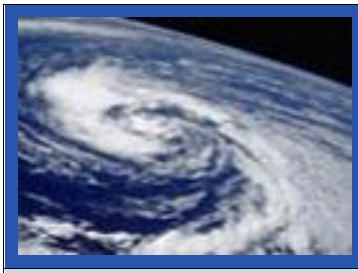


The Weather Wire

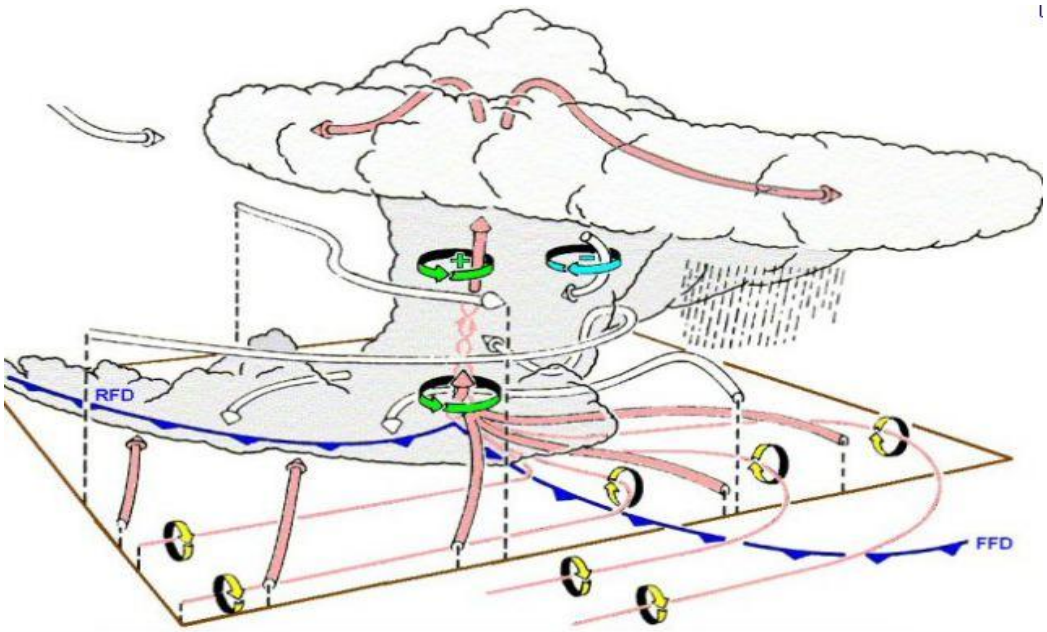
August 2011 Volume 18 Number 8

Contents:

Cloud Types Associated with Thunderstorms

Thunderstorms themselves are called cumulonimbus clouds but there are other cloud features associated with strong thunderstorms such as roll clouds, wall clouds, mammatus clouds, scud clouds, etc. During the spring and summer months when moisture is more abundant thunderstorms in the Denver Metro area can become strong and severe with cloud structures that can be misinterpreted as tornadoes. A tornado by definition is: A violently rotating column of air extending between, and in contact with, a cloud and the surface of the earth. If it does not touch the ground then it is called a funnel cloud.

In stronger storms there is a lot of wind convergence and rotation, especially near the updraft area but larger areas of rotation are not funnels nor do they necessarily mean a tornado is imminent. Below is a diagram of a "typical Thunderstorm" and the rotation associated with it:



As can be seen in the picture there are multiple areas of rotation in a storm, the air coming in rotates, the air in the updraft rotates and in the downdraft as well. The whole storm essentially rotates. These rotating thunderstorms are called super cell thunderstorms. These storms literally create a weather engine bringing in warm and moist air as fuel in the updraft area and releasing it as heavy rain, hail and cooler air in the downdraft region. All the rotation results in abnormal cloud formations which are only associated with moist, low base storms with deep moisture otherwise these cloud structures are not present with our "high based" thunderstorms that produce more wind than rain. Here is a photo of a "Roll" cloud due to thunderstorm, roll clouds can be a precursor of strong straight line winds:

This photo clearly shows the horizontal rotation going on within this roll cloud. Outflow from upstream thunderstorms (well to the right of this photo) is curling upward at its leading edge. This led to a horizontally-rotating tube, and the creation of this roll cloud.

