

Tornadoes Impacting Interstates: Service and Societal Considerations



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The views expressed are those of the authors and do not necessarily represent those of the National Weather Service.

Overview

- ✓ Quantify the frequency of tornadoes crossing Interstates in “Tornado Alley”
 - ✓ Occurrences of vehicles/people impacted by Interstate tornadoes
 - ✓ Investigate any additional factors that increased chances for impact
 - ✓ Examine the recommended protective actions for motorists
 - ✓ What can be done to improve message/services to travelers
- 

Why Interstate Tornadoes?



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Why Interstate Tornadoes?

“We’re from Missouri and we get tornadoes. We have a basement but not on the highway.”

Cassie Barker, Lebanon, MO (KMBC-9 Kansas City)



Why Interstate Tornadoes?

Motorists on Interstates have increased vulnerability to weather hazards!

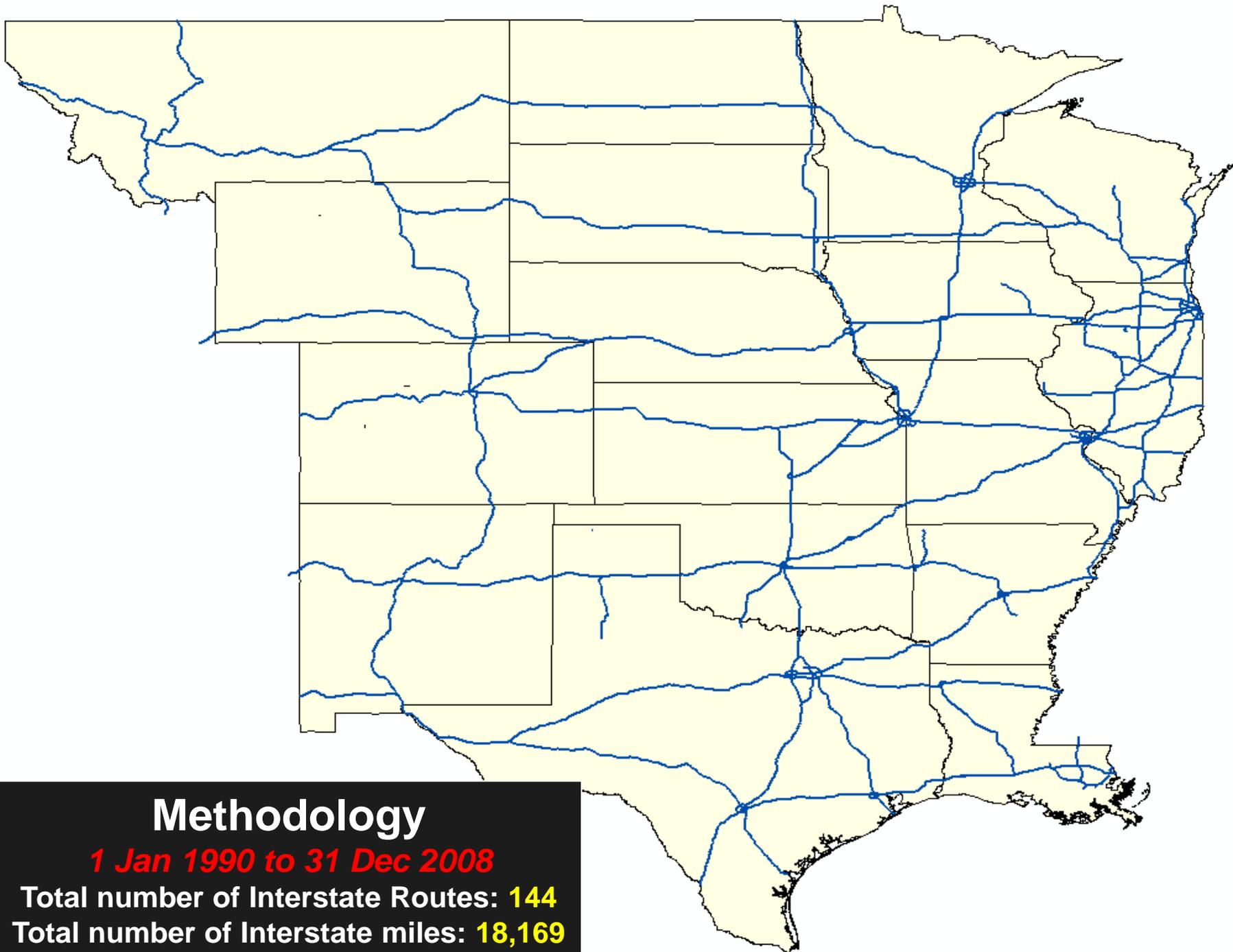
Motorists lack immediate access to a substantial shelter

