



# How Can 100-year+ Events Possibly be Overlooked?

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Flood Warning & Information Services



2018 AUG  
Conference  
Ventura, CA



What are your chances of getting a hole in one?

A: For the average golfer about 12,000 to 1 for each attempt, requiring ~3000 rounds to achieve the goal.



120+ in ~20 years

**The Ranch Country Club**

## HOLE-IN-ONE HONOR ROLL

HOLE #4	HOLE #5	HOLE #13	HOLE #15	HOLE #17
 BLUE - 147 YARDS WHITE - 148 YARDS GOLD - 149 YARDS RED - 150 YARDS	 BLUE - 111 YARDS WHITE - 112 YARDS GOLD - 113 YARDS RED - 114 YARDS	 BLUE - 177 YARDS WHITE - 178 YARDS GOLD - 179 YARDS RED - 180 YARDS	 BLUE - 166 YARDS WHITE - 167 YARDS GOLD - 168 YARDS RED - 169 YARDS	 BLUE - 155 YARDS WHITE - 156 YARDS GOLD - 157 YARDS RED - 158 YARDS
JOHN ANDERSON HOLE IN ONE 10/15/2018				

# SO...WHAT ABOUT STORMS?

July 31, 1976



## What caused the Big Thompson flood

The causes of the July 31, 1976, Big Thompson Canyon flood — about 50 miles northwest of Denver — were similar to those of other flash floods, especially a flood that hit the South Dakota Black Hills June 10, 1972, killing 237 people.

5 Hardly any of the rain soaked into the steep-sided canyon.

6 The river quickly went over its banks, and within seconds that acted like battering rams against downstream buildings, cars.

7 Water backed up in the canyon's narrow mouth. In floods, water often backs up as debris piles against bridges.

4 Humid high-altitude air combining with weak winds meant the storm pulled in little dry air to weaken its rainfall.

3 Winds were less than 20 mph above 10,000 feet, too weak to move the storm away.

2 The unstable air continued rising as its water vapor condensed.

1 Winds from the east pushed very humid air up the mountains.

8 Flood water speeds up as it squeezes through narrow places, or is flooded when a dam formed by debris bursts loose.

Normal river size

**HUFFPOST**

## The 1,000 Year Storm: Colorado's Flood Is One For The History Books

By Matt Ferner

09/20/2013 12:11 pm ET | Updated Dec 06, 2017

Just how rare was the deluge in Colorado that resulted in the deaths of as many as 10 people, hundreds unaccounted for, nearly \$2 billion in property damage, the evacuation of more than 10,000 people that affected at least a 200 mile stretch of the state, north to south?

Very rare. So rare that the amount of rainfall is likely to occur less than once every 1,000 years.



Nobody missed this one!

# A SEPTEMBER TO REMEMBER



# How about 2017

Did something big happen?



