



# *The Weather Wire*

**April 2013**

**Volume 20 Number 4**

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## **Lightning Facts and Safety**

As the atmosphere warms in the spring the storm systems that move through the state become more convective in nature producing thunderstorms. Just in the first couple days of the month there has been lightning activity in the mountains producing “thundersnow” with a few strikes over the southern Denver suburbs in late March from weak storms. The clash of the cold Canadian air masses and warm/moist air from the south in the form of a front are the usual producers of thunderstorms and potentially severe weather but daytime heating alone in an unstable air mass can also produce isolated thunderstorm activity mainly in and near the mountains. Denver averages 2 thunderstorm days during the month and although lightning is typically not the greatest weather concern in April it is time to start thinking about you lightning safety plan.

Skyview Weather has been monitoring lightning for a number of years for a wide range of clients and has produced a lightning safety class aimed at keeping people safe from lightning. For this month’s newsletter we thought we would pass along some of the information from our presentation to shed some light on how the approach to lightning safety has changed over the years and include some interesting tidbits.

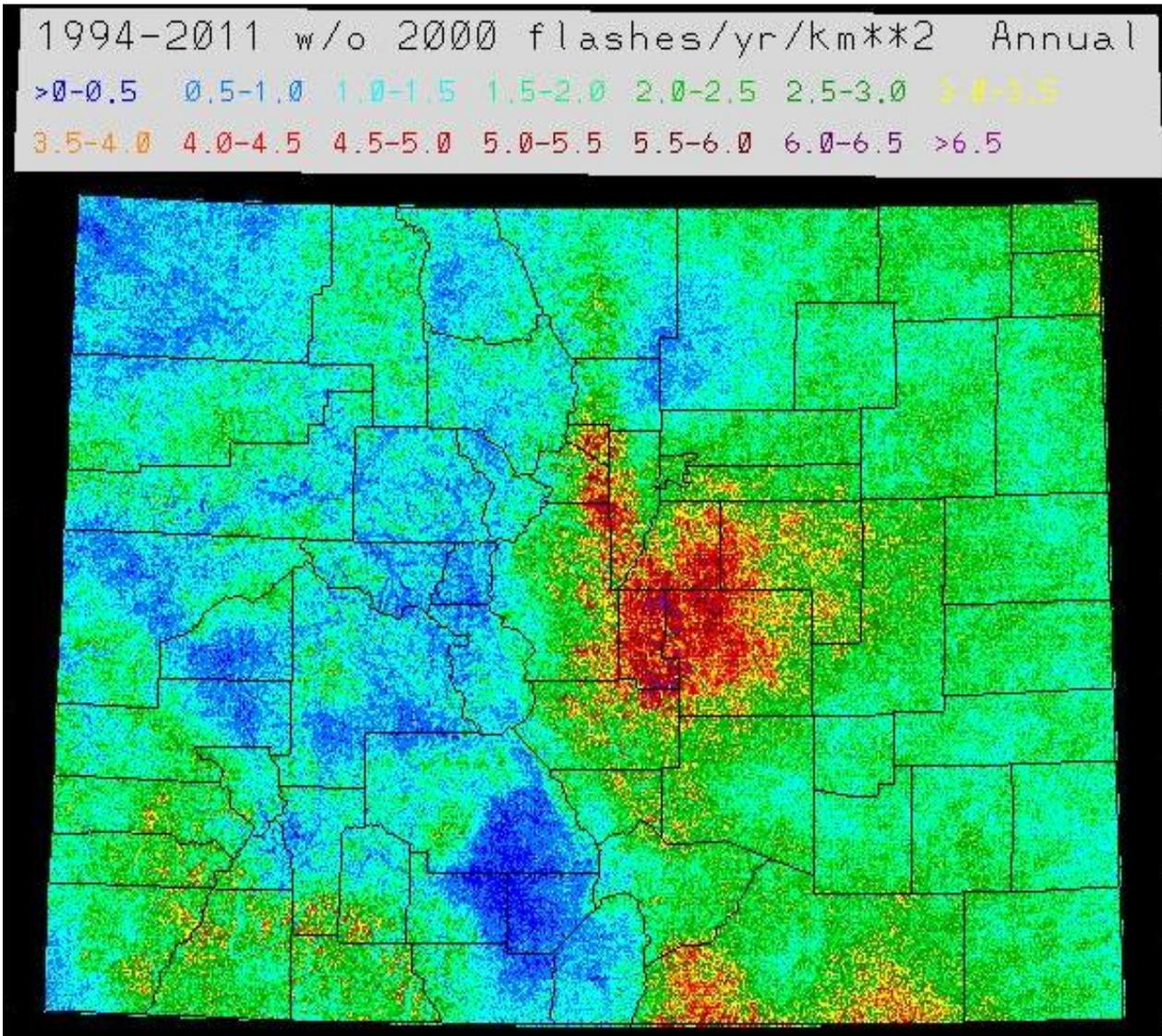
First let’s review how lightning strikes occur and why we hear thunder. As a cumulus cloud grows taller they reach a point in the atmosphere where temperatures are below freezing which results in the formation of ice crystals. This developing storm now has all three phases of water in the cloud (water(liquid), ice(solid) and water vapor(gas). The friction between the different phases of water creates a charge like rubbing your feet on the carpet but on a much larger scale. Updrafts and downdrafts create a charge separation within the cloud with the lighter ice crystals at the top of the cloud being positively charged and the larger/heavier rain drops near the bottom of the cloud being negatively charged. Electronically charged leaders then extend downward from the cloud base while electrically charged streamers are reaching upward from the ground (typically from the highest point). When the leader and streamer connect the circuit is complete and an electronic discharge (return stroke) is released which we see as a lightning strike. The return stroke can be either negative or positive in charge but negative strikes far outnumber positive strikes. Most of the lightning (80%) associated with a storm occurs