Roll clouds typically do not result in the public reports of possible tornadoes but "Wall" clouds are often called in as they rotate under the base of the thunderstorm: This is the definition of a wall cloud: A **wall cloud** (or **pedestal cloud**) is a large, lowering, and rotating base of a cumulonimbus cloud that can potentially form tornadoes(**but not necessarily**). It is typically beneath the rain-free base (RFB) portion of a strong thunderstorm and indicates the area of primary and strongest updraft which condenses into cloud at altitudes lower than that of the ambient cloud base. Here are some pictures of wall clouds:

Figure I 2: Wall cloud. Photo - NSSL.

Wall clouds can also trigger “scud” clouds and these can often be misinterpreted as funnels or even tornadoes by untrained spotters. Scud clouds are erratically shaped clouds that are typically very near the wall cloud itself. Sorry, but we do not have a good picture of a wall cloud but below is another wall cloud with some small scud on the right. In your mind just imagine a swirling small rotor type cloud that can be sucked into the updraft and stretched and squeezed in multiple ways.

Some other cloud types associated with thunderstorms are: Mammatus Clouds

Mammatus clouds are typically found under the "anvil" of a strong, rotating thunderstorm. Below is a picture of a super cell thunderstorm with many of the cloud types above:

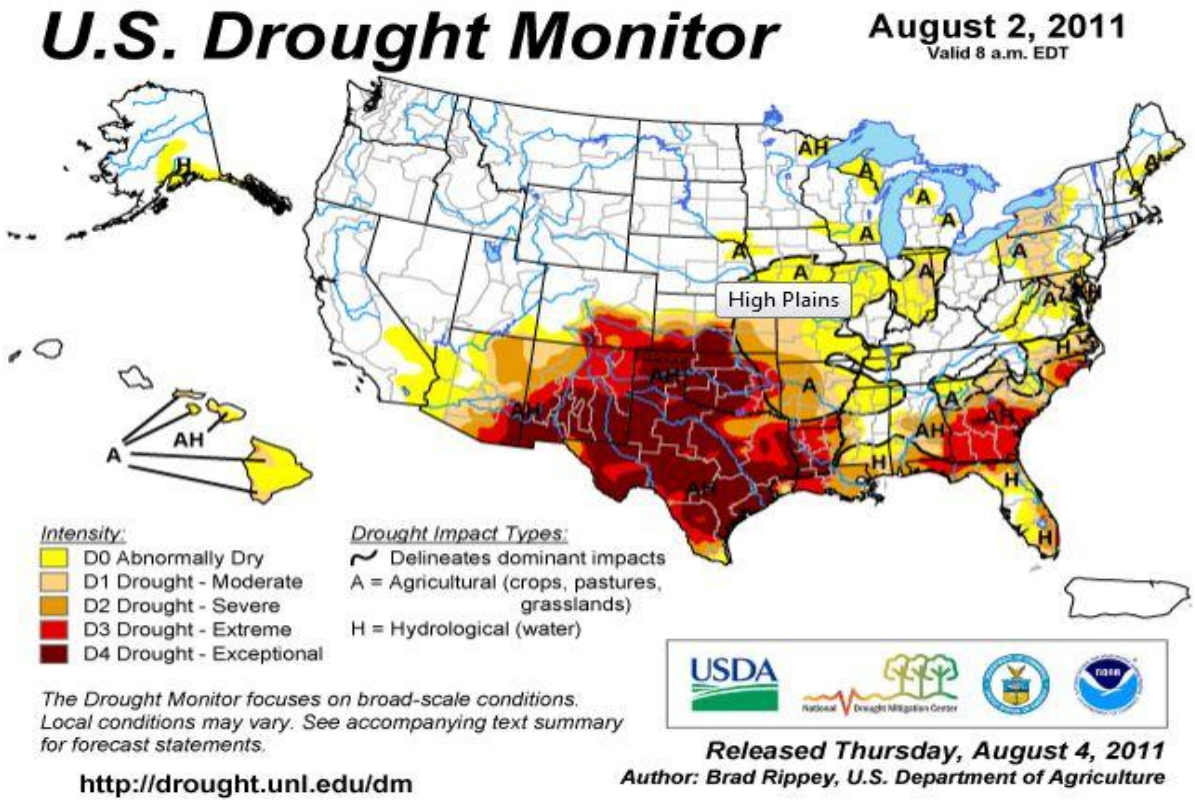
Most people know what the anvil top of a thunderstorm looks like as they are commonplace here in Colorado. Anvil clouds develop when the thunderstorm has reached maximum vertical altitude and the thunderstorm top begins to spread out and gets carried along by stronger upper level winds. There are many other interesting