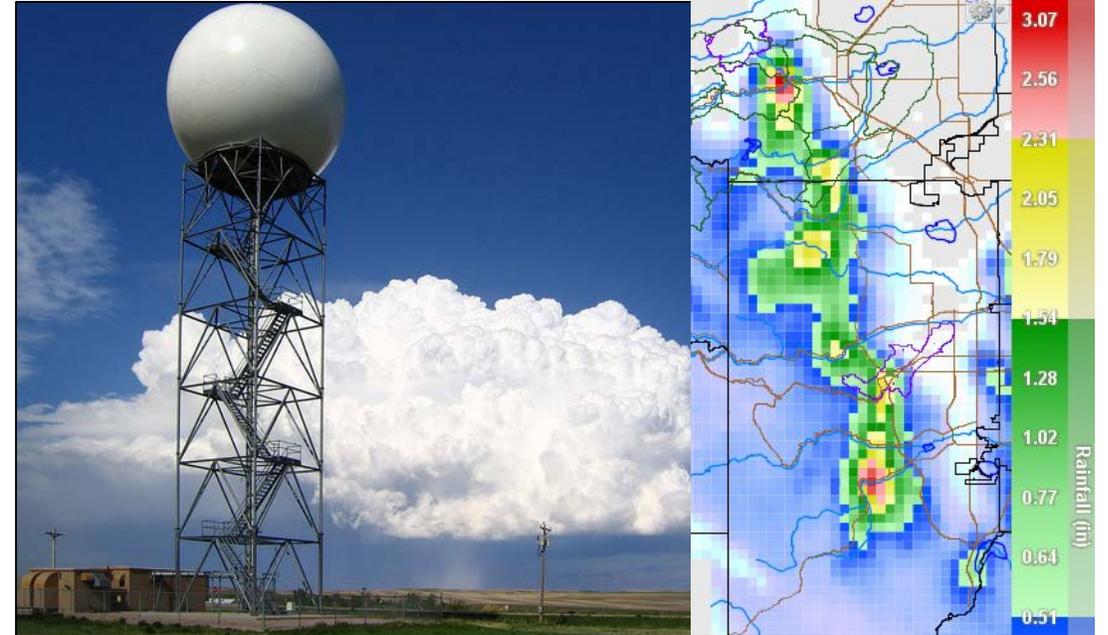
Is there one in particular that you remember?

If so, why?

# Tools for today's analysis



An ALERT rain gage at the  
Denver Tech Center  
*(over 200 system-wide)*



Radar & Derivatives

Let's first look back at September 2013.

**HUFFPOST**

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# A view from a single rain gauge point.

