# Historic Colorado Flooding:
## September 11– 17, 2013

## *Presentation to the White House Subcommittee on Disaster Reduction*

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**Christopher S. Strager, Acting Director**
**Office of Climate, Water, and Weather Services**
**National Weather Service**

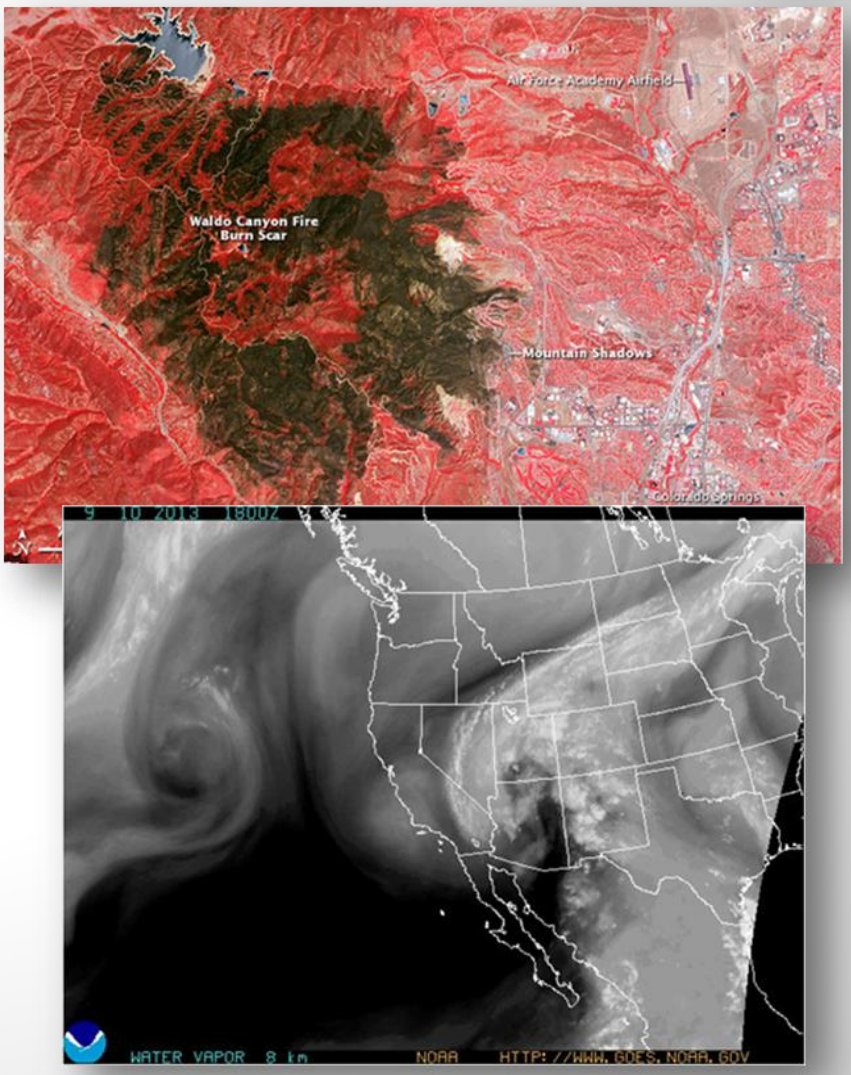
Image: NOAA – W. von Dauster

# Overview
## Meteorological Event

- Heavy rain fell across portions of the foothills of Colorado on the night of September 11– 12.
- Catastrophic flash flooding occurred across large portions of the Colorado front range, from Fort Collins to Colorado Springs, including Boulder.
- Runoff transitioned into longer-term river flooding affecting locations well east of the foothills into northeast Colorado and even Nebraska.