cloud types and many of them can be seen here, along with the rest of the photos above: **http://www.photolib.noaa.gov/nssl/clouds1.html**

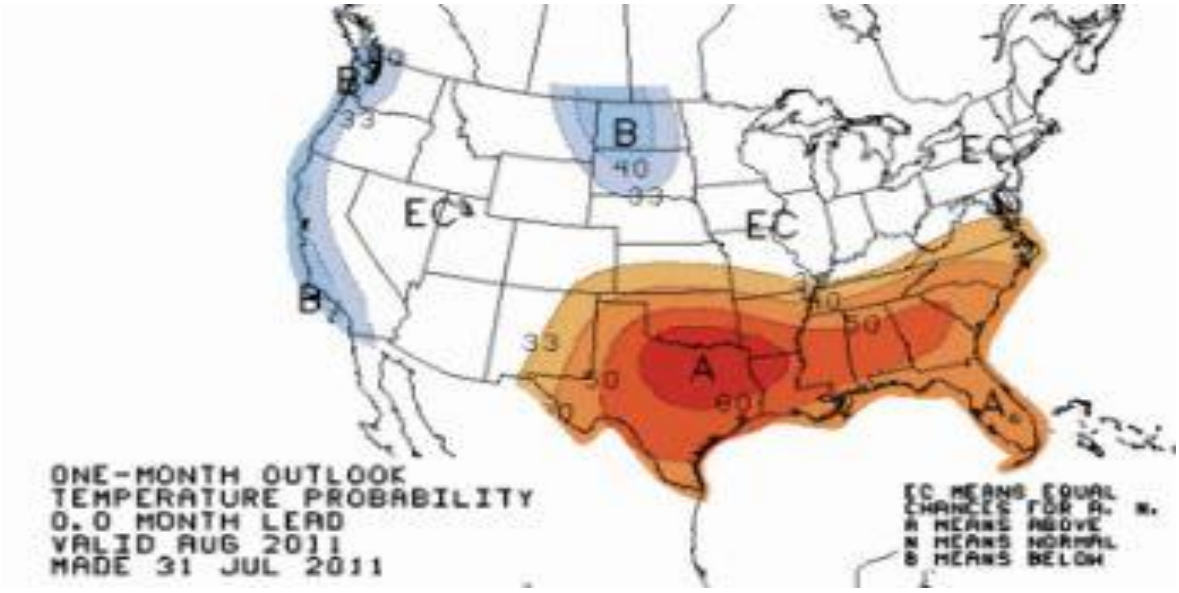
More pictures and information about weather spotting can be found at:
http://www.weather.gov/os/brochures/basicspot.pdf

