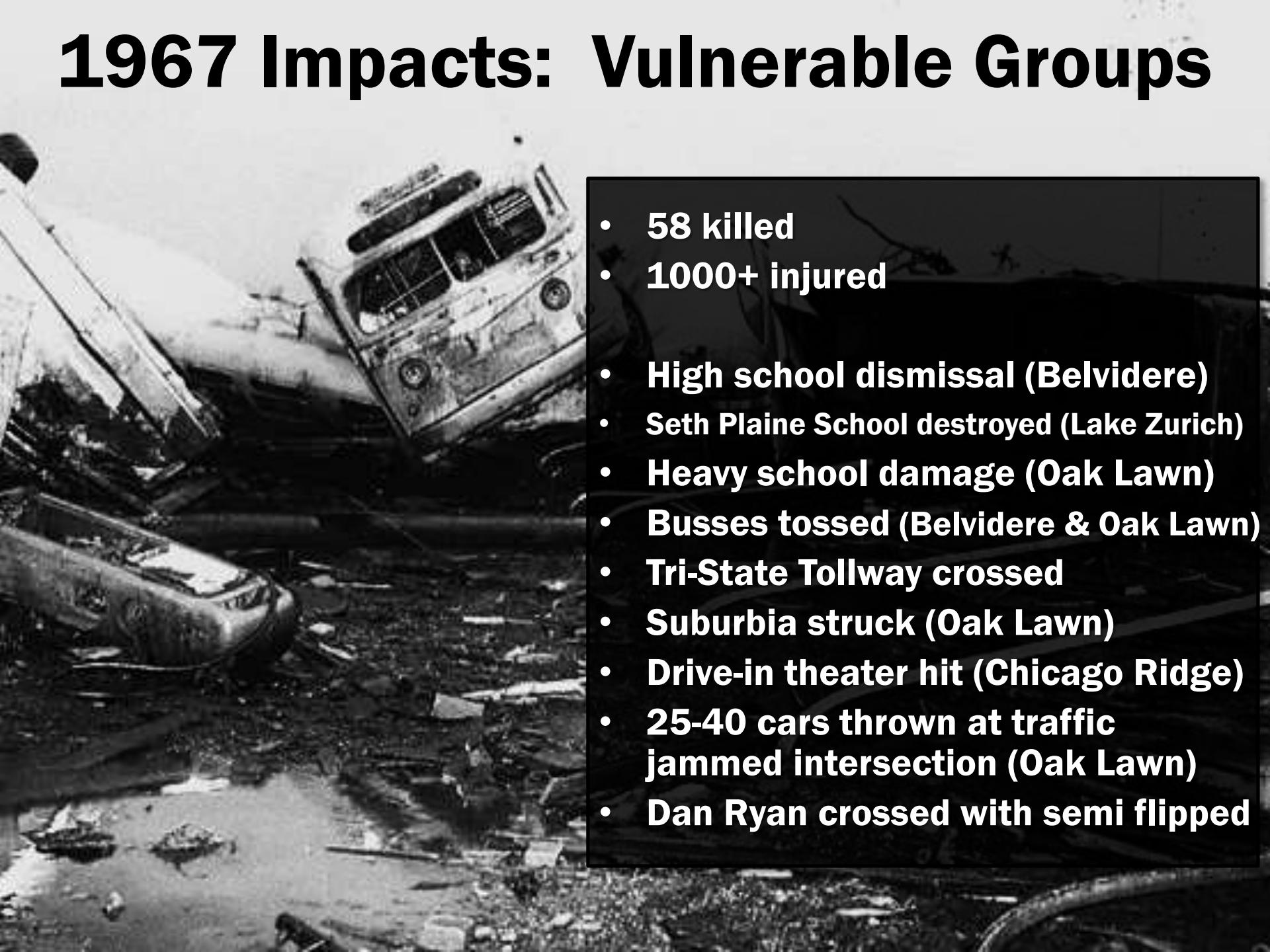
Weather Ready Reminders of the 1967 Outbreak