# Overview
## Prior Conditions

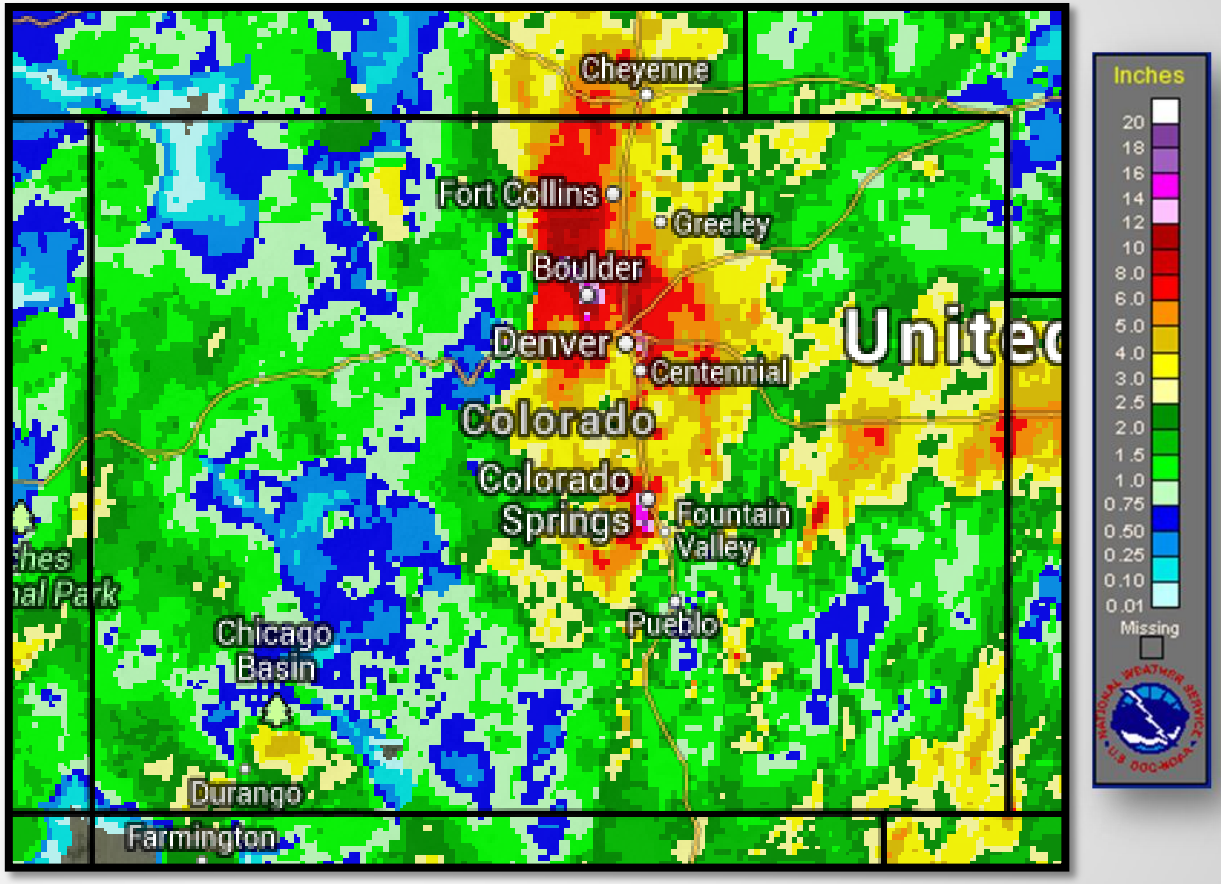
- Burn scars existed from past wildfires creating a surface conducive to runoff
- Atmosphere was abnormally wet with a plume of subtropical moisture flowing north through Colorado.
- Low-level winds flowed upslope behind a cold front and also tapped Gulf moisture, which converged on the Front Range.