within the cloud itself and the cloud-to-cloud strikes often precede cloud-to-ground strikes. When lightning discharges it heats the air around it so rapidly that a shock wave is created by the expanding air which we hear as thunder. The time it takes from when you see the strike (speed of light) until you hear the thunder (speed of sound) can tell you how far away the lightning strike was. It is the difference between the speed of light and the speed of sound that allows us to make an estimate on how far away the lightning is. Thunder (the speed of sound) travels at about 1 mile in 5 seconds. The rule of thumb is if you can count to 30 before hearing the thunder the lightning is within 6 miles and time to seek shelter.

Some interesting lightning facts:

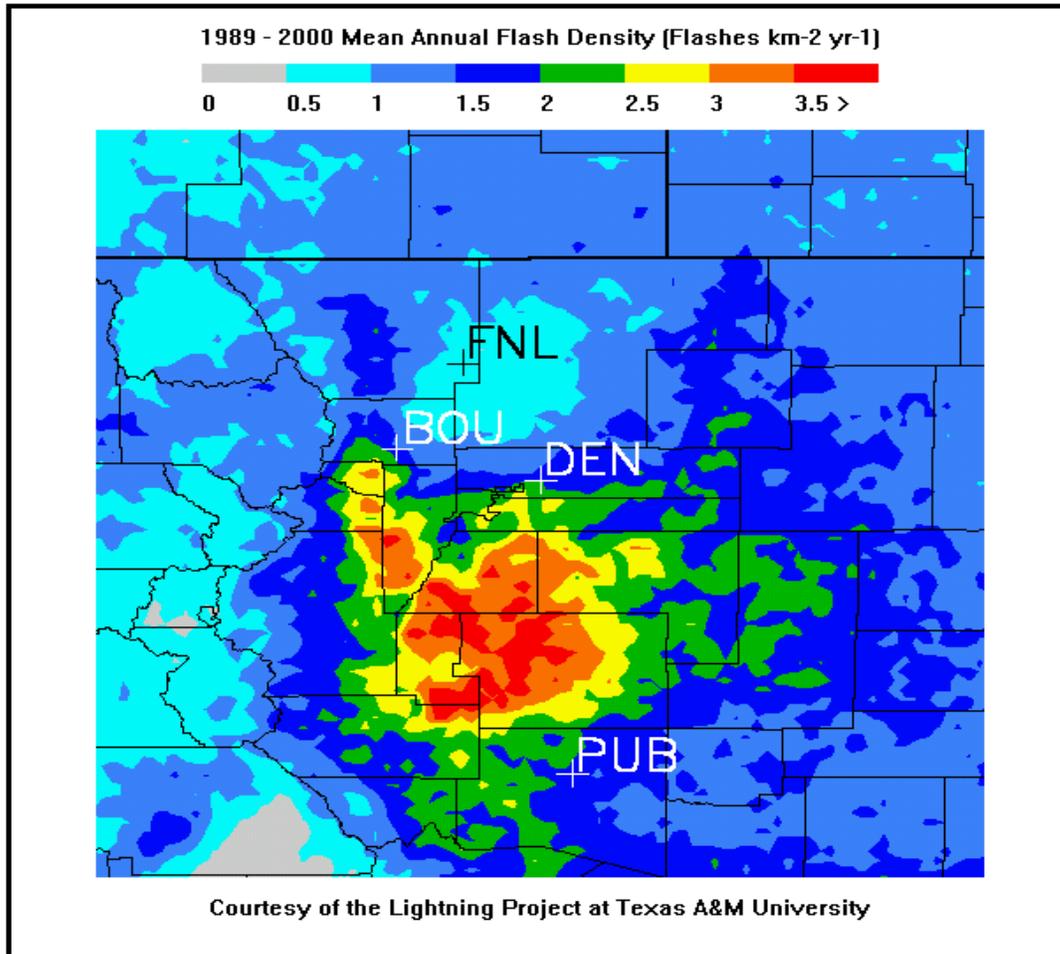
1. Every thunderstorm has lightning, by definition if no lightning, not a thunderstorm!
2. There are more than 40 million lightning strikes each year in the US, with more than 71 fatalities per year (1972 –2001).
3. Florida leads the nation in lightning deaths, but when population taken into account, the Rocky Mountain states have the leading number of lightning fatalities and injuries.
4. 1 Injury is reported for every 86,000 lightning flashes, with 1 fatality for every 345,000 flashes. The US Average per million flashes is 7.7 casualties.
5. Colorado is ranked 11<sup>th</sup> in the U.S. for fatalities and 10<sup>th</sup> in the U.S. for injuries.
6. 95 persons were killed in Colorado between 1959 and 1994 while 299 were injured.
7. On average 2.7 persons are killed in Colorado and 8.5 persons were injured on a yearly basis in Colorado.
8. It is felt that both lightning fatalities and lightning injuries are most likely under reported.