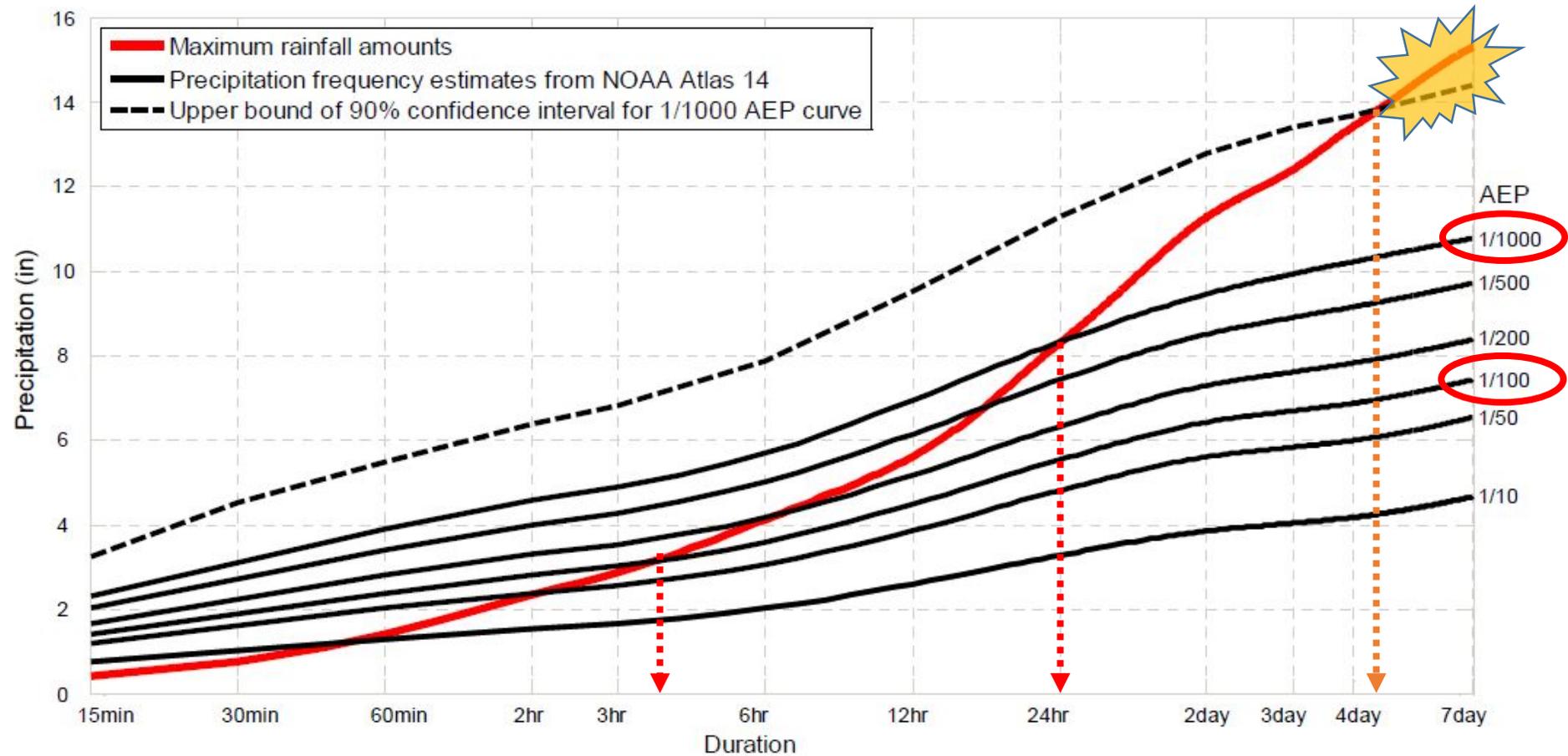