# Radar Precipitation Estimates

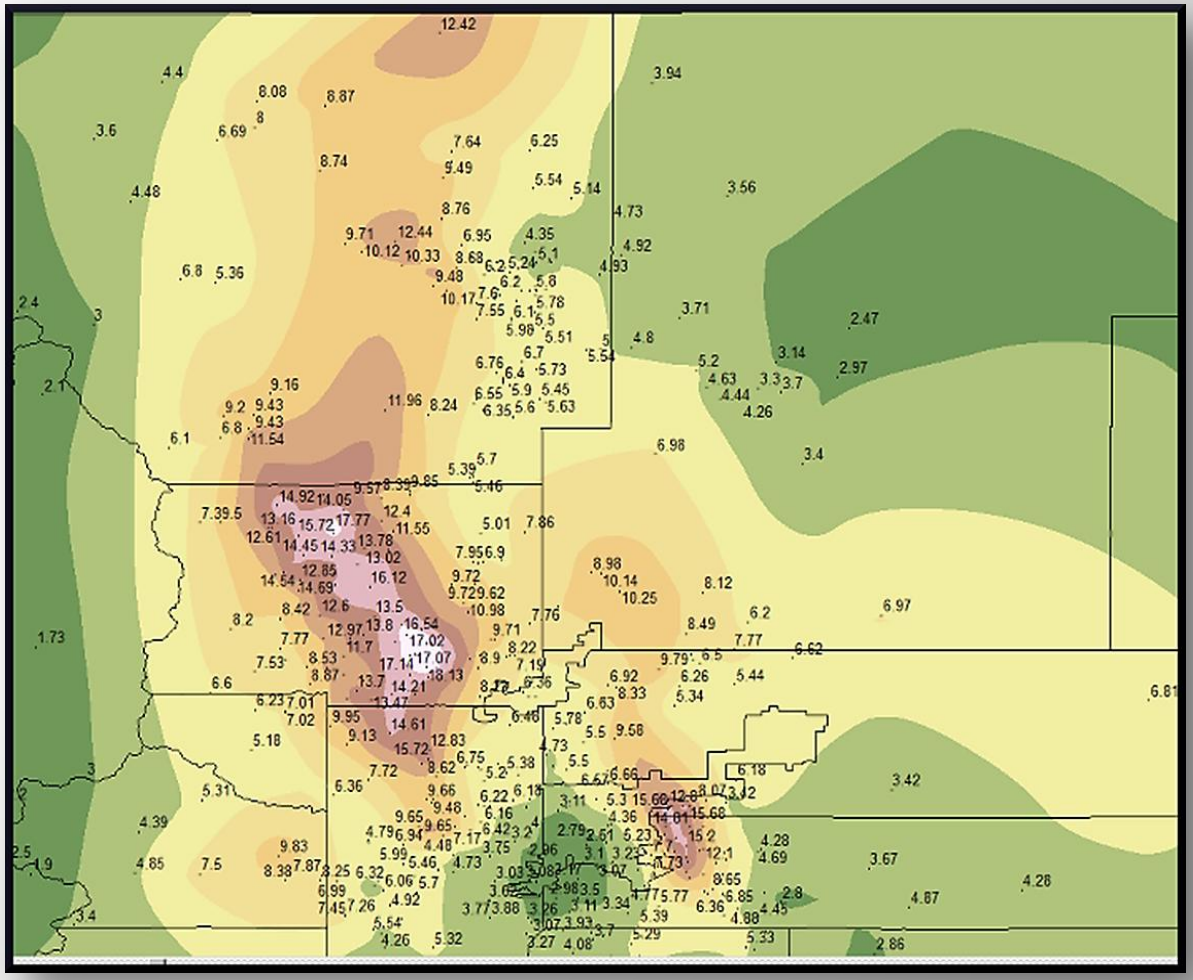
## September 9 - 16

- Radar estimates show areas near Boulder and Colorado Springs experienced 12+ inches of rain.



# Rainfall Analysis

- Rainfall observations from cooperative observers and the Urban Drainage and Flood Control District depicted amounts of 13-18 inches in the hardest hit areas.