Few opportunities to change direction of travel or exit off the Interstate.

Limited ability to obtain convective “warnings” or unaware/unable to access existing mobile services that provide warning information.

Travelers likely unfamiliar with local towns and counties referenced in warnings, even if they have access to warning information.

Interstates hold a relatively constant stream of vehicles (*e.g. potential for many eyewitnesses*). May offset some traditional underrepresentation of rural tornado events.

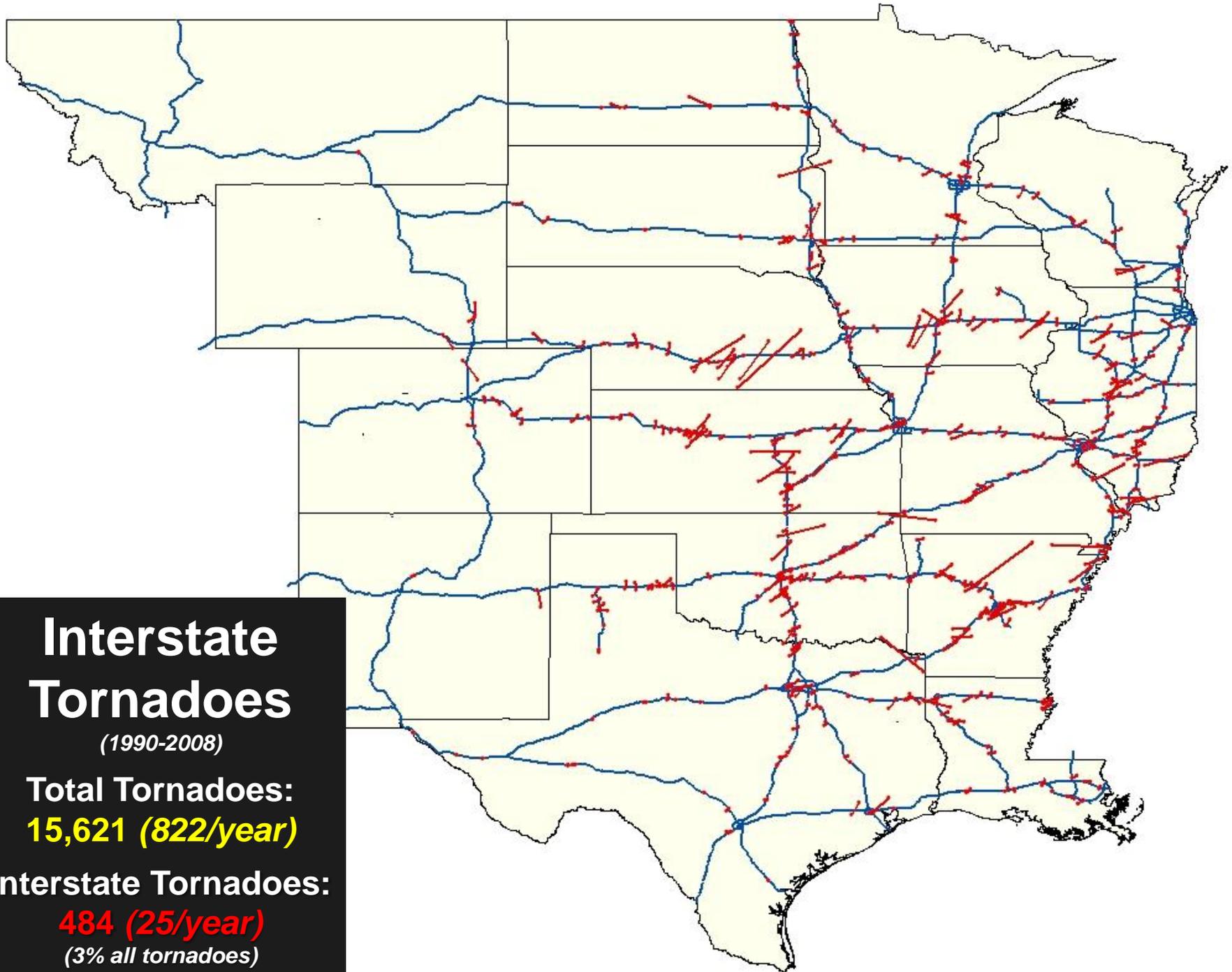


Methodology

1 Jan 1990 to 31 Dec 2008

Total number of Interstate Routes: **144**