Drought Update

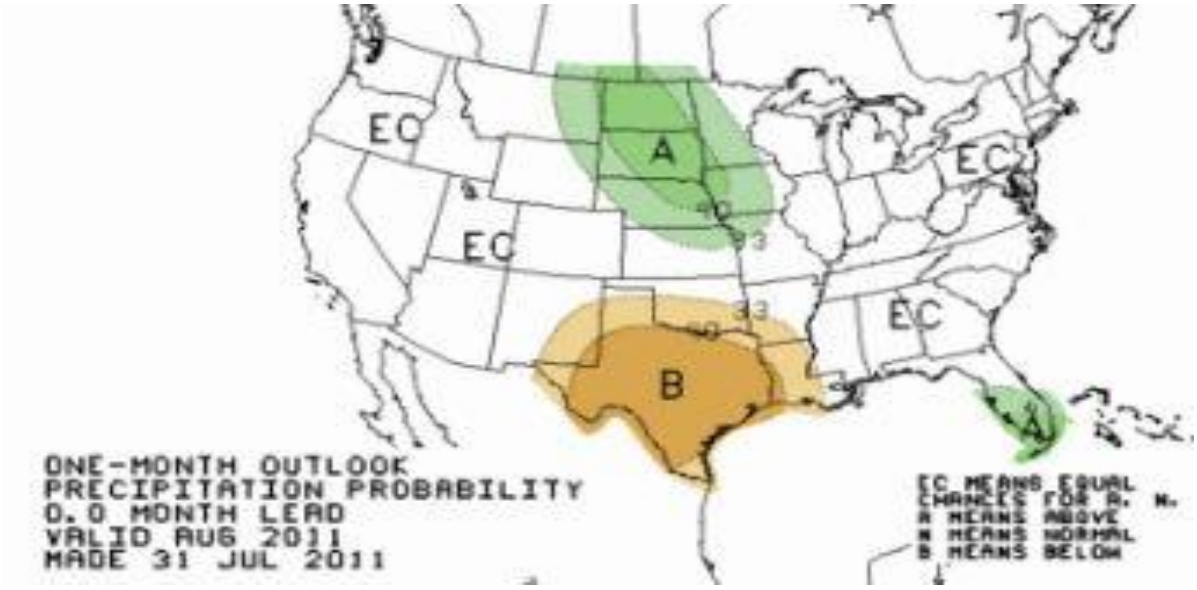
Conditions since mid August of 2010 have brought severe drought conditions to parts of southern and southeastern Colorado while other parts of the state have seen significant improvement due to above normal precipitation.