# Flooding Impacts:
## The Human Toll

**People**

- Fatalities: 8
  - Boulder Co. 4
  - El Paso Co. 2
  - Clear Creek 1
  - Larimer Co. 1
- Unaccounted for: 1
- In Shelter: 98 in 4 shelters
- Total people evacuated during the event: 18,097


Source: FEMA 9/27/13

# Flooding Impacts:
## Destruction

**Damages and FEMA disaster declaration**

- 20 counties affected statewide
- 1,533 square miles affected by flooding
- Total operations costs to date (state): $19,493,840
- FEMA disaster assistance
  - Approved Individual Assistance (IA) - $43.2 million
  - SBA disaster loans approved - $23.2 million
- Homes destroyed: 1,882  damaged: 16,101

**Impacts to transportation**

- 200 miles of roads (state highway and roads) damaged
- 50 bridges damaged
- $475 million projected to repair roads and bridges

Source:  FEMA

# How Historic was the Rainfall?

**Boulder**

- 24-hour Daily Record set: 9.08"
  - Previous record: 4.80" on July 31, 1919
- Monthly Record for September set: 18.16"
  - Previous record: 5.50" in September 1940
  - Average rainfall in September: 1.63”
- Monthly Record (any month) set: 18.16"
  - Previous record: 9.60" in May 1995
- Annual record of 30.14" set (thru Sept. 30): 31.12"
  - Previous record: 29.47" in 1995

**Denver International Airport**

- 24-hour Daily Record set: 2.01"
  - Previous record: 1.48" on September 26, 2012

# How Historic was the Rainfall?

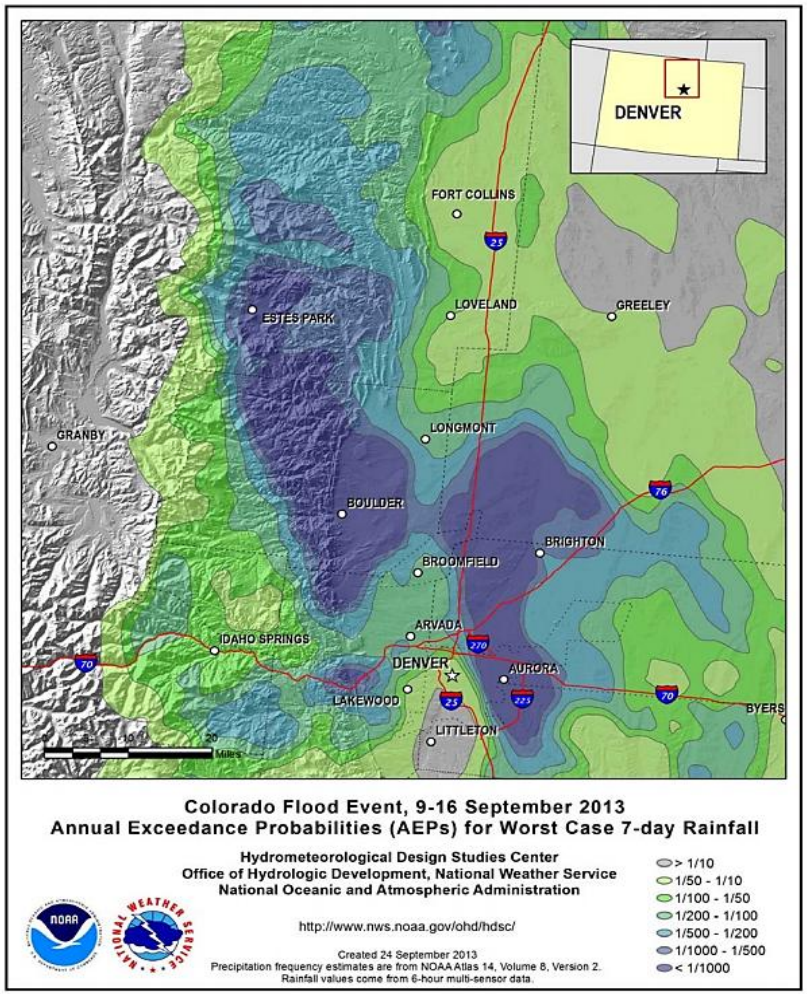



Figure 4. Annual exceedance probabilities for the worst case 7-day rainfall.

