

# *The Weather Wire*

**August 2015**

**Volume 22 Number 8**

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## **Lightning Safety Discussion**

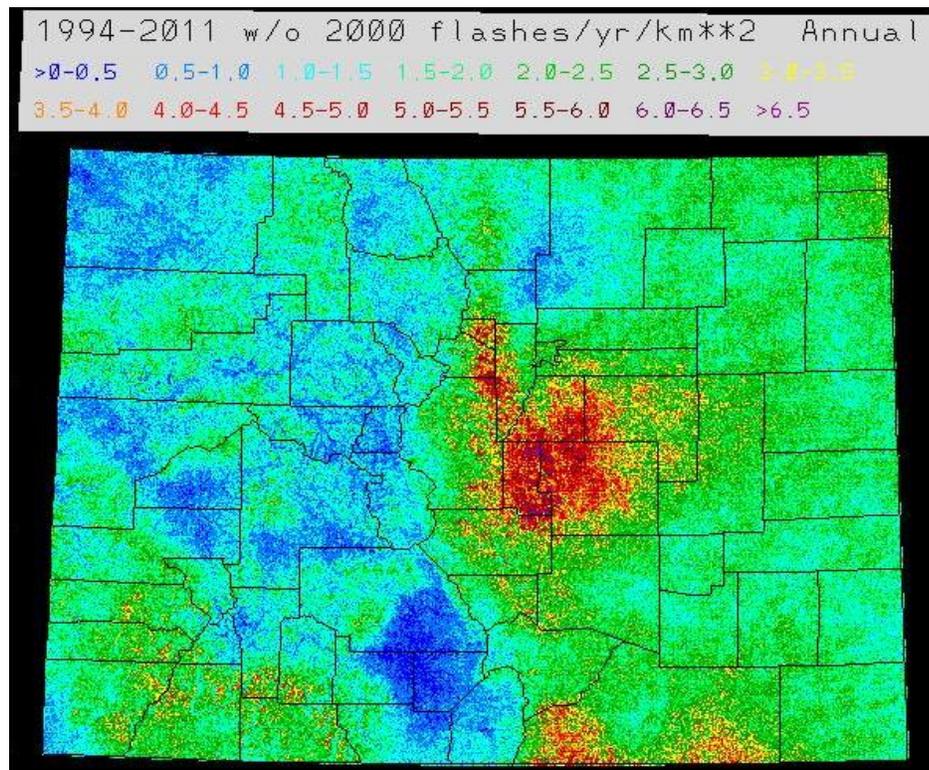
Lightning has been in the news frequently as of late with numerous lightning related injuries and fatalities in the state of Colorado. Many of these lightning strikes are occurring above tree line where there is literally no place to hide... With all of the outdoor recreation Colorado has to offer and the number of thunderstorms we endure each year it is always good to review some lightning safety tips. Over the years the approach to lightning safety has changed. Below are some interesting tidbits on lightning and how to keep yourself safe from electricity producing storms(thunderstorms).

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:

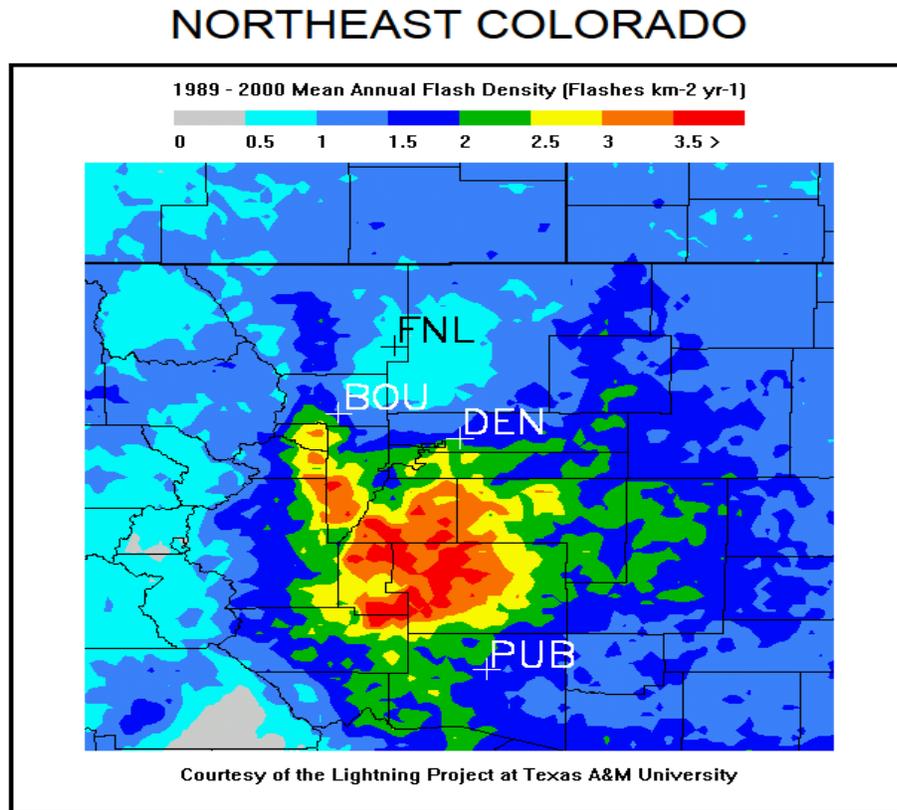
1. Every thunderstorm has lightning, by definition if no lightning, not a thunderstorm!
2. There are more than 40 million lightning strikes each year in the US, with more than 71 fatalities per year (1972 –2001).
3. Florida leads the nation in lightning deaths, but when population taken into account, 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>

