

# METEOROLOGICAL CASE STUDIES OF LIGHTNING STRIKE VICTIMS IN COLORADO



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## INTRODUCTION

This poster examines the meteorology prior to people being struck by lightning in the state of Colorado.

22 lightning strike casualty cases examined.

For each case, lightning activity from the time of the casualty to 30 minutes prior is shown. A WSR-88D radar/CG lightning plot at the time of the casualty is also shown. Most cases (20), show CG flash data, but two cases show IC flash and CG stroke data. VAISALA NLDN data was used in this study.

Questions I wish to answer included:

How much CG lightning was occurring in the vicinity prior to the person being struck?

- Few flashes or numerous flashes in the vicinity prior to the casualty occurring?
- 1<sup>st</sup> flash from storm?
- Bolt from the blue?
- Distance between flash which caused casualty and flashes prior

Did people have a chance to seek safe shelter, or were they in a location where no safe shelter could be found?

What was the intensity of the rain in the vicinity prior to the person being struck?

How fast was the storm moving?

Forensic Lightning Studies:

Two important things needed for this study:

### LOCATION:

Where was the victim struck?  
Typically this was well known (GPS), News Media.

### TIME:

What time the victim was struck?  
Not so easy, narrowed down by:  
911 call registry.  
News media, witnesses.