Total number of Interstate miles: **18,169**

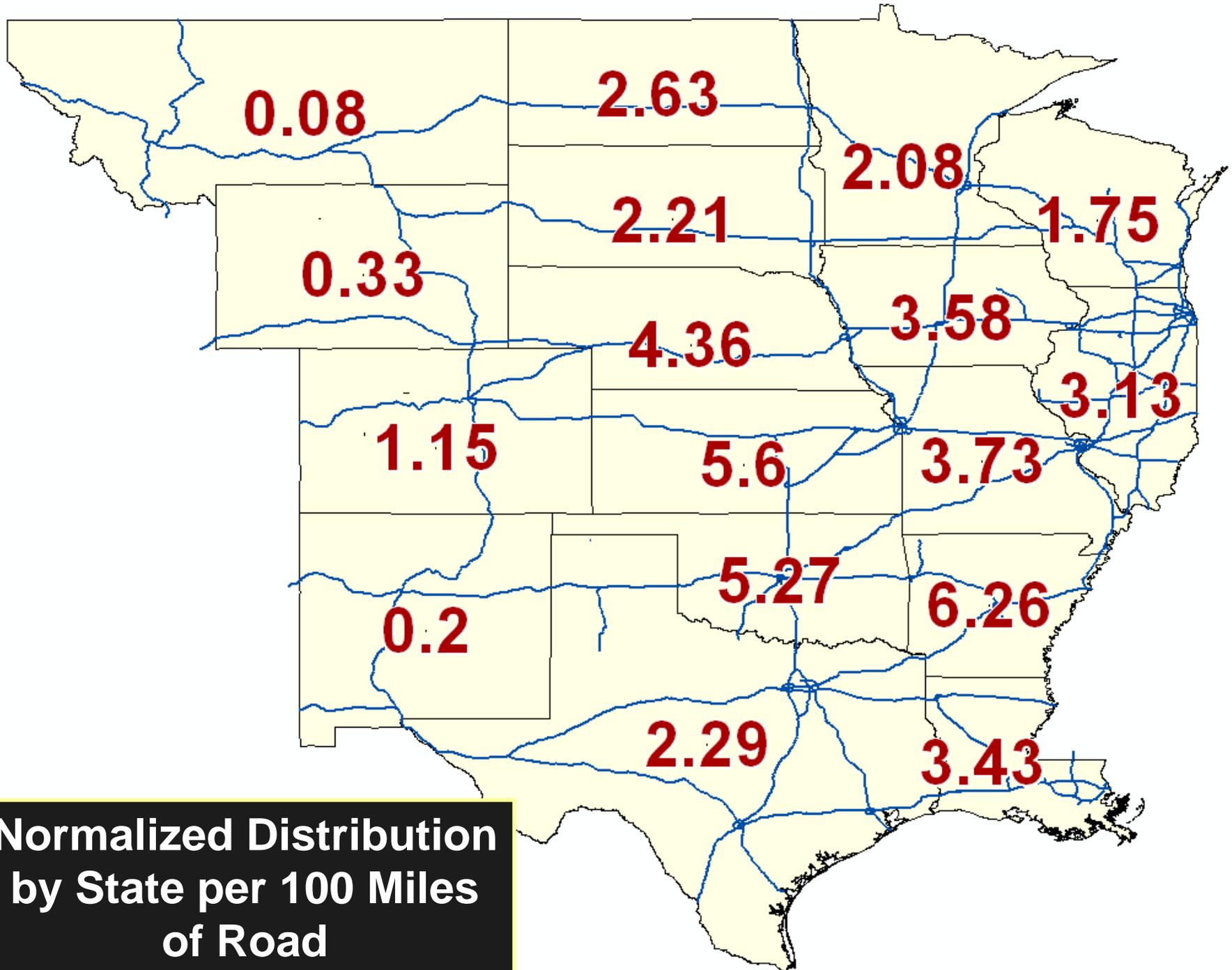


Interstate Tornadoes

(1990-2008)

Total Tornadoes:
15,621 (822/year)

Interstate Tornadoes:
484 (25/year)
(3% all tornadoes)



**Normalized Distribution
by State per 100 Miles
of Road**

Motor Vehicle Impacts

Defined as any motor vehicle “impacted” on an Interstate by a tornado.

(Broken windows, body damage, vehicles shifted or blown off the road, vehicle rolled, overturned, tossed, or destroyed.)

92 Vehicle Impact Tornadoes

Accounts for **19%** of Interstate tornadoes

(~ 1 in 5 tornadoes struck vehicles based on the “existing” record)

Impacted Vehicles:

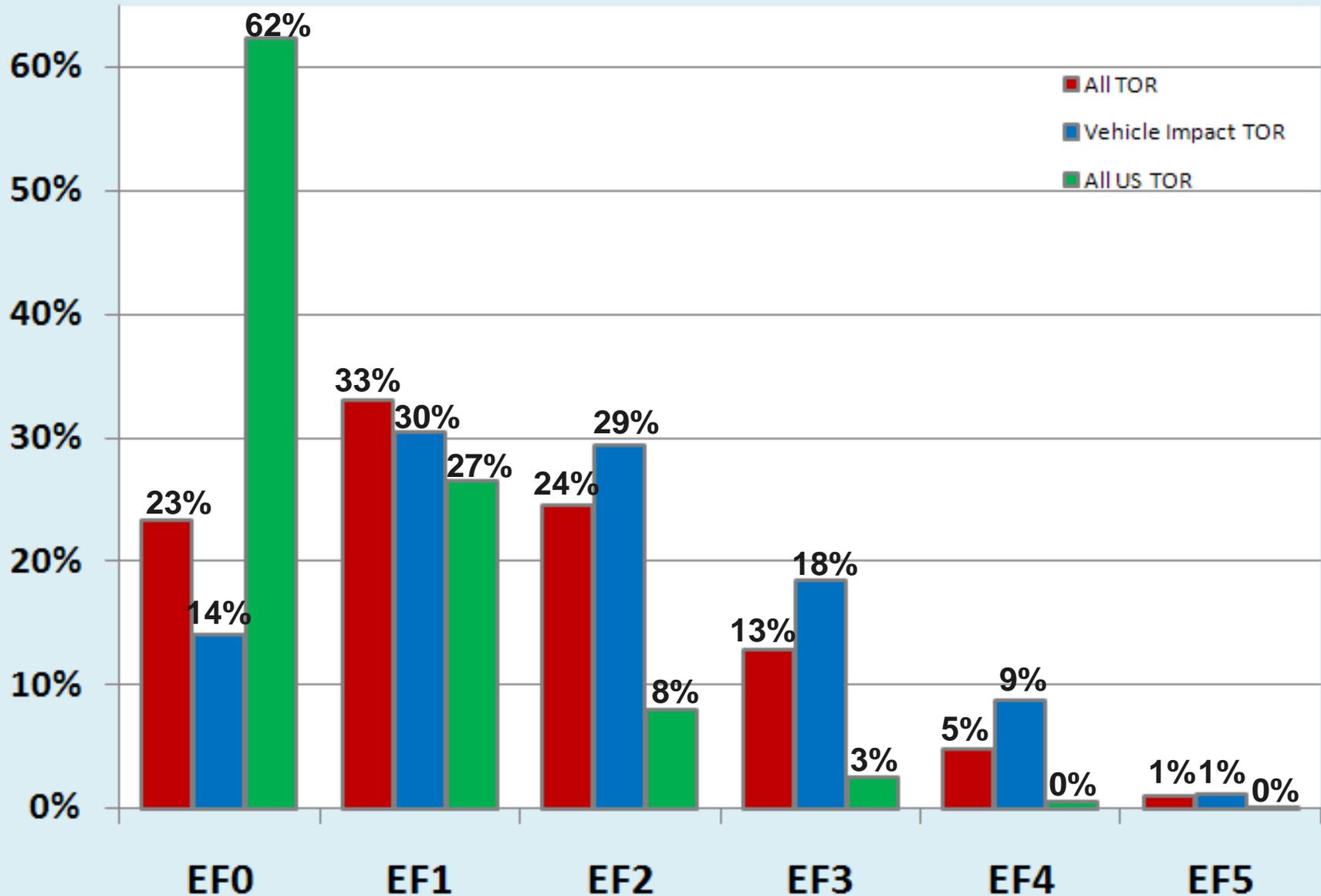
263 Total Vehicles

150 Semi-trailer Trucks

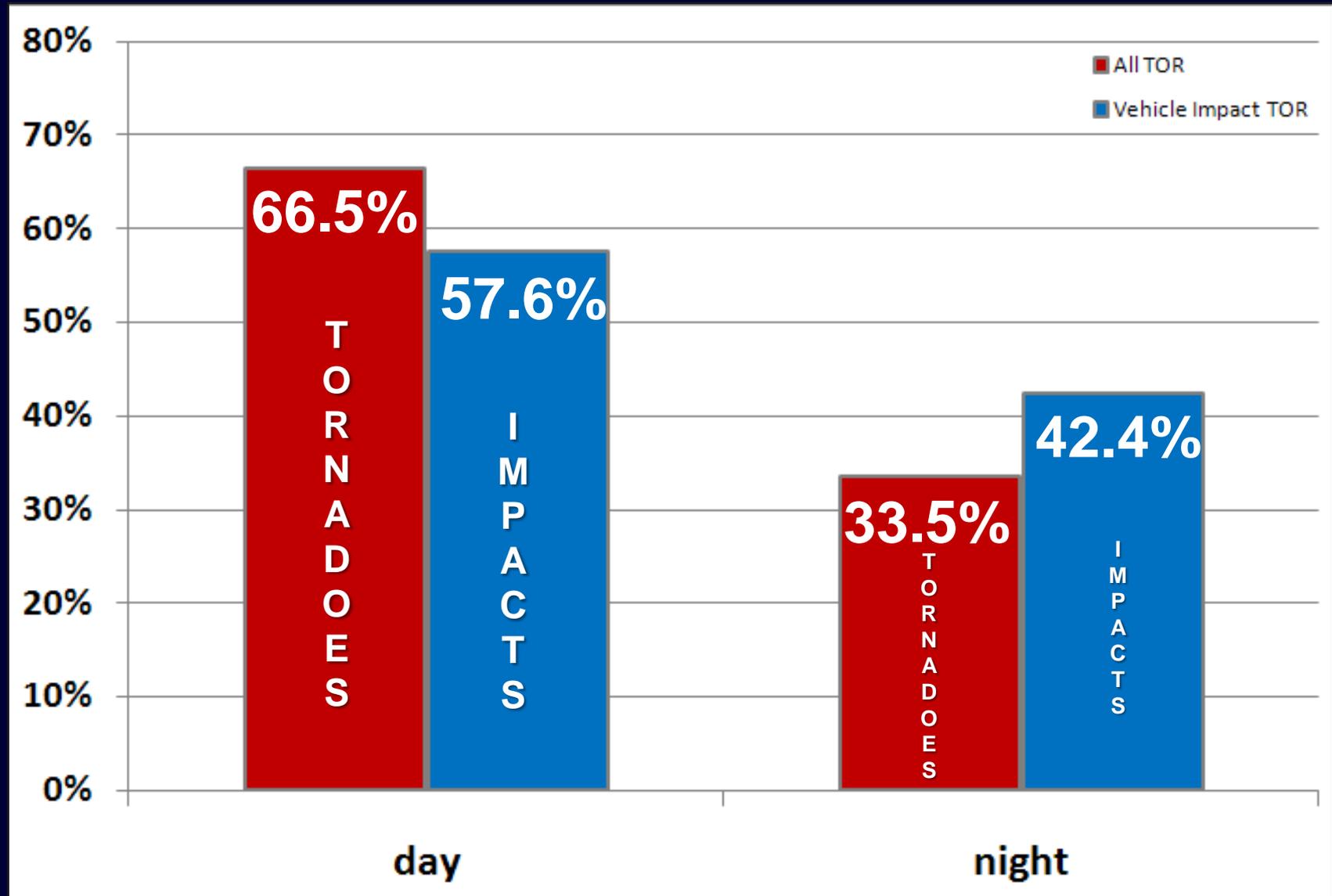


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EF Scale Distribution



Time of Day Tornado Distribution



Interstate Killer Tornadoes

7 tornadoes resulted in 8 direct fatalities on the interstate.

Arkansas	3/1/97	EF4	day
Arkansas	11/27/05	EF3	night
Illinois	4/19/96	EF3	night
Illinois	6/1/99	EF3	day
Oklahoma	5/3/99	EF5	day
Oklahoma	5/3/99	EF4	night
Wisconsin	8/27/94	EF3	night



- ~ **7%** killer tornadoes per vehicle impact tornadoes
- ~ **1%** killer tornadoes per all interstate tornadoes

(All killer tornadoes EF3 or greater intensity)

Interstate Killer Tornadoes

Were there specific circumstances that enhanced threat?



Fatality Location	Mitigated?
2 deaths under overpass	Outside of vehicles
2 deaths from debris inside vehicle	Body below windows?