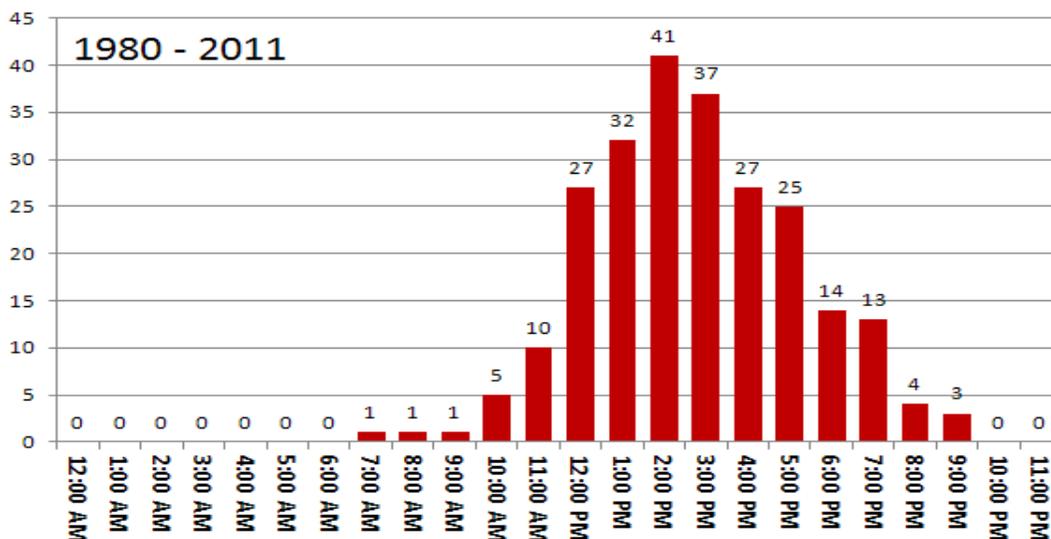


Notice the highest lightning density is from roughly from around Pikes Peak into the Front Range foothills and extends eastward over the Palmer Divide. Many people may have thought that the highest lightning density was limited to the mountains but in fact the mountains actually receive less lightning 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:

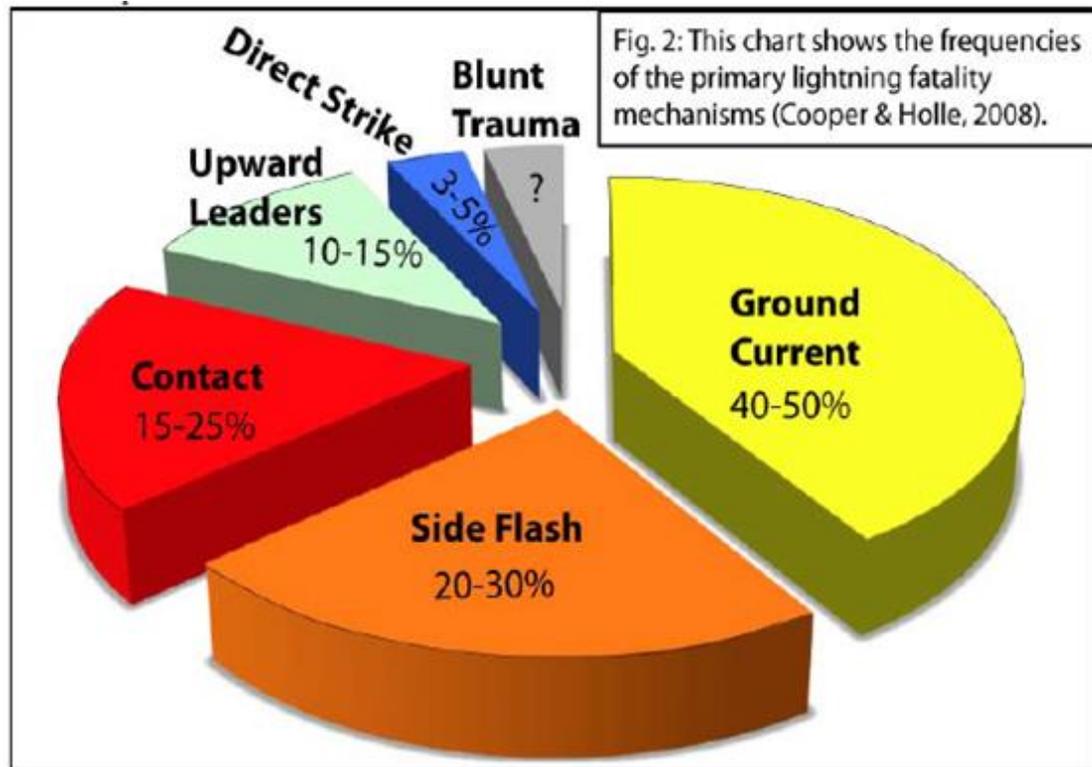


Lightning season begins in April peaking in July and August and coming to an end by the end of September. Lightning activity peaks in the afternoon hours when storms are most numerous. Below is a graph showing at what time of day lightning casualties occurred from 1980-2011:



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.

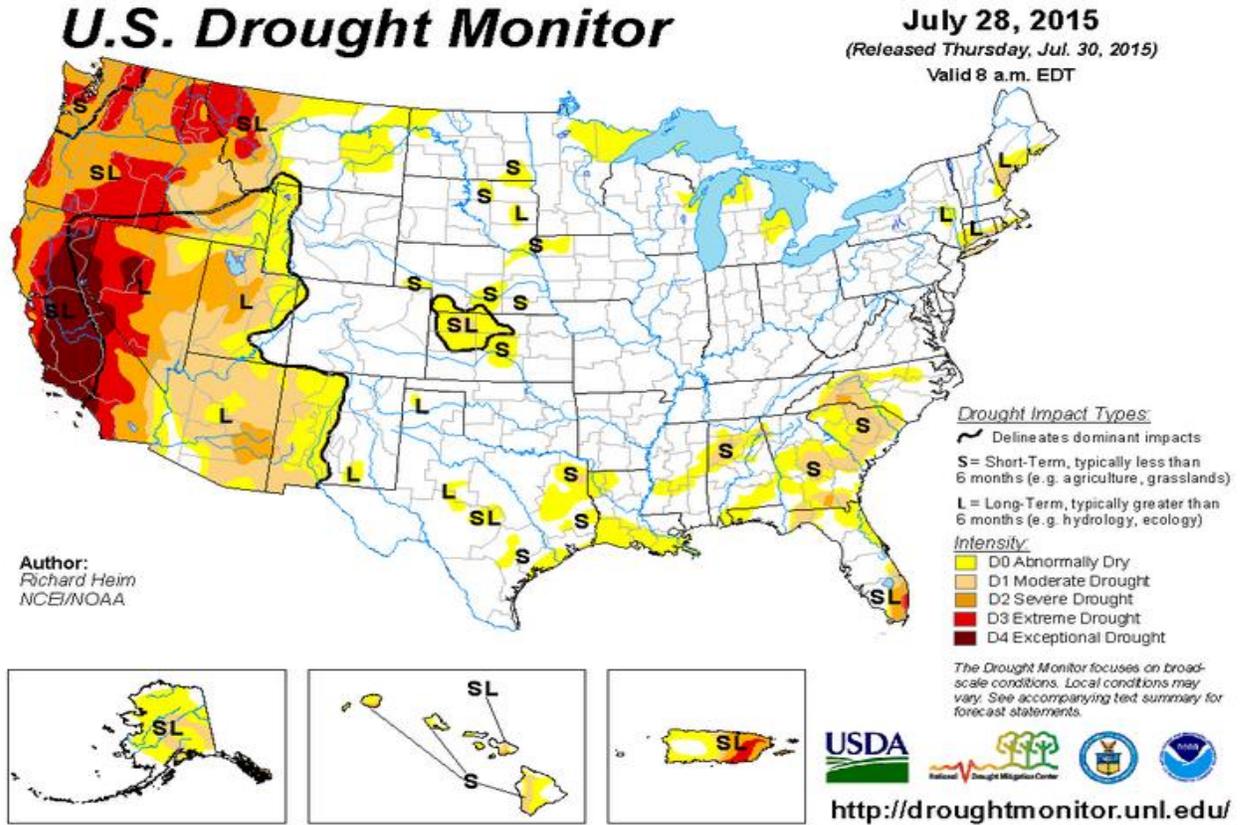
2. Postpone activities ahead of thunderstorms.
3. Try to be the lowest point, even if you are only slightly higher than surrounding terrain your chances for being struck increase.
4. Use 30 second rule.
5. Go to safe location. (Inside a building, inside a car, etc.) Avoid dangerous locations. (sides 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):