## FLASH RATE DEFINITIONS

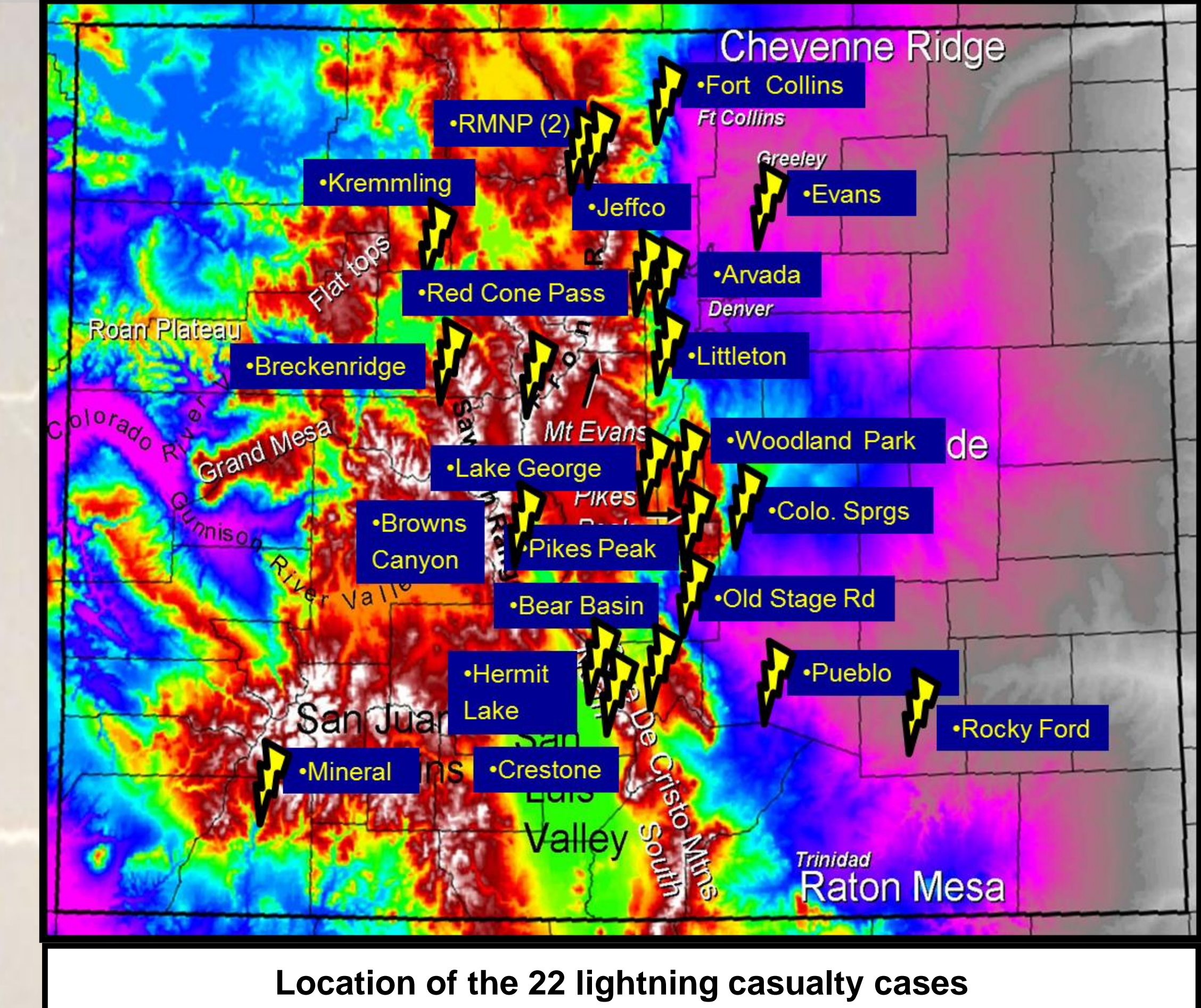
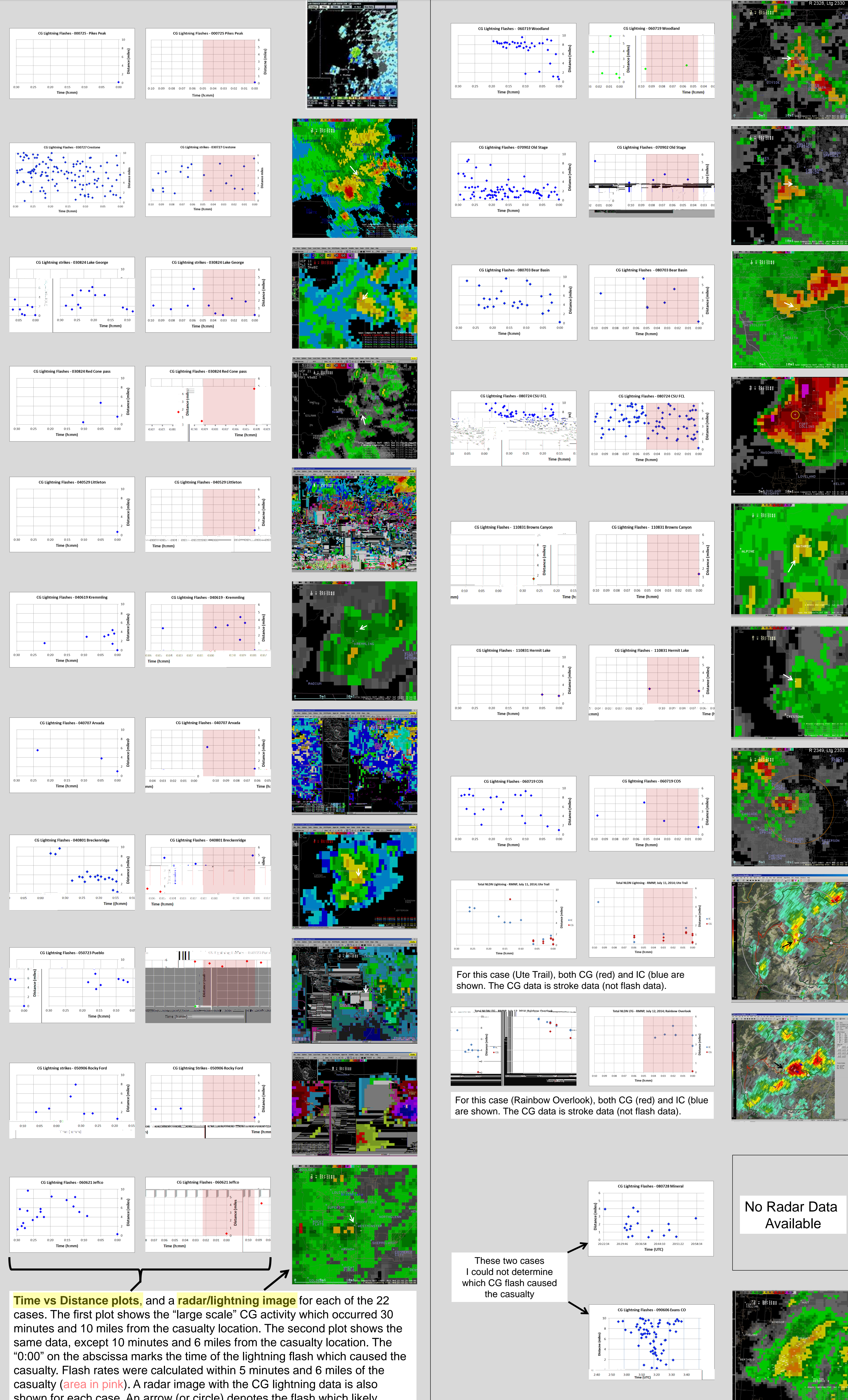
CG flash rates were calculated for 20 of the 22 cases (two of the cases I could not calculate a flash rate as I could not determine, within reason, which flash actually caused the casualty). CG flashes which occurred within a 5-minute time period of the casualty and within a 6-mile radius were used to calculate the flash rate ("5 Min/6 Mile Criteria").