Applying Yesterday's Lessons to Today's Vulnerability

Matt Friedlein & Mike Bardou

National Weather Service – Chicago/Romeoville, IL

1967 Impacts: Vulnerable Groups



- 58 killed
- 1000+ injured

- High school dismissal (Belvidere)
- Seth Plaine School destroyed (Lake Zurich)
- Heavy school damage (Oak Lawn)
- Busses tossed (Belvidere & Oak Lawn)
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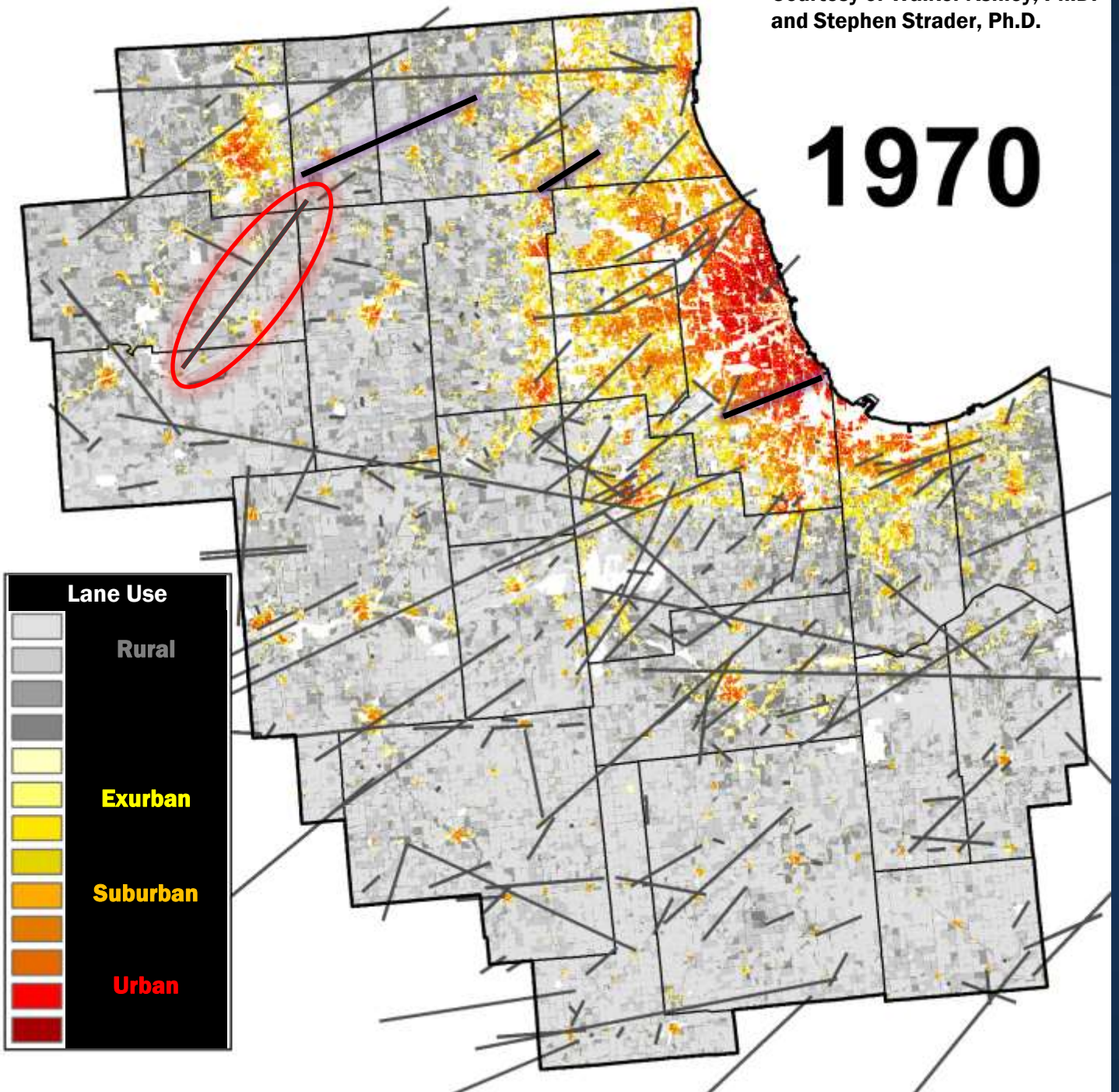
Courtesy of Walker Ashley, Ph.D.
and Stephen Strader, Ph.D.