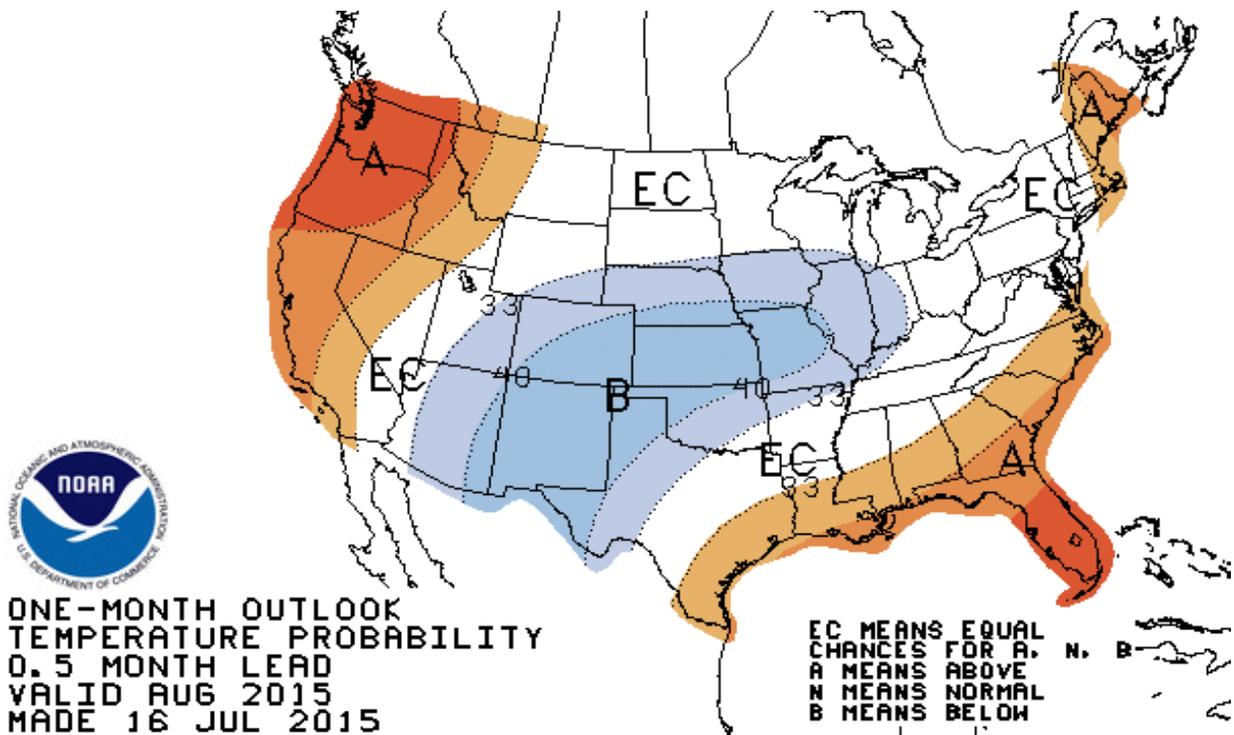
By using common sense and giving you enough time to take the necessary precautions lightning safety can be greatly increased. Don't wait for somebody else to take the lead in lightning safety take it upon yourself to keep your friends and family safe this summer and enjoy the outdoor beauty and recreation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