I used the following Flash Rate definitions:

**Frequent flash rate activity:** CG activity  $\geq 1.0$  flash per minute within 5 Min/6 miles.

**Infrequent flash rate activity:** CG activity  $< 1.0$  flash per minute within 5 Min/6 miles.

To your right, you will see "Time vs Distance" lightning plots for the each case. The area in pink shows the CG activity within 5 minutes and 6 miles of the casualty.



Location of the 22 lightning casualty cases

## FINDINGS:

For the 20 cases in which I could reasonably determine which flash caused the casualty, it was found that 70% of the people who were struck by lightning in Colorado were being struck by storms that were producing infrequent lightning activity (CG activity  $< 1.0$  flash per minute within 5 min/6 miles).

yyymmdd	Location	# fl/5 min.	(F/min)
000725	- Pikes Peak	0/5 min.	(0.0 F/min)
030727	- Crestone	10/5 min.	(2.0 F/min)
030824	- Lake George	5/5 min.	(1.0 F/min)
030824	- Redcone Pass	1/5 min.	(0.2 F/min)
040529	- Littleton	0/5 min.	(0.0 F/min)
040619	- Kremmling	5/5 min.	(1.0 F/min)
040707	- Arvada	1/5 min.	(0.2 F/min)
040801	- Breckenridge	7/5 min.	(1.4 F/min)
050723	- Pueblo	2/5 min.	(0.4 F/min)
050906	- Rocky Ford	0/5 min.	(0.0 F/min)
060621	- Jeffco	0/5 min.	(0.0 F/min)
060719	- Colo Sprgs (COS)	1/5 min.	(0.2 F/min)
060719	- Woodland	4/5 min.	(0.8 F/min)
070902	- Oldstage	9/5 min.	(1.8 F/min)
080703	- Bear Basin	4/5 min.	(0.8 F/min)
080724	- CSU, Ft Collins	40/5 min.	(8.0 F/min)
080728	- Mineral (contdvd)	Could not be determined	
090606	- Evans	Could not be determined	
100612	- Browns Canyon	0/5 min.	(0.0 F/min)
110631	- Hermit Lake	1/5 min.	(0.2 F/min)
140711	- Ute Trail	2/5 min.	(0.4 F/min)
140712	- Rainbow Overlook	0/5 min.	(0.0 F/min)

Was there CG lightning nearby prior to the flash that caused the casualty? Six of the 20 cases had no CGs occur (within 5 min/6 miles) prior to the flash which caused the casualty. For the other 14 cases, the average time and distance between the CG flash which caused the casualty and the prior CG flash was 1:52 minutes and 3.14 miles respectively.

Most of the storms were only producing light to moderate rain at the time of the lightning casualty.

Average storm motion was 5 to 15 mph. In most cases (77%), a safe shelter was nearby.

Of note, 3 of the 22 cases showed **NO** CG lightning occurring with 30 minutes or 10 miles of the casualty location ("first flash from the storm").

The most important finding in this study is that the majority of storms that produce lightning casualties in Colorado produce **infrequent** CG lightning activity ( $< 1$  flash per minute averaged over a 5 minute time period and within 6 miles of the casualty event).

**WHEN THUNDER ROARS...GO INDOORS!**