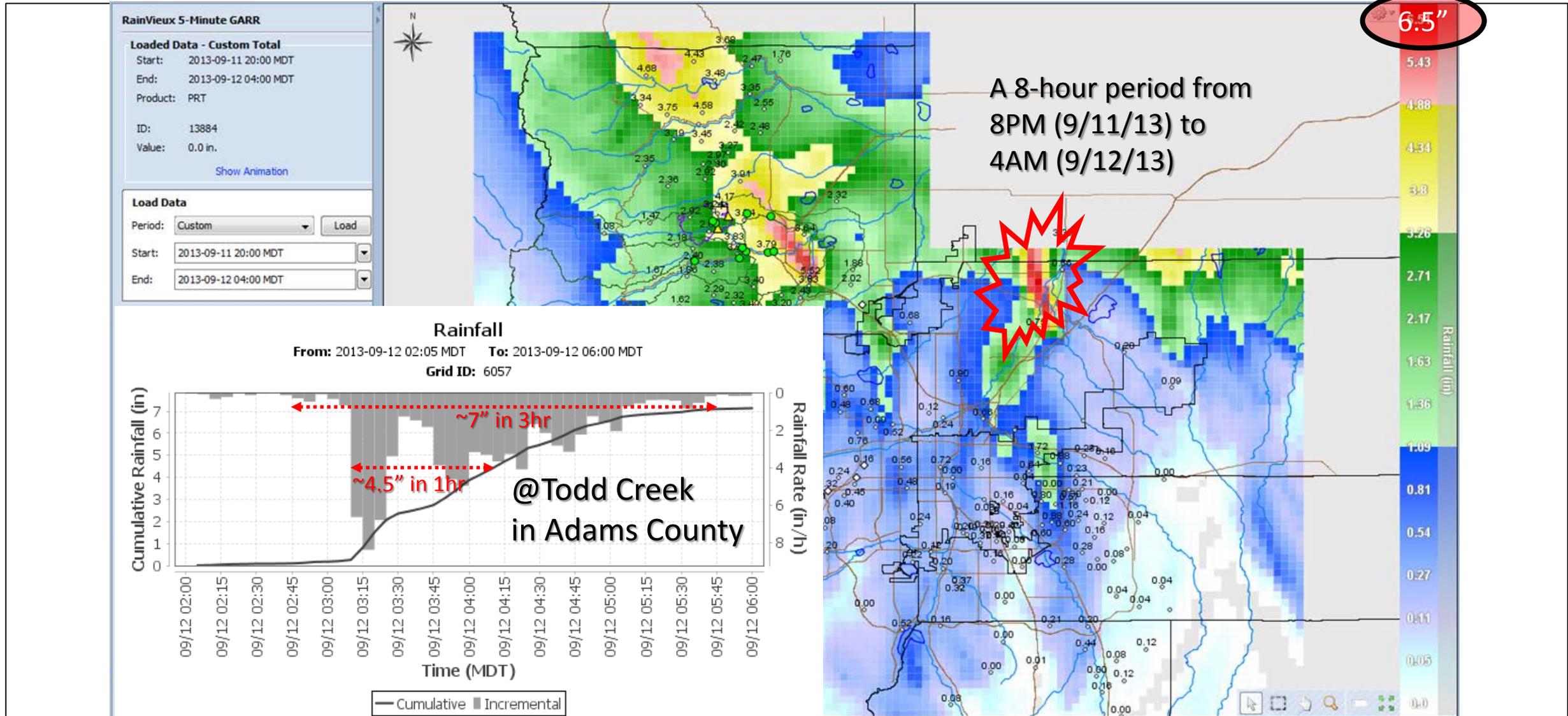