Below is a lightning density map for the entire state of Colorado and can be found on the web at Colorado's Lightning Resource Page at: <http://www.crh.noaa.gov/pub/ltg.php>

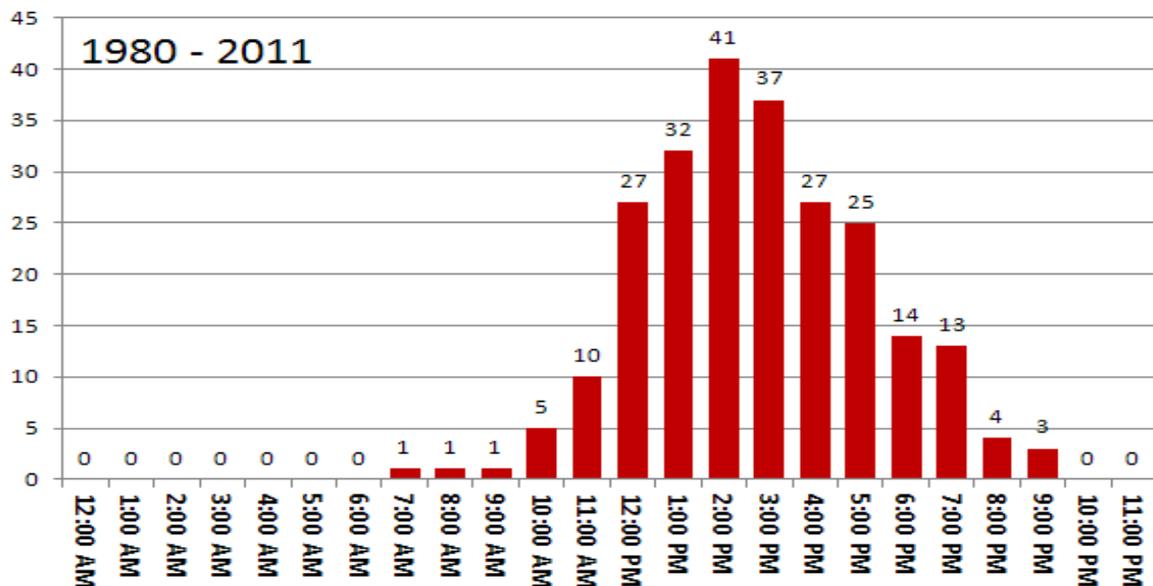


Notice the highest lightning density is from roughly from around Pikes Peak into the Front Range foothills and extends eastward over the Palmer Divide. Many people may have thought that the highest lightning density was limited to the mountains but in fact the mountains actually receive less lightning on an annual basis than areas such as Colorado Springs, Castle Rock and Aurora. Below is another map focusing on the northeastern part of the state:

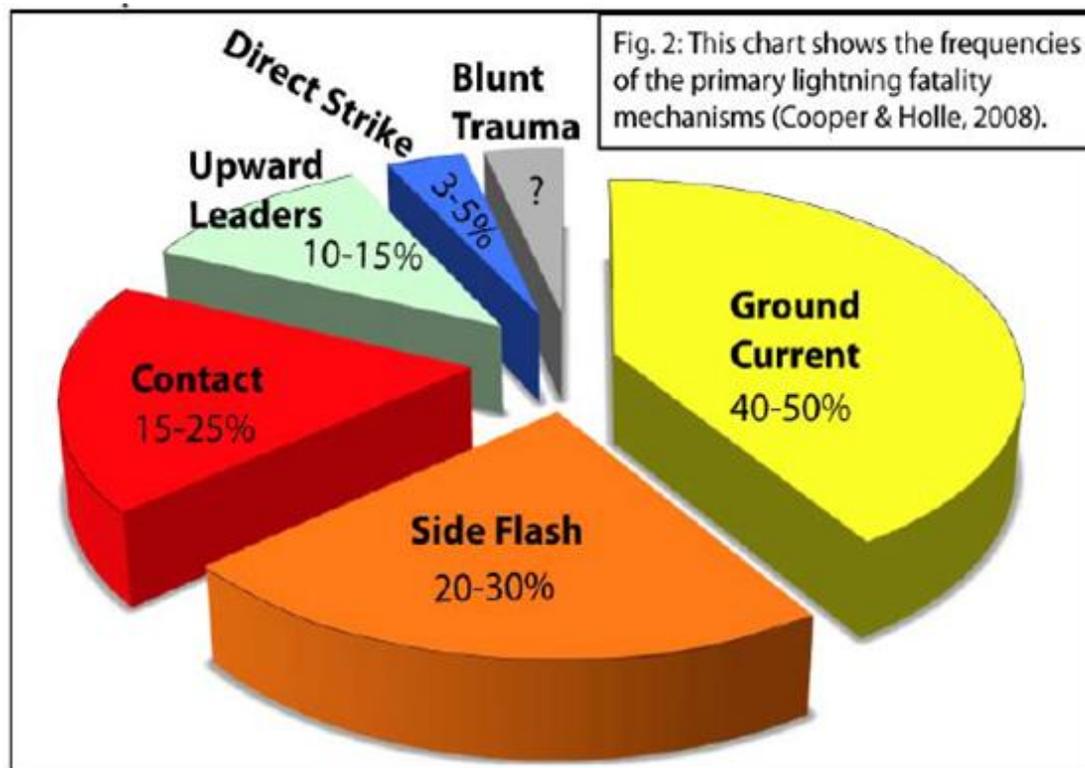
# NORTHEAST COLORADO



Lightning season begins in April peaking in July and August and coming to an end by the end of September. Lightning activity peaks in the afternoon hours when storms are most numerous. Below is a graph showing at what time of day lightning casualties occurred from 1980-2011:



It used to be thought that the direct strike was the leading cause of lightning fatalities but through ongoing research it has been found that ground current and side flashes actually do more harm than a direct strike. Below is a pie chart showing that direct strikes only account for only 3-5% of fatalities.