# Drought Update

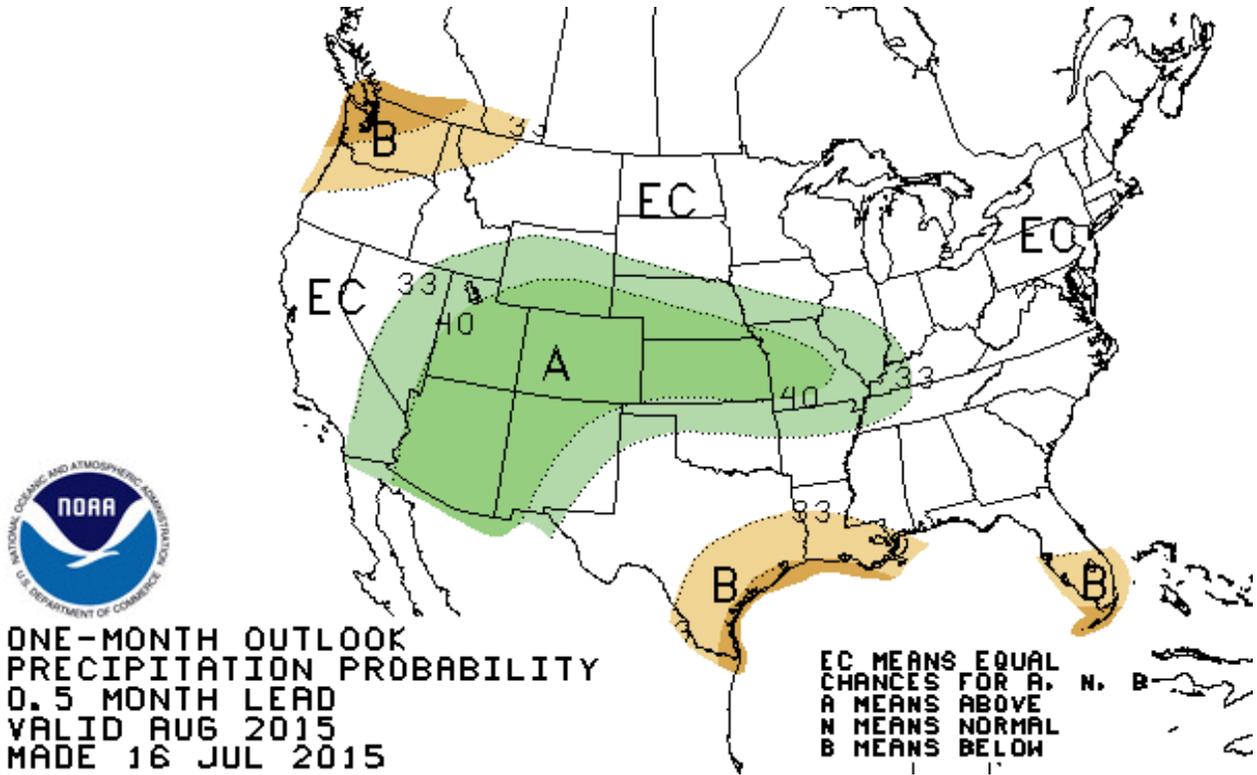
The state of Colorado is drought free with the exception of far NW areas of the state. Drought continues to be severe to exceptional over majority of the western states,



The map below shows forecasted temperature deviances for August 2015. There is a bias towards below normal temperatures for the month of August over Colorado.