Figure 1. Maximum observed rainfall amounts in relationship to corresponding precipitation frequency estimates for the Justice Center gauge.

# Let's broaden our perspective a little.



Who remembers...

The Great Todd Creek Flood of  
September 12, 2013



# So again, how about 2017?

Did something big happen?



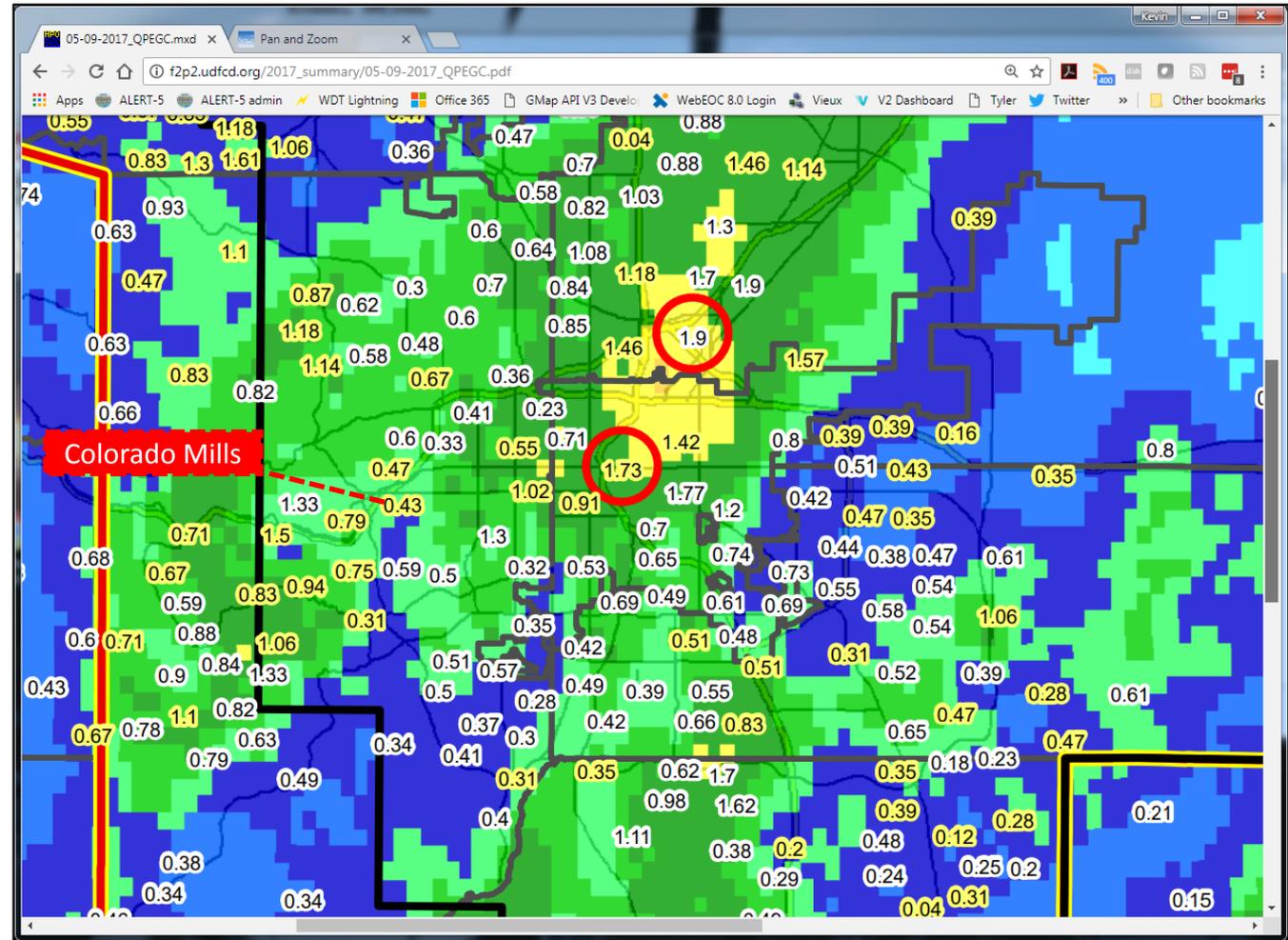
Is there one in particular that you remember?