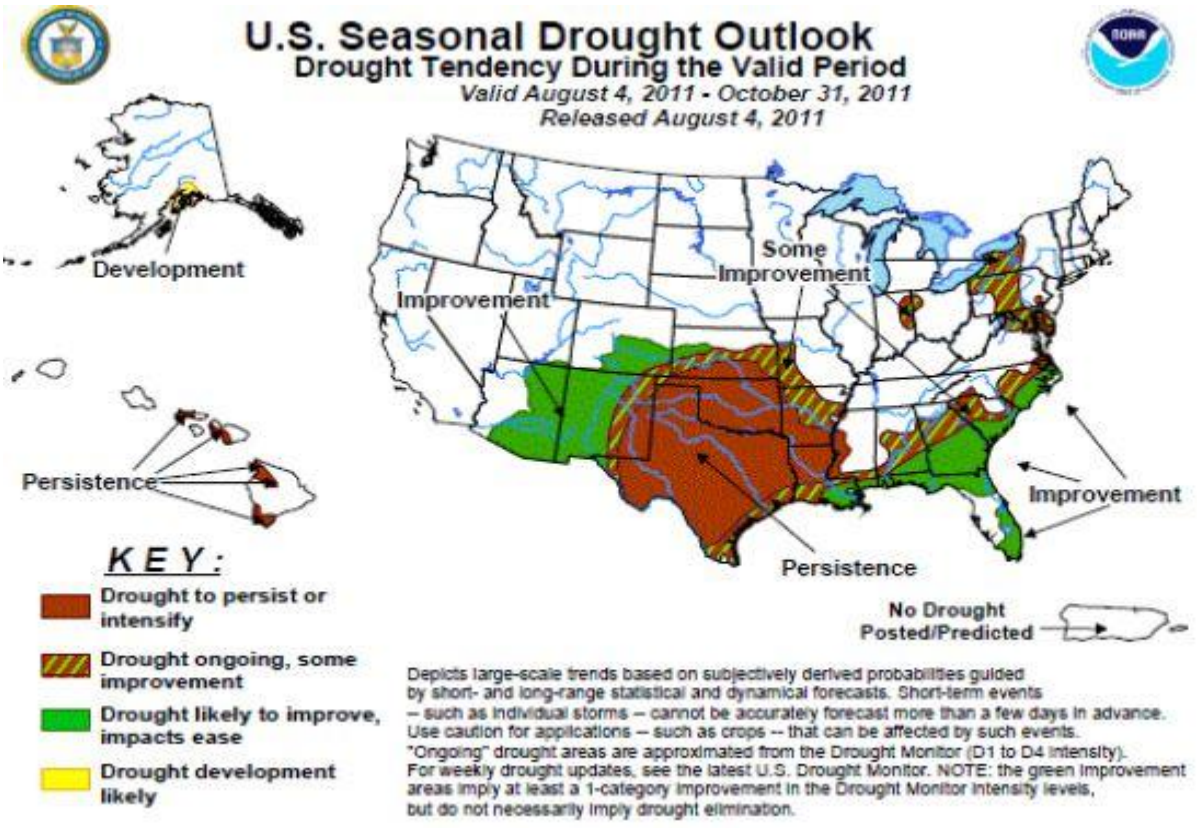
The map below shows forecasted temperature deviances for August 2011. As can be seen, normal temperatures are expected over most of the state with above normal temperatures for parts of eastern and southeastern Colorado.



The map below shows forecasted precipitation deviances for August 2011. Near normal precipitation amounts are expected across most of Colorado but as we already know many locations of NE Colorado are already at or above normal yearly precipitation currently.



Drought conditions are expected to see improvement over southeastern Colorado. Let's hope that the drought improvement in southeastern Colorado comes to fruition.



July Summary

July was the wettest July in Denver History if records were still taken at Stapleton but they are not official from that location anymore. DIA still recorded a good amount of rainfall but less than many areas in and around Denver with 3.41". Still well above the normal of 2.16" which now makes 3 months in a row with above normal precipitation. For the year to date Denver is 2.70" above normal which is a big improvement from last year at this time. Temperatures were above normal with the average high above 90 degrees and there was a streak of 17 days in a row of 90 degree temperatures from the 15th thru the 31st. There were 16 thunderstorms days which is 5 above normal. If you thought it felt humid you are right the average humidity was 50% for the month, quite high for Colorado standards.

July Stats

TEMPERATURE (IN DEGREES F)

AVERAGE MAX	91.1	NORMAL	88.0	DEPARTURE	3.1
AVERAGE MIN	60.7	NORMAL	58.7	DEPARTURE	2.0
MONTHLY MEAN	75.9	NORMAL	73.4	DEPARTURE	2.5
HIGHEST	99 on the 4th and 31st				
LOWEST	56 on the 1st				

DAYS WITH MAX 90 OR ABOVE	20	NORMAL	15
DAYS WITH MAX 32 OR BELOW	0	NORMAL	0.0
DAYS WITH MIN 32 OR BELOW	0	NORMAL	0.0
DAYS WITH MIN ZERO OR BELOW	0	NORMAL	0.0

TEMPERATURE RECORDS

No temperature records tied or broken.