1 death in semi at a rest area on Interstate	Was driver asleep?
1 death in the sleeper portion of a semi	No seat belt, asleep?
1 death in van with person ejected	No seat belt?
1 death from vehicle thrown upside down	---

263 Total Vehicles Impacted = Few Direct Fatalities

Recommended Protective Actions



Recommended Protective Actions

NWS and ARC Joint Statement - Issued Summer 2009

If you are caught outdoors, you should seek shelter in a basement, shelter or sturdy building. If you cannot quickly walk to a shelter:

- **Immediately get into a vehicle, buckle your seat belt and try to drive to the closest sturdy shelter.**
- **If flying debris occurs while you are driving, pull over and park. Now you have the following options as a last resort:**
 - **Stay in the car with the seat belt on. Put your head down below the windows, covering with your hands and a blanket if possible.**
 - **If you can safely get noticeably lower than the level of the roadway, exit your car and lie in that area, covering your head with your hands.**
- **Your choice should be driven by your specific circumstances.**

Recommended Protective Actions

NWS and ARC Joint Statement - Issued Summer 2009



➤ If flying debris occurs while you are driving, pull over and park. Now you have the following options as a last resort:

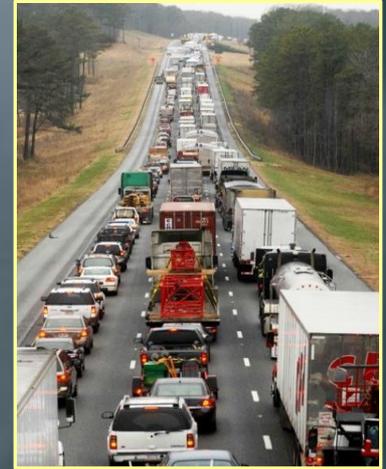
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➤ Your choice should be driven by your specific circumstances.

Support Services and Technologies



TORNADO WARNING
I-80...MM 248 TO MM 256
UNTIL 430 PM CDT



Interstates are crucial points of reference to both travelers and local residents

NWS Support to Interstate Travelers

Mile markers (MM) are the universal language!