If so, why?

# May 8, 2017...THE WINNER



Colorado Mills Hail Storm  
Insured losses > \$2.2 Billion

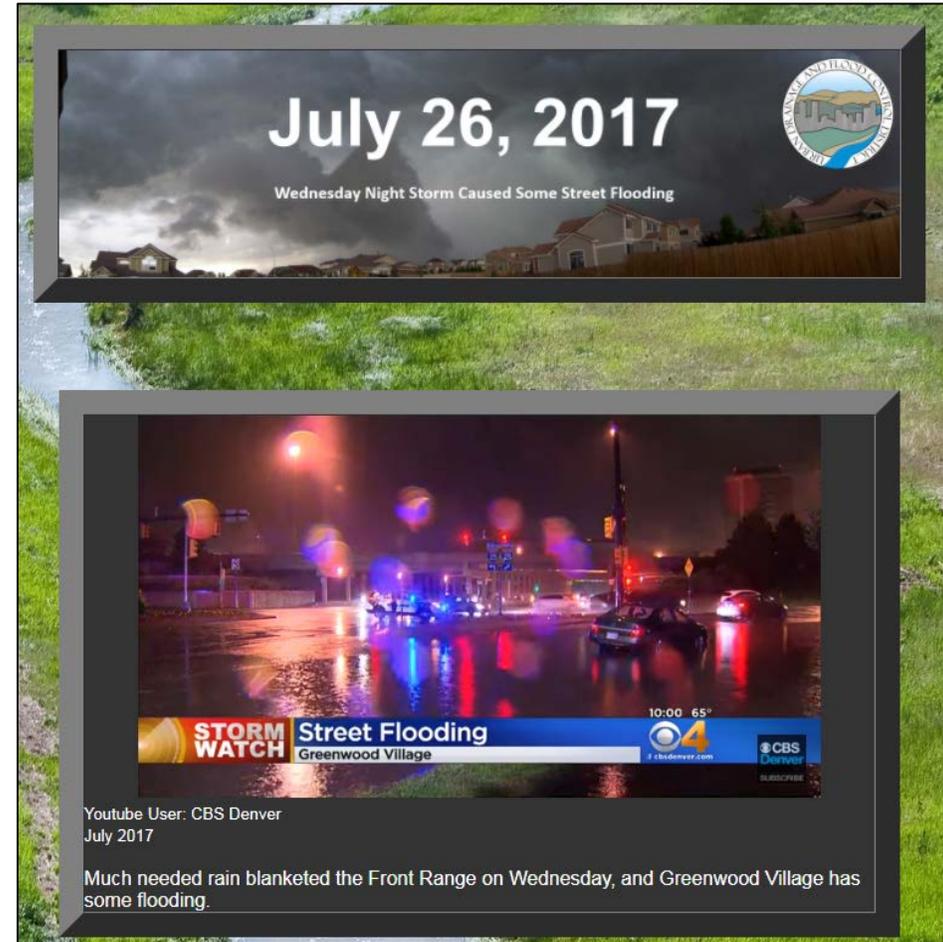


# Now let's take a look at July 26, 2017



A small stream out of its banks but no notable damages.