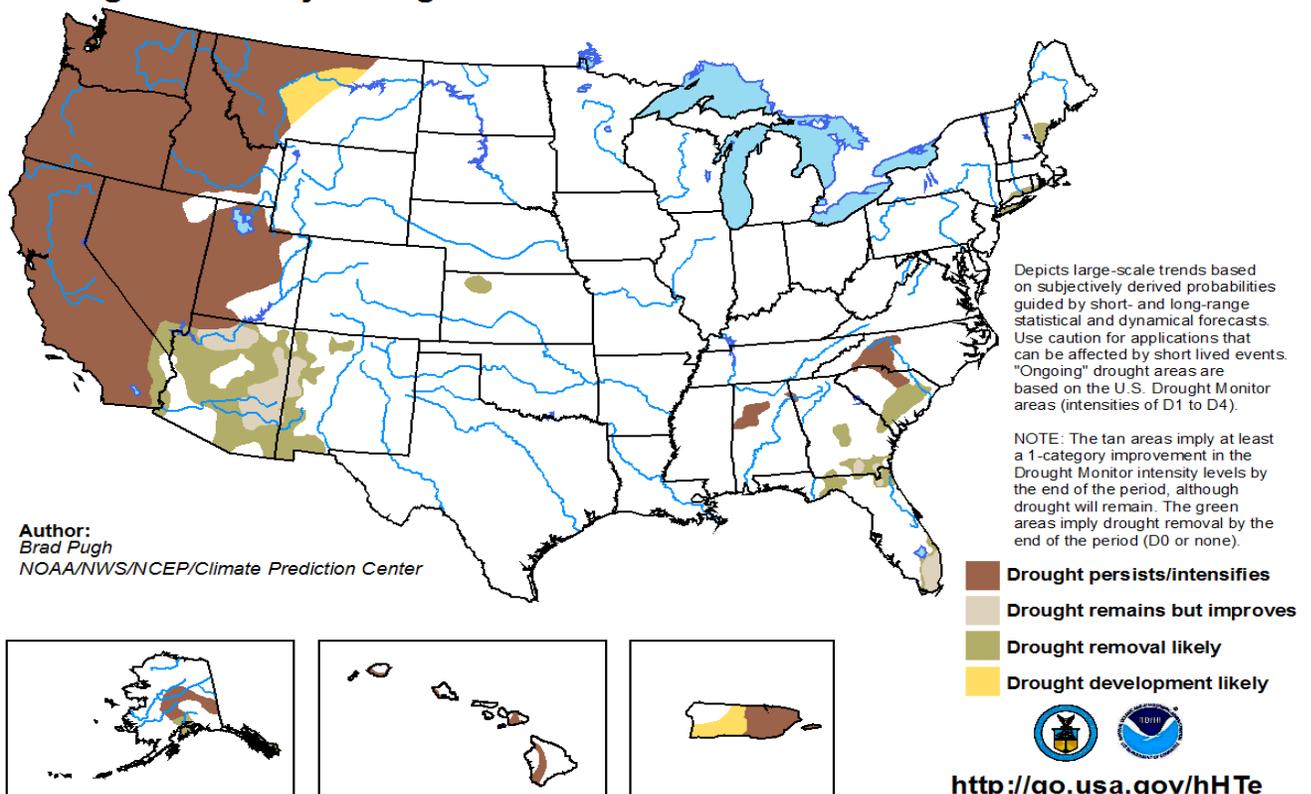
The map below shows forecasted precipitation deviances for August 2015. There is a strong bias towards above normal precipitation over the entire state of Colorado.



No drought is forecast for Colorado in the near term. Drought looks to persist or intensify over the West Coast inland through the Great Basin.

**U.S. Seasonal Drought Outlook**  
Drought Tendency During the Valid Period

Valid for July 16 - October 31, 2015  
Released July 16, 2015



## July Summary

July of 2015 was below normal in temperature and precipitation at DIA. The average high temperature for July was 87.6 degrees which was 1.8 degrees below the normal of 89.4 degrees. Average lows were 57.9 degrees which was 1 degree below the normal of 58.9 degrees. The average highs and lows combined for a monthly mean temperature of 72.8 which was 1.4 degrees below the normal of 74.2. There were 16 days during the month with high temperatures reaching or exceeding 90 degrees which is normal for July. The warmest day of the month was 97 degrees on 7/27 with the coolest day on 7/6 where the high temperature only reached 65 degrees. Although precipitation at DIA was just 1.06" there were many Denver area suburbs that received closer to normal precipitation for the month. The 1.06" measured at DIA was 1.10" below the normal of 2.16". For the year there has been 12.42" of moisture measured at DIA which still leaves a 2.75" surplus over the normal precipitation of 9.76". Despite the lack of rain at DIA there were 12 days with measureable rainfall and 11 days with thunderstorms reported. The highest daily rainfall total for the month was 0.33" on 7/18.