The most significant change in how people are approaching lightning safety currently is acknowledging the fact that the direct strike is not the main cause of injury or death from a direct lightning strike and concentrating more on how to lower the risk from ground current, side strikes and contact or touch voltage.

Ground current occurs with each strike and results in roughly 40-50% of all lightning fatalities. The high voltage from the strike itself is not the problem it is the difference in voltage between both feet or arms that is the main concern. The difference in voltage is determined by the distance of feet/arms apart and conductance. It is the difference in voltage between one foot/arm that drives the electrical current through us. The way to lessen the electrical current that passes through the body is to keep hand and feet close together and to not come into contact with highly conductive materials. The side flash is exactly that as a piece of the main strike arcs into another object. When lightning strikes a tree or other object the main current follows the tree trunk to the ground but some current may arc across the air to another path of least resistance which could be you! Touch or contact voltage occurs when we touch an electrified object such as a fence, train tracks, a corded telephone, wet ropes, field goal uprights, extended tape measure, etc... The return stroke or "direct strike" is the most significant electrical event of each lightning strike but accounts for only around 5% of all fatalities. If you are directly struck that means the stepped leader connected with a streamer coming out of your body then the return stroke passed through you or over your body's surface.

Lightning safety tips:

1. Always plan ahead, keep eye to sky.
2. Postpone activities ahead of thunderstorms.
3. Try to be the lowest point, even if you are only slightly higher than surrounding terrain your chances for being struck increase.
4. Use 30 second rule.
5. Go to safe location. (Inside a building, inside a car, etc.) Avoid dangerous locations. (sides of buildings, under a tree, etc.)
6. Avoid conductors (wet ropes, railings, sides of buildings) keep feet close together.
7. If all else fails use the safety crouch (instead of hands on knees in picture below you will want to use your hands to cover your head):



By using common sense and giving yourself enough time to take the necessary precautions lightning safety can be greatly increased. Don't wait for somebody else to take the lead in lightning safety take it upon yourself to keep your friends and family safe this summer and enjoy the outdoor beauty and recreation Colorado has to offer!



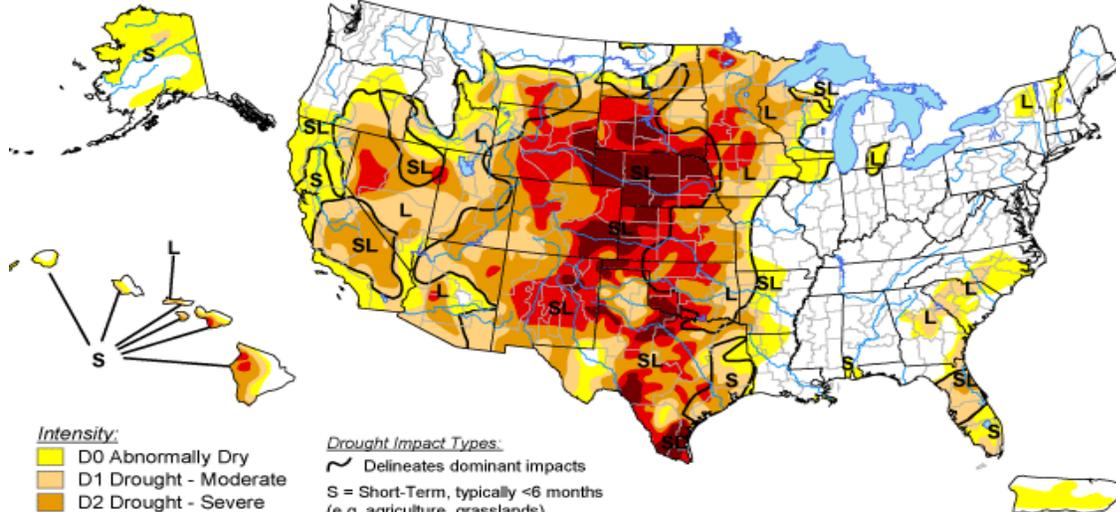
## Drought Update

Severe, extreme and exceptional drought continues over the central part of the US from South Dakota to Texas extending westward into Colorado. The NW and along and east of the Mississippi River including the east Coast continue to be relatively drought free.

# U.S. Drought Monitor

March 26, 2013

Valid 7 a.m. EDT



**Intensity:**

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

**Drought Impact Types:**

- Delineates dominant impacts
- S = Short-Term, typically <6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months (e.g. hydrology, ecology)