- Consistent with evening news reports about street flooding in Greenwood Village

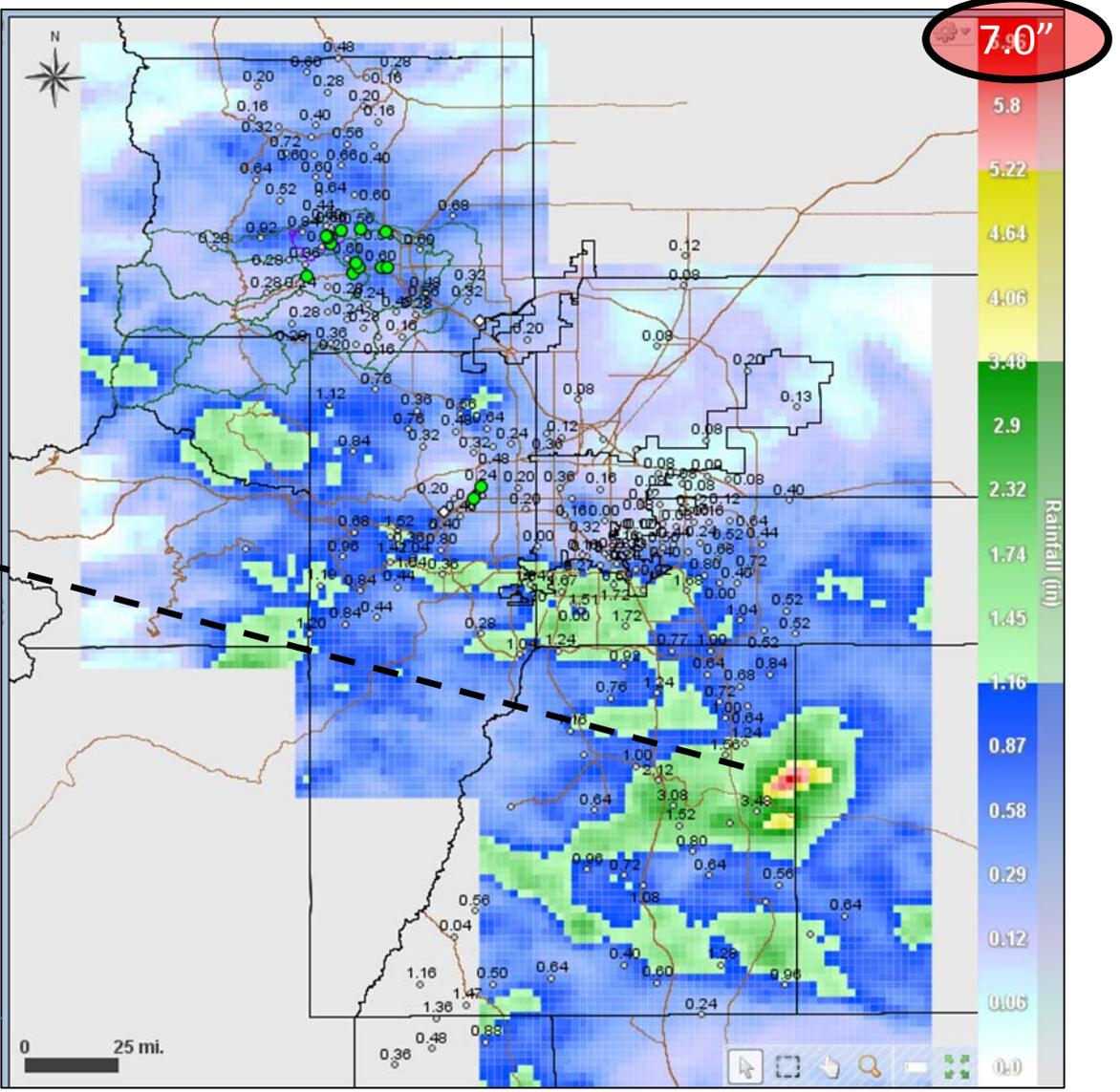


# July 26, 2017

If not in Greenwood Village, where was the big event this day

?