Annual Exceedence Probabilities for Worst Case 7-Day Rainfall suggest this was a 1 in 1000+ year event for some locales

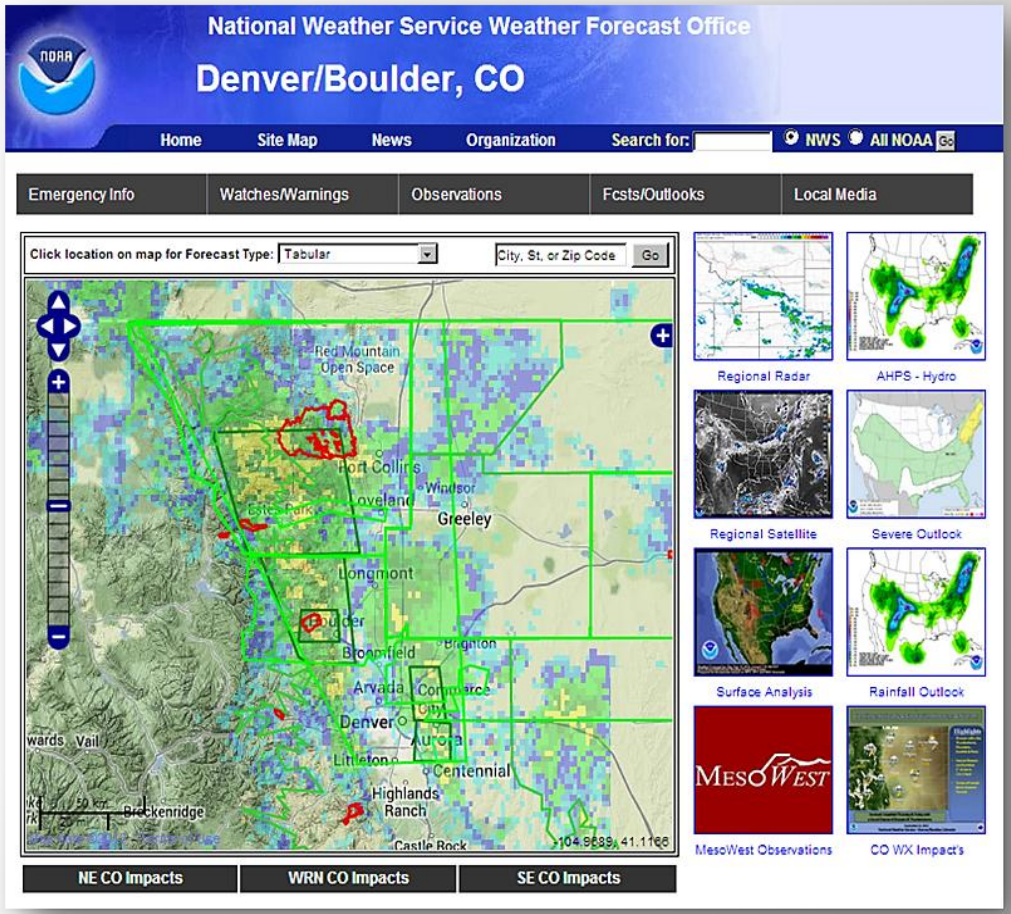
More information can be found at:
http://www.nws.noaa.gov/oh/hdsc/aep_storm_analysis/index.html

# NWS Performance and Support

## Decision Support Services (DSS)

**WFO Boulder**

- Coordination with Boulder EOC and OEM, Larimer communications, and Fort Collins Water quality officials
- Created a DSS page including burn scar perimeter maps
- Provided briefings to State of Colorado EOC



# NWS Response

## National Service Assessment Team Representation

- Chartered a 9-member service assessment team on October 24; team currently in Colorado gathering information and conducting interviews
- Team co-led by USGS Associate Director of Colorado Water Science Center and NWS Hydrologist in Charge of the Northeast River Forecast Center
- Includes membership and consultants from a variety of fields including hydrology, meteorology, social science, emergency management, hydrometeorological forecast modeling, program management, warning coordination, and scientific research

# Questions?