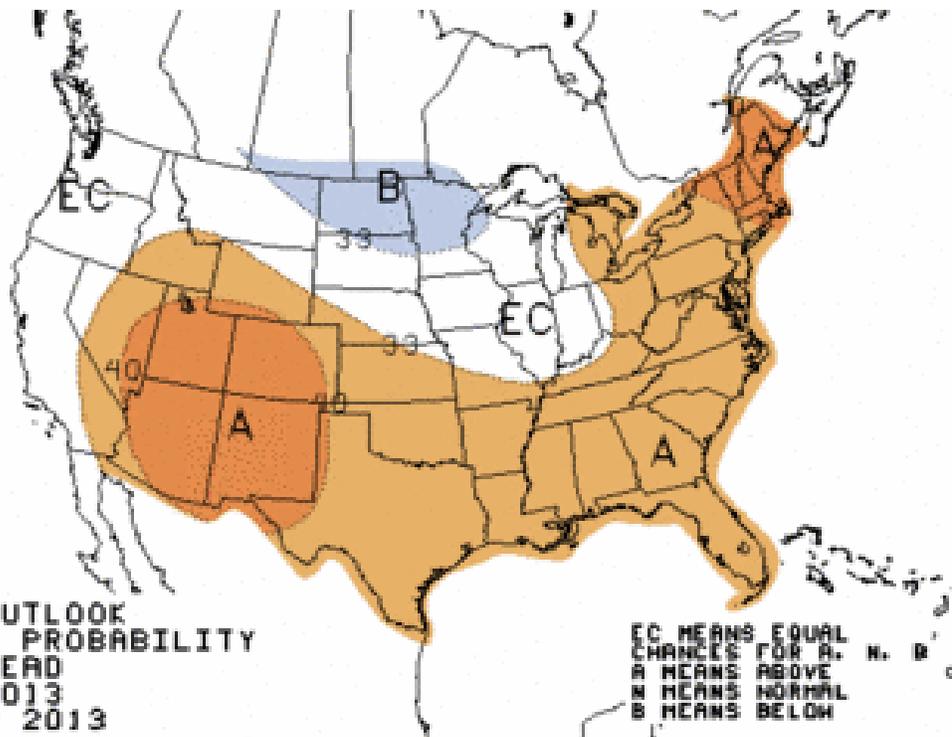
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://droughtmonitor.unl.edu/>



Released Thursday, March 28, 2013  
 Author: Anthony Artusa, NOAA/NWS/NCEP/CPC

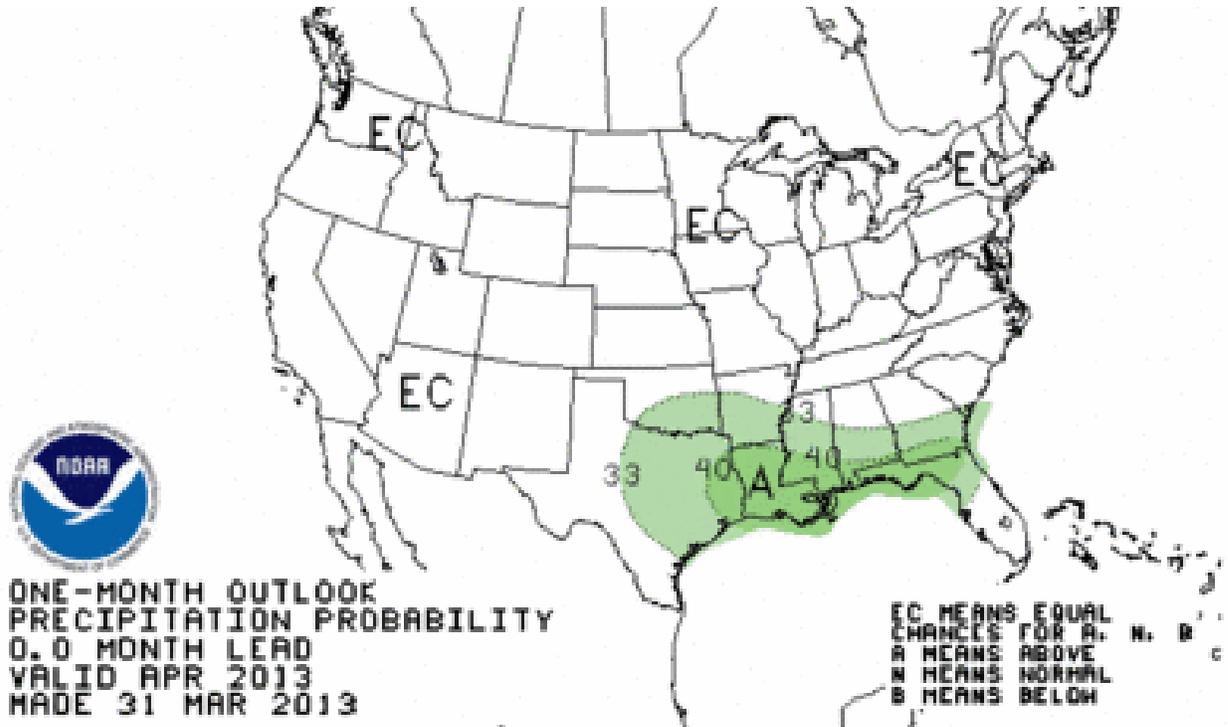
The map below shows forecasted temperature deviances for April 2013. Above normal to temperatures are forecast for April in Colorado.