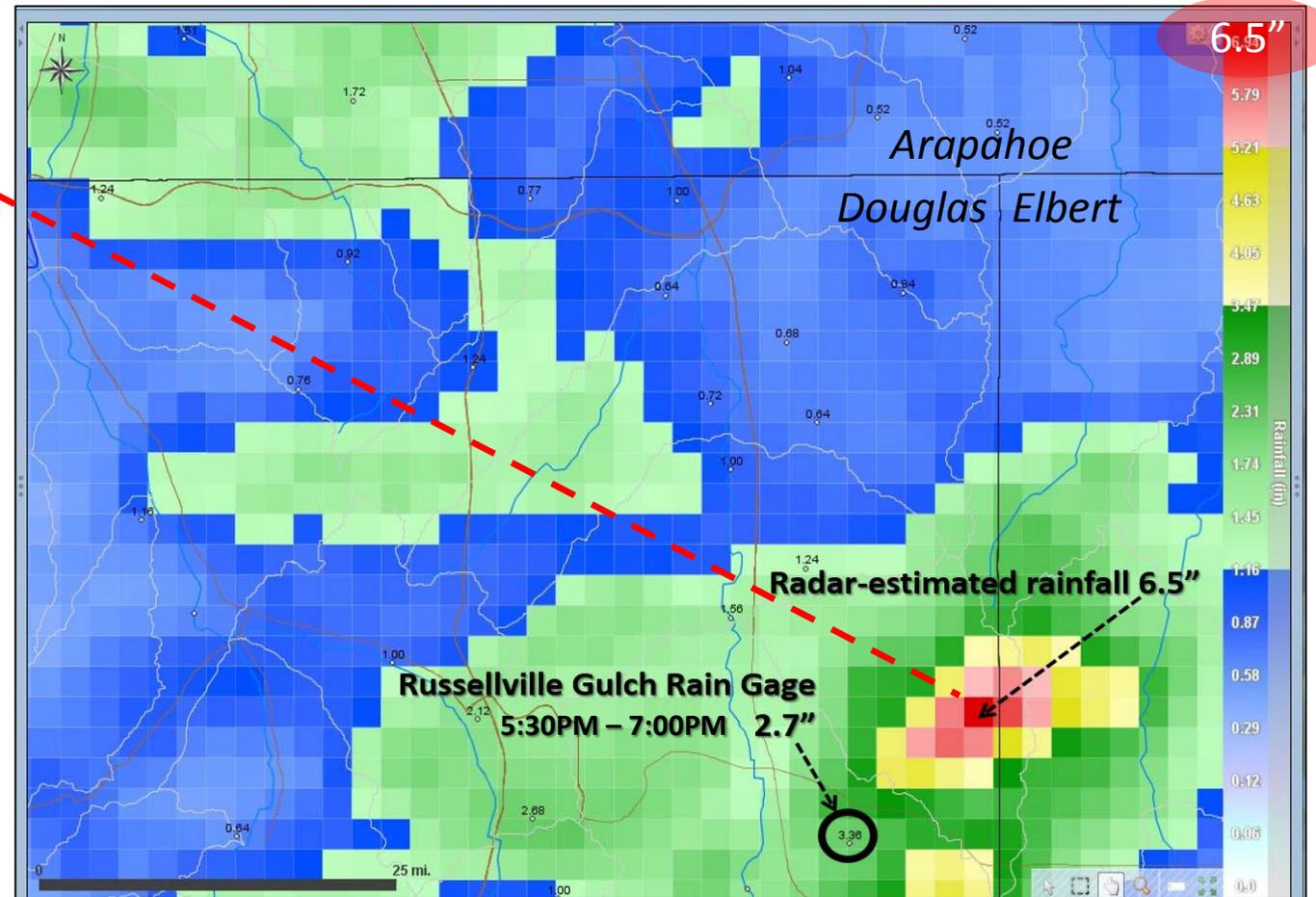
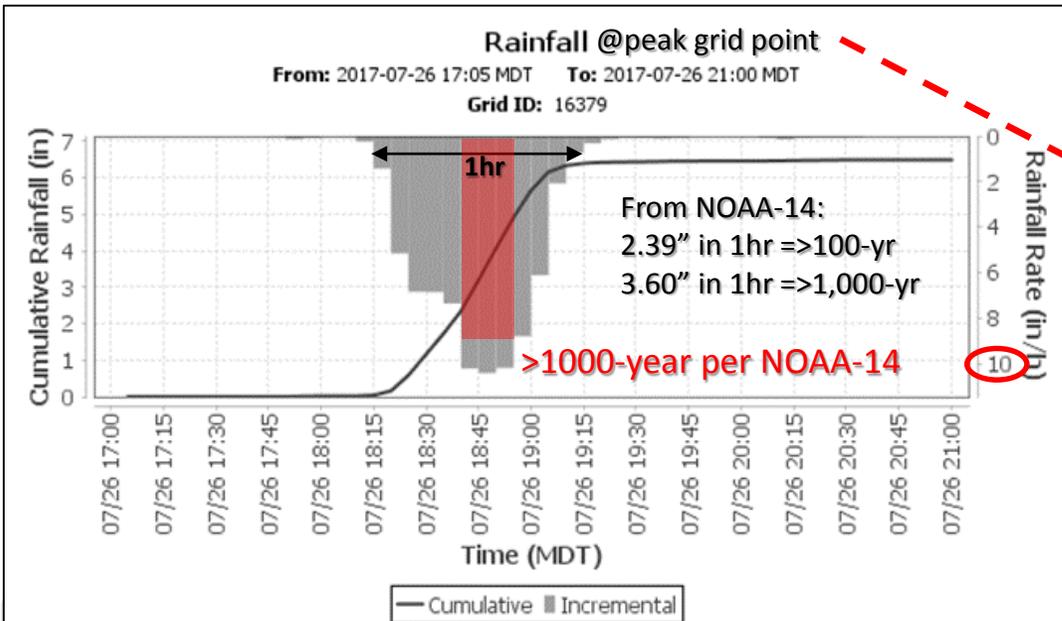
12-hour Gage-Adjusted Radar Rainfall (GARR) estimates between Noon and Midnight



# July 26, 2017...The Unseen

## Russellville Gulch ALERT Station:

10 Minute Peak Intensities					15 Minute Peak Intensities					30 Minute Peak Intensities							
Station	Date	Tips	Inches	in/hr	Frequency	Station	Date	Tips	Inches	in/hr	Frequency	Station	Date	Tips	Inches	in/hr	Frequency
2900	7/26/17 18:20:55	30	1.181	7.087	<200yr	2900	7/26/17 18:23:49	40	1.575	6.299	<200yr	2900	7/26/17 18:30:21	60	2.362	4.724	<500yr



Check out these 5-min intensities!

# *Really...a 1,000-year event was overlooked?*

If true, what must happen for events this big to get noticed?



1. Lots of broken stuff
2. People inconvenienced
3. Fatalities



# The Historic “1,000-YEAR” Fox Hill Flood of 2017



Storm Date: July 26  
Photo Date: July 28

# Thank you!

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## SOME OTHER CLOSING THOUGHTS...

- ✓ “Rare” events are not that rare.
- ✓ They happen all the time.
- ✓ Will your next big event get noticed?



**Protecting People, Property, and the Environment**