HEATING DEGREE DAYS

MONTHLY TOTAL	0	NORMAL	1	DEPARTURE	-1
SEASONAL TOTAL	0	NORMAL	1	DEPARTURE	-1

COOLING DEGREE DAYS

MONTHLY TOTAL	346	NORMAL	261	DEPARTURE	85
YEARLY TOTAL	481	NORMAL	422	DEPARTURE	59

PRECIPITATION (IN INCHES)

MONTHLY TOTAL	3.41	NORMAL	2.16	DEPARTURE	1.25

YEARLY TOTAL	12.95	NORMAL	10.25	DEPARTURE	2.70
GREATEST IN 24 HOURS		1.08" on the 12th to 13th			
DAYS WITH MEASURABLE PRECIP			11		

SNOWFALL (IN INCHES)

MONTHLY TOTAL	0.0	NORMAL	0.0	DEPARTURE	0.0
SEASONAL TOTAL	0.0	NORMAL	0.0	DEPARTURE	0.0
GREATEST IN 24 HOURS		0.0"			
GREATEST DEPTH		0.0"			

WIND (IN MILES PER HOUR)

AVERAGE SPEED	9.5mph
PEAK WIND GUST	68mph from the NW

MISCELLANEOUS WEATHER

NUMBER OF DAYS WITH THUNDERSTORM	16	NORMAL	11
NUMBER OF DAYS WITH HEAVY FOG	0	NORMAL	<1
NUMBER OF DAYS WITH HAIL	4		
NUMBER OF SUNNY DAYS	6		
NUMBER OF PARTLY CLOUDY DAYS	22		
NUNMER OF CLOUDY DAYS	3		
AVERAGE RELATIVE HUMIDITY	50%		

August Preview

The thunderstorm season begins to wind down during the month of August and is typically over by the second week of September. The first few weeks of the month typically have more thunderstorm activity than the final week and a half with 8 thunderstorm days on average. Thunderstorms during August are typically slow movers with moderate and heavy rainfall with little threat of severe weather. Temperatures can still be very warm during the month of August but high temperatures begin to fall during the final two weeks. Sunshine noticeably decreases sometimes losing up to 3 minutes of light a day. Near normal precipitation is expected this month with above normal temperatures.

ENVER'S NOVEMBER CLIMATOLOGICALLY NORMAL
(NORMAL PERIOD 1971-2000)

TEMPERATURE

AVERAGE HIGH	87.2
AVERAGE LOW	57.9
MONTHLY MEAN	72.5
DAYS WITH HIGH 90 OR ABOVE	12
DAYS WITH HIGH 32 OR BELOW	0
DAYS WITH LOW 32 OR BELOW	0
DAYS WITH LOWS ZERO OR BELOW	0

PRECIPITATION

MONTHLY MEAN	1.57”
DAYS WITH MEASURABLE PRECIPITATION	9
AVERAGE SNOWFALL IN INCHES	0.0”
DAYS WITH 1.0 INCH OF SNOW OR MORE	0

MISCELLANEOUS AVERAGES

HEATING DEGREE DAYS	10
COOLING DEGREE DAYS	244
WIND SPEED (MPH)	8.0mph
WIND DIRECTION	South
DAYS WITH THUNDERSTORMS	8
DAYS WITH DENSE FOG	1
PERCENT OF SUNSHINE POSSIBLE	71%

EXTREMES

RECORD HIGH	105 on 8/8/1878
RECORD LOW	40 on 8/24 thru 8/26/1910
WARMEST	76.8 IN 1937
COLDEST	66.5 IN 1915
WETTEST	5.85” IN 1979

DRIEST	0.02” IN 1924
SNOWIEST	0.0”
LEAST SNOWIEST	0.0”

Sunrise/Sunset (July - December Denver area)