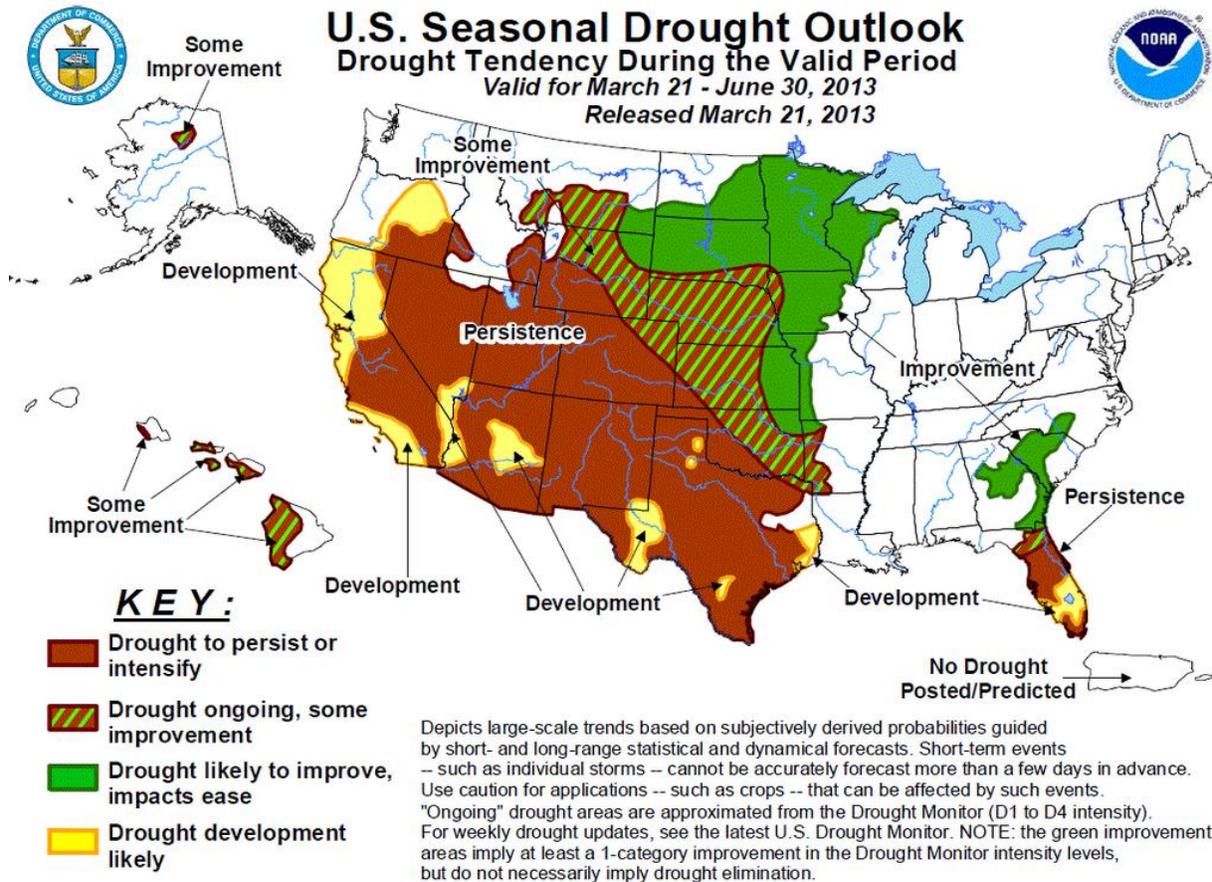
ONE-MONTH OUTLOOK  
 TEMPERATURE PROBABILITY  
 0.0 MONTH LEAD  
 VALID APR 2013  
 MADE 31 MAR 2013

EC MEANS EQUAL CHANCES FOR A, N, B  
 A MEANS ABOVE  
 N MEANS NORMAL  
 B MEANS BELOW

The map below shows forecasted precipitation deviances for April 2013. Near normal precipitation is likely over the state of Colorado.



Drought conditions are forecast to persist over much of Colorado but there could be some improvement over the far NE plains.



## March Summary

Above normal precipitation and below normal temperatures from February continued through the month of March. Average high temperatures were 50.7 degrees with average lows at 24.6 degrees. Both high and low temperatures were below normal resulting in a monthly mean temperature of 37.7 degrees, 2.7 degrees below the normal of 40.4 degrees. The highest temperature of the month was a record setting 76 on the 15<sup>th</sup> with a low temperature of 2 on the 25<sup>th</sup> producing a temperature spread of 74 degrees. There were 3 days where the high temperature did not exceed freezing and 24 days with a temperature at or below freezing. The weather pattern was active with 4 storms producing 2" or more and 3 storms producing 4" or more and 1 storm producing more than 10". At DIA there was 2" reported on the 4<sup>th</sup>, 5.4" on the 9<sup>th</sup>, 4.4" on the 11-12<sup>th</sup>, 11.6" on the 22-23<sup>rd</sup> and 0.1" on the 24-25<sup>th</sup>. The total for the month of 23.5" was 12.8" above the normal of 10.7". For the year now DIA has tallied 54.6" of snow compared to 45.8" on average which is 8.8" above normal for the season so far! Moisture for the month totaled 1.47" which resulted in a 16" snow to 1" moisture ratio for the month which is relatively high for March standards. The 1.47" of moisture is 0.55" above the normal of 0.92" for March and increases the precipitation for the year so far to 2.55", 0.85" above normal. Overall, March of 2013 was just what the doctor ordered as long duration drought has plagued much of eastern Colorado. The above normal precipitation of February and March does not even come close to alleviating the drought conditions but it is a start in the right direction. It will take many months of above normal precipitation to make up the moisture deficit and more importantly our snowpack in the mountains is below normal(75-80% of normal) and that is the moisture that feeds our major rivers and streams in the state. The higher moisture months of April, May, June, July and August will make or break our year as far as precipitation goes over the plains. Hopefully Mother Nature can provide timely rains over the plains this spring and summer lowering the need to pull water stored in our reservoirs.