## July Stats

### TEMPERATURE (IN DEGREES F)

AVERAGE MAX	87.6	NORMAL 89.4	DEPARTURE -1.8
AVERAGE MIN	57.9	NORMAL 58.9	DEPARTURE -1.0
MONTHLY MEAN	72.8	NORMAL 74.2	DEPARTURE -1.4
HIGHEST	97 on 7/27		
LOWEST	52 on 7/28		

DAYS WITH MAX 90 OR ABOVE	16	NORMAL	16
DAYS WITH MAX 32 OR BELOW	0	NORMAL	0
DAYS WITH MIN 32 OR BELOW	0	NORMAL	0
DAYS WITH MIN ZERO OR BELOW	0	NORMAL	0

### TEMPERATURE RECORDS

No temperature records tied or broken

### HEATING DEGREE DAYS

MONTHLY TOTAL	5	NORMAL 6	DEPARTURE -1
SEASONAL TOTAL	5	NORMAL 6	DEPARTURE -1

### COOLING DEGREE DAYS

MONTHLY TOTAL	251	NORMAL 289	DEPARTURE -38
YEARLY TOTAL	409	NORMAL 444	DEPARTURE -35

### PRECIPITATION (IN INCHES)

MONTHLY TOTAL	1.06	NORMAL	2.16	DEPARTURE	-1.10
YEARLY TOTAL	12.42	NORMAL	9.76	DEPARTURE	2.75
GREATEST IN 24 HOURS	0.33" On 7/18				
DAYS WITH MEASURABLE PRECIP.					12

### 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	NA				
GREATEST DEPTH	NA				

### WIND (IN MILES PER HOUR)

AVERAGE SPEED	9.3mph
PEAK WIND GUST	60mph from the NW on 7/15

### MISCELLANEOUS WEATHER

NUMBER OF DAYS WITH THUNDERSTORM	11	NORMAL	11
NUMBER OF DAYS WITH HEAVY FOG	0	NORMAL	0
NUMBER OF DAYS WITH HAIL	0		
NUMBER OF SUNNY DAYS	4		
NUMBER OF PARTLY CLOUDY DAYS	22		
NUMBER OF CLOUDY DAYS	5		
AVERAGE RELATIVE HUMIDITY	52%		

## August Preview

The “monsoon” season is typically in its prime during the month of August with severe weather on the decline. Storms typically become slower moving and carry the potential for heavy rains versus large hail and tornadoes. Temperatures begin their slow decline into fall now that sunlight is making a noticeable decrease each day. The sun rises at 5:58am on the 1<sup>st</sup> and 6:26am on the 31<sup>st</sup> losing 28 minutes while sunset times are shaved off by 40 minutes, making for a loss of 68 minutes of sunshine during the month. Average temperatures for the month of August start out at 90 degrees and finish the month at 84 degrees. Average lows start out at 60 degrees and finish at 54 degrees. The warmest day in August is 105 degrees set on the 8<sup>th</sup> back in 1878. The coldest August temperature is 40 degrees and has been set multiple times, most recently in 1910. Precipitation on average for August is lower than July at 1.69” and much of it can occur in just a storm or two! On average there are 8 thunderstorm days and 9 days during the month which produce measureable rainfall. For August of 2015 Skyview weather believes temperatures will be slightly below normal with above normal precipitation for many areas in and around Denver.

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

#### 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	1.69”
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 multiple dates
WARMEST	77.0 in 2011
COLDEST	66.5 in 1915
WETTEST	5.85" in 1979
DRIEST	0.02" in 1924
SNOWIEST	0.0"
LEAST SNOWIEST	0.0"

## Rainfall

### May 2015 to October 2015

City	May	June	July	Aug	Sept	Oct	Total
Aurora (Central)	6.85	3.35	2.32				12.52
Brighton	5.20	1.14	1.06				7.40
Broomfield	6.54	3.39	2.09				12.02
Castle Rock	4.72	5.08	1.10				10.90
Colo Sprgs Airport	8.13	5.72	3.14				16.35
Denver DIA	3.76	2.53	1.06				7.35
Denver Downtown	5.87	4.92	1.54				12.33
Golden	6.93	2.60	2.28				11.81
Fort Collins	6.09	1.96	1.42				9.47
Highlands Ranch	5.31	3.46	2.17				10.94
Lakewood	5.59	4.33	1.06				10.98
Littleton	6.18	4.06	0.75				10.99
Parker	4.17	5.12	1.85				11.14
Sedalia - Hwy 67	5.51	3.58	2.24				11.33
Thornton	4.96	2.72	1.73				9.41
Westminster	6.34	4.09	1.89				12.32
Wheat Ridge	5.89	4.81	1.18				11.88

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