Initial tornado warnings (2005-2008) for confirmed Interstate tornadoes

95 Interstate Tornadoes

Warnings

87 Tornado Warnings

8 No Tornado Warning

Mile Markers

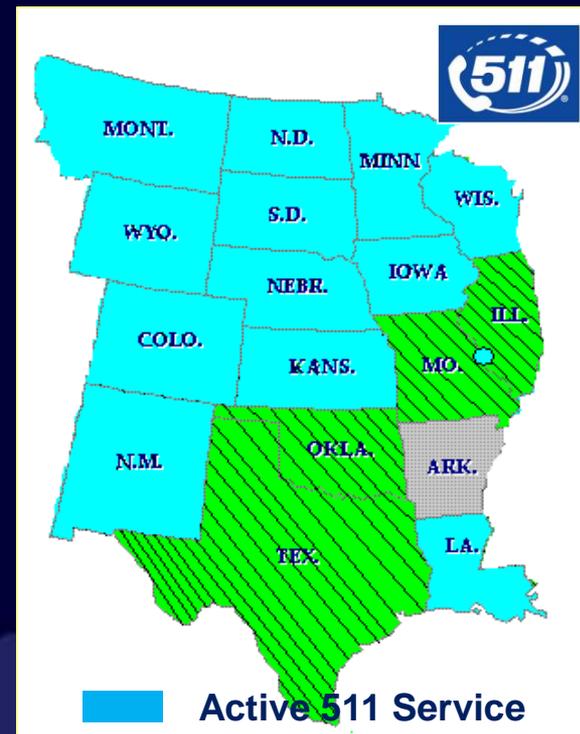
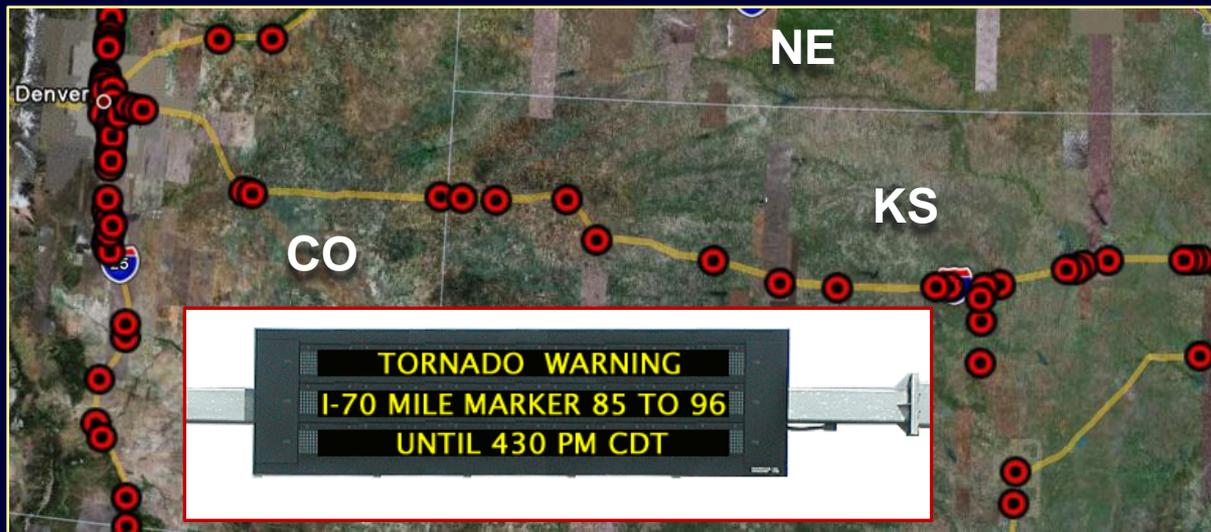
70 No MM Mention

17 MM Mention

5 Interstates mentioned in text

**Only 23% tornadoes with reference to
Interstates mentioned in TOR warnings**

Future Tools - Collaboration Possibilities



Dynamic Message Signs

511 Service

Media/DOT Radio Broadcasts

Law Enforcement Road Closures

Cell Phones/Graphical Tools



Conclusions and Future Work

- Motorists traveling on Interstates (other roadways) have **increased vulnerability** to weather hazards
- Interstates and Mile Markers serve as **important references** in disseminated warning information
- Multi-agency collaboration and future technologies may help **mitigate casualties/damage**
- **Paradigm shift**: New “last-resort” safety options training
- **Paper** to summarize results and recommendations

Thank You!

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