## March Stats

### TEMPERATURE (IN DEGREES F)

AVERAGE MAX	50.7	NORMAL 54.4	DEPARTURE -3.7
AVERAGE MIN	24.6	NORMAL 26.4	DEPARTURE -1.8
MONTHLY MEAN	37.7	NORMAL 40.4	DEPARTURE -2.7
HIGHEST	76 on the 15 <sup>th</sup>		
LOWEST	2 on the 25 <sup>th</sup>		

DAYS WITH MAX 90 OR ABOVE	0	NORMAL	0
DAYS WITH MAX 32 OR BELOW	3	NORMAL	2
DAYS WITH MIN 32 OR BELOW	24	NORMAL	24
DAYS WITH MIN ZERO OR BELOW	0	NORMAL	0

### TEMPERATURE RECORDS

New record high of 76 on the 15<sup>th</sup>

## HEATING DEGREE DAYS

MONTHLY TOTAL	840	NORMAL 763	DEPARTURE 77
SEASONAL TOTAL	5112	NORMAL 5202	DEPARTURE -90

## COOLING DEGREE DAYS

MONTHLY TOTAL	0	NORMAL 0	DEPARTURE 0
YEARLY TOTAL	0	NORMAL 0	DEPARTURE 0

## PRECIPITATION (IN INCHES)

MONTHLY TOTAL	1.47	NORMAL 0.92	DEPARTURE 0.55
YEARLY TOTAL	2.55	NORMAL 1.70	DEPARTURE 0.85
GREATEST IN 24 HOURS	0.43" on 2/24		
DAYS WITH MEASURABLE PRECIP.	6		

## SNOWFALL (IN INCHES)

MONTHLY TOTAL	23.5	NORMAL 10.7	DEPARTURE 12.8
SEASONAL TOTAL	54.6	NORMAL 45.8	DEPARTURE 8.8
GREATEST IN 24 HOURS	6.2" on 3/23		
GREATEST DEPTH	NA		

## WIND (IN MILES PER HOUR)

AVERAGE SPEED	10.1mph
PEAK WIND GUST	47mph from the West

## MISCELLANEOUS WEATHER

NUMBER OF DAYS WITH THUNDERSTORM	0	NORMAL	0
NUMBER OF DAYS WITH HEAVY FOG	4	NORMAL	1
NUMBER OF DAYS WITH HAIL	0		
NUMBER OF SUNNY DAYS	2		
NUMBER OF PARTLY CLOUDY DAYS	20		
NUMBER OF CLOUDY DAYS	9		
AVERAGE RELATIVE HUMIDITY	53%		

## April Preview

April showers bring May flowers is the saying for many in the US but here in Colorado it can still snow any day of the month and the saying might as well be, "April snows bring May lawn mows." There will certainly be some rain during the month and many times below 7,000' as storm may begin as rain or even a thunderstorm but quite often will end as "wet" snow. The average snowfall for April is 6.8" and believe it or not it is the 5<sup>th</sup> snowiest month of the year. The snowiest April on record was in 1933 with 33.8" of snow reported and there are only 4 years in Denver history with no snow at all during the month with the last occurrence in 1992. Many times the snow will accumulate on grassy surfaces only due to a warming ground leaving roadways just wet but there can be colder storms producing temperatures in the single digits and even below zero as the record low for the month is -2 degrees. The chances for temperatures in the single digits and teens decrease significantly after the first 2 weeks. The average high temperature to start the month is 58 degrees and is 66 by month's end. Normal low temperatures begin at 30 degrees and warm to 37 degrees. The monthly mean temperature is 47.4 degrees, 7 degrees warmer than March. There are many days with temperatures in the 70's and even 80's with a record high of 90 degrees set back on the last day of the month in 1992. Although many gardeners may have gotten away with planting early last year it is typically not safe to plant tender vegetation outside until the first week or two of May and even later for higher elevations. Hardier plants such as onions, potatoes, broccoli and cabbage can usually be planted in April without any worry. The trees will begin to leaf out during the month and if a late season snow does occur it can damage the vegetation by breaking limbs or freezing the fresh foliage. Precipitation is typical about 1 out of every 3 days during the month with 9 days producing measureable precipitation. Total monthly precipitation for April is 0.79" higher than March at 1.71". There are typically 2 thunderstorm days during the month and severe weather can occur over the eastern plains but would be rare west of I-25. The wettest April on record was back in 1900 when 8.24" was reported. April of 2013 is expected to be near normal in precipitation and slightly above normal in temperature. Snowfall is expected to be slightly below normal with 1-3 measureable snow events.

### DENVER'S MARCH CLIMATOLOGICALLY NORMAL (NORMAL PERIOD 1981-2010 DIA Data)

#### TEMPERATURE

AVERAGE HIGH	61.5
AVERAGE LOW	33.3
MONTHLY MEAN	47.4
DAYS WITH HIGH 90 OR ABOVE	0
DAYS WITH HIGH 32 OR BELOW	0
DAYS WITH LOW 32 OR BELOW	13
DAYS WITH LOWS ZERO OR BELOW	0

#### PRECIPITATION

MONTHLY MEAN	1.71"
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DAYS WITH MEASURABLE PRECIPITATION	9
AVERAGE SNOWFALL IN INCHES	6.8"
DAYS WITH 1.0 INCH OF SNOW OR MORE	NA