	JUL	AUG	SEP	OCT	NOV	DEC	
	sr - ss	sr - ss	sr - ss	sr - ss	sr - ss	sr - ss	
01	0535-0831	0558-0814	0627-0732	0655-0644	0728-0558	0701-0436	01
02	0536-0831	0559-0813	0628-0731	0656-0642	0729-0557	0702-0435	02
03	0536-0831	0600-0812	0629-0729	0657-0641	0730-0556	0703-0435	03
04	0537-0831	0601-0811	0630-0728	0658-0639	0731-0554	0704-0435	04
05	0537-0831	0602-0809	0631-0726	0659-0637	0733-0553	0705-0435	05
06	0538-0831	0603-0808	0632-0725	0700-0636	0634-0452	0706-0435	06
07	0538-0830	0604-0807	0633-0723	0701-0634	0635-0451	0707-0435	07
08	0539-0830	0605-0806	0634-0721	0702-0633	0636-0450	0708-0435	08
09	0540-0830	0606-0805	0635-0720	0703-0631	0637-0449	0709-0435	09
10	0540-0829	0607-0804	0636-0718	0704-0630	0638-0448	0709-0435	10
11	0541-0829	0608-0802	0637-0717	0705-0628	0639-0447	0710-0435	11
12	0542-0829	0608-0801	0637-0715	0706-0627	0641-0447	0711-0435	12
13	0542-0828	0609-0800	0638-0713	0707-0625	0642-0446	0712-0436	13
14	0543-0828	0610-0758	0639-0712	0709-0624	0643-0445	0713-0436	14
15	0544-0827	0611-0757	0640-0710	0710-0622	0644-0444	0713-0436	15
16	0545-0827	0612-0756	0641-0708	0711-0621	0645-0443	0714-0436	16
17	0545-0826	0613-0754	0642-0707	0712-0619	0646-0443	0715-0437	17
18	0546-0825	0614-0753	0643-0705	0713-0618	0647-0442	0715-0437	18
19	0547-0825	0615-0752	0644-0703	0714-0616	0648-0441	0716-0437	19
20	0548-0824	0616-0750	0645-0702	0715-0615	0650-0441	0716-0438	20
21	0549-0823	0617-0749	0646-0700	0716-0613	0651-0440	0717-0438	21
22	0549-0823	0618-0747	0647-0659	0717-0612	0652-0439	0717-0439	22
23	0550-0822	0619-0746	0648-0657	0718-0611	0653-0439	0718-0439	23
24	0551-0821	0620-0745	0649-0655	0719-0609	0654-0438	0718-0440	24

25	0552-0820	0621-0743	0650-0654	0720-0608	0655-0438	0719-0440	25
26	0553-0819	0622-0742	0651-0652	0721-0607	0656-0437	0719-0441	26
27	0554-0818	0623-0740	0652-0650	0722-0605	0657-0437	0719-0442	27
28	0555-0818	0624-0739	0653-0649	0724-0604	0658-0437	0720-0442	28
29	0556-0817	0624-0737	0654-0647	0725-0603	0659-0436	0720-0443	29
30	0556-0816	0625-0736	0655-0645	0726-0601	0700-0436	0720-0444	30
31	0557-0815	0626-0734		0727-0559		0720-0445	31

Rainfall

June 2011 to Sept 2011

City	June	July	Aug	Sept	Total
Aurora (Central)	2.09	4.88			6.97
Brighton	0.79	6.10			6.89
Broomfield	1.14	4.09			5.23
Castle Rock	1.38	2.76			4.14
Colo Sprgs Airport	0.26	4.90			5.16
Denver DIA	2.43	3.41			5.84
Denver Downtown	1.42	3.86			5.28
Golden	2.26	3.12			5.38
Fort Collins	2.20	2.12			4.32
Highlands Ranch	1.22	3.62			4.84
Lakewood	2.36	5.00			7.36
Littleton	1.46	2.32			3.78
Parker	2.76	4.65			7.41
Sedalia - Hwy 67	1.81	2.13			3.94
Thornton	0.94	4.69			5.63
Westminster	1.29	4.00			5.29
Wheatridge	1.42	4.49			5.91

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