### **MISCELLANEOUS AVERAGES**

HEATING DEGREE DAYS	529
COOLING DEGREE DAYS	1
WIND SPEED (MPH)	10.0mph
WIND DIRECTION	South
DAYS WITH THUNDERSTORMS	2
DAYS WITH DENSE FOG	1
PERCENT OF SUNSHINE POSSIBLE	67%

### **EXTREMES**

RECORD HIGH	90 on 4/30/1992
RECORD LOW	-2 on 4/2/1975
WARMEST	56.4 in 1946, 1981
COLDEST	38.8 in 1920
WETTEST	8.24" in 1900
DRIEST	0.03" in 1963
SNOWIEST	33.8" in 1933
LEAST SNOWIEST	0.0" in 1888, 1930, 1943, 1992

## Sunrise/Sunset (July - December Denver area)

	JAN	FEB	MAR	APR	MAY	JUN	
	<b>SR - SS</b>						
01	0720-0445	0706-0517	0631-0550	0642-0722	0559-0752	0532-0820	01
02	0720-0446	0705-0518	0630-0551	0641-0723	0558-0753	0532-0821	02
03	0720-0447	0704-0520	0628-0552	0639-0724	0556-0754	0532-0822	03
04	0720-0448	0703-0521	0627-0553	0637-0725	0555-0755	0531-0823	04
05	0720-0449	0702-0522	0625-0554	0636-0726	0554-0756	0531-0823	05
06	0720-0449	0701-0523	0624-0555	0634-0727	0553-0757	0531-0824	06
07	0720-0450	0700-0524	0622-0556	0633-0728	0552-0758	0531-0824	07
08	0720-0451	0659-0526	0621-0557	0631-0729	0551-0759	0530-0825	08
09	0720-0452	0658-0527	0619-0558	0630-0730	0550-0800	0530-0826	09
10	0719-0453	0657-0528	0717-0700	0628-0731	0549-0801	0530-0826	10
11	0719-0454	0656-0529	0716-0701	0627-0732	0548-0802	0530-0827	11
12	0719-0456	0654-0530	0714-0702	0625-0733	0547-0803	0530-0827	12
13	0719-0457	0653-0532	0713-0703	0624-0734	0546-0804	0530-0828	13
14	0718-0458	0652-0533	0711-0704	0622-0735	0545-0805	0530-0828	14
15	0718-0459	0651-0534	0710-0705	0621-0736	0544-0806	0530-0828	15
16	0717-0500	0649-0535	0708-0706	0619-0737	0543-0807	0530-0829	16
17	0717-0501	0648-0536	0706-0707	0618-0738	0542-0808	0530-0829	17
18	0717-0501	0647-0537	0705-0708	0616-0739	0541-0809	0530-0829	18
19	0716-0502	0645-0539	0703-0709	0615-0740	0540-0810	0530-0830	19
20	0715-0503	0644-0540	0702-0710	0613-0741	0540-0811	0531-0830	20
21	0715-0504	0643-0541	0700-0711	0612-0742	0539-0812	0531-0830	21
22	0714-0505	0641-0542	0658-0712	0611-0743	0538-0812	0531-0830	22
23	0714-0507	0640-0543	0657-0713	0609-0744	0537-0813	0531-0831	23
24	0713-0508	0639-0544	0655-0714	0608-0745	0537-0814	0532-0831	24
25	0712-0509	0637-0545	0653-0715	0606-0746	0536-0815	0532-0831	25
26	0711-0510	0636-0546	0652-0716	0605-0747	0535-0816	0532-0831	26
27	0711-0511	0634-0548	0650-0717	0604-0748	0535-0817	0533-0831	27
28	0710-0513	0633-0549	0649-0718	0603-0749	0534-0817	0533-0831	28
29	0709-0514		0647-0719	0601-0750	0534-0818	0533-0831	29
30	0708-0515		0645-0720	0600-0751	0533-0819	0534-0831	30
31	0707-0516		0644-0721		0533-0820		31

# Snowfall

## Oct 2012 to Apr 2013

City	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total
Aurora (Central)	4.7	1.0	5.6	2.8	9.9	17.3		41.3
Brighton	5.6	3.0	2.0	3.3	12.8	18.6		45.3
Broomfield	5.9	2.0	4.8	4.2	10.7	21.5		49.1
Castle Rock	4.0	0.2	10.8	2.1	16.1	17.5		50.7
Colo Sprgs Airport	Trace	0.3	5.4	3.1	10.6	4.1		23.5
Denver DIA	5.5	1.7	5.2	4.6	14.1	23.5		54.6
Denver Downtown	4.8	0.7	4.9	3.1	15.2	20.8		49.5
Golden	5.8	1.4	10.7	4.5	21.3	26.6		70.3
Fort Collins	4.5	0.4	5.8	2.6	10.6	11.2		35.1
Highlands Ranch	4.9	1.2	11.3	4.9	21.7	22.9		66.9
Lakewood	4.9	1.0	5.8	4.0	14.1	15.0		44.8
Littleton	4.5	1.5	10.3	4.2	19.0	19.0		58.5
Parker	3.8	2.0	9.1	2.8	17.5	16.8		52.0
Sedalia - Hwy 67	4.0	TR	10.0	2.0	21.0	11.0		48.0
Thornton	6.2	2.0	4.5	3.6	14.6	27.3		58.2
Westminster	5.2	2.0	6.1	4.0	16.1	24.0		57.4
Wheat Ridge	4.4	1.3	5.7	4.5	16.8	21.0		53.7

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