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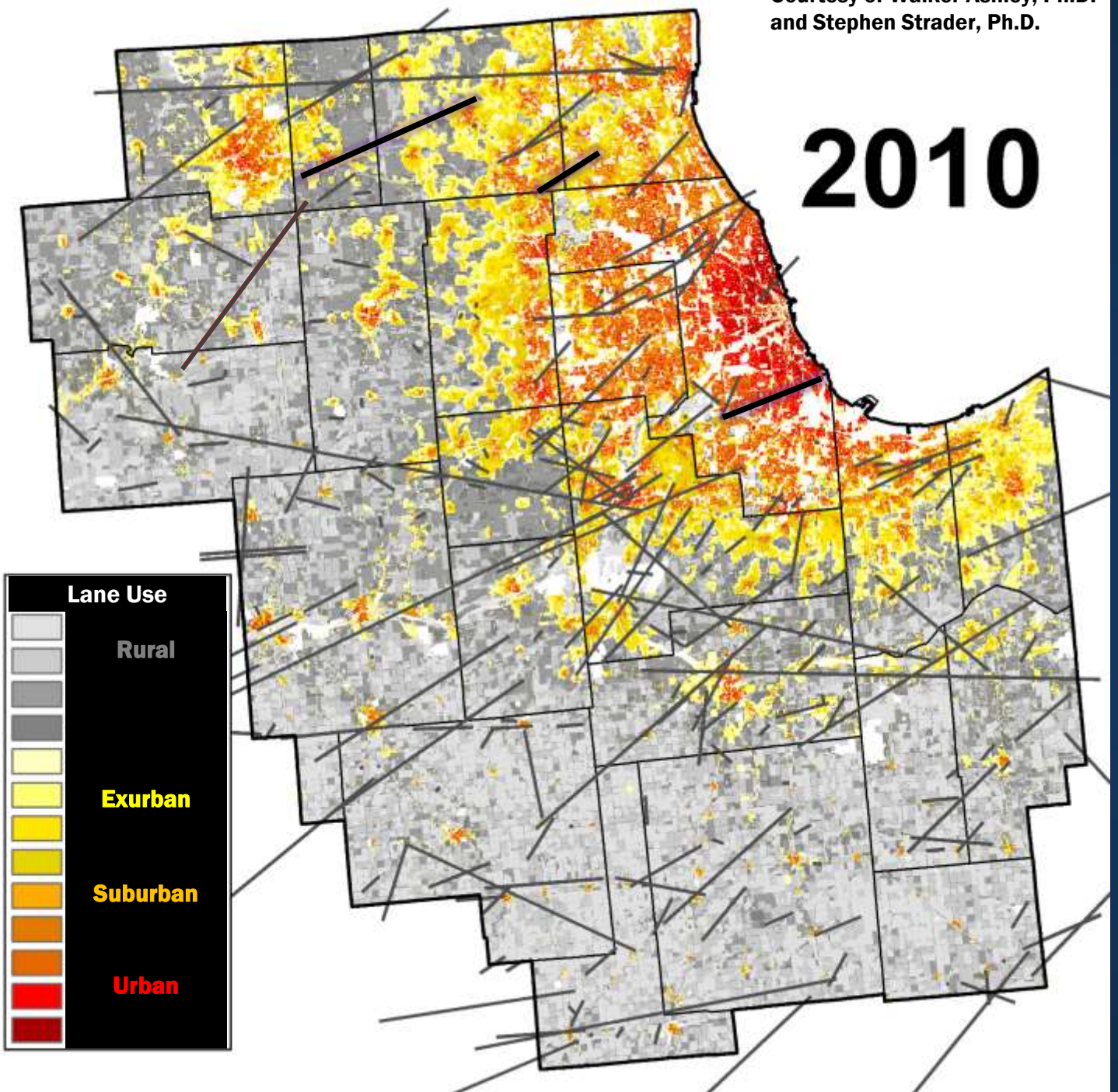

Expanding Bull's-Eye Effect

Walker Ashley, Ph.D. & Stephen Strader, Ph.D.

- **Their research stresses that "targets"—i.e., humans and their possessions—of hazards are enlarging as populations grow and spread**

Spatiotemporal Changes in Tornado Hazard Exposure: The Case of the Expanding Bull's-Eye Effect in Chicago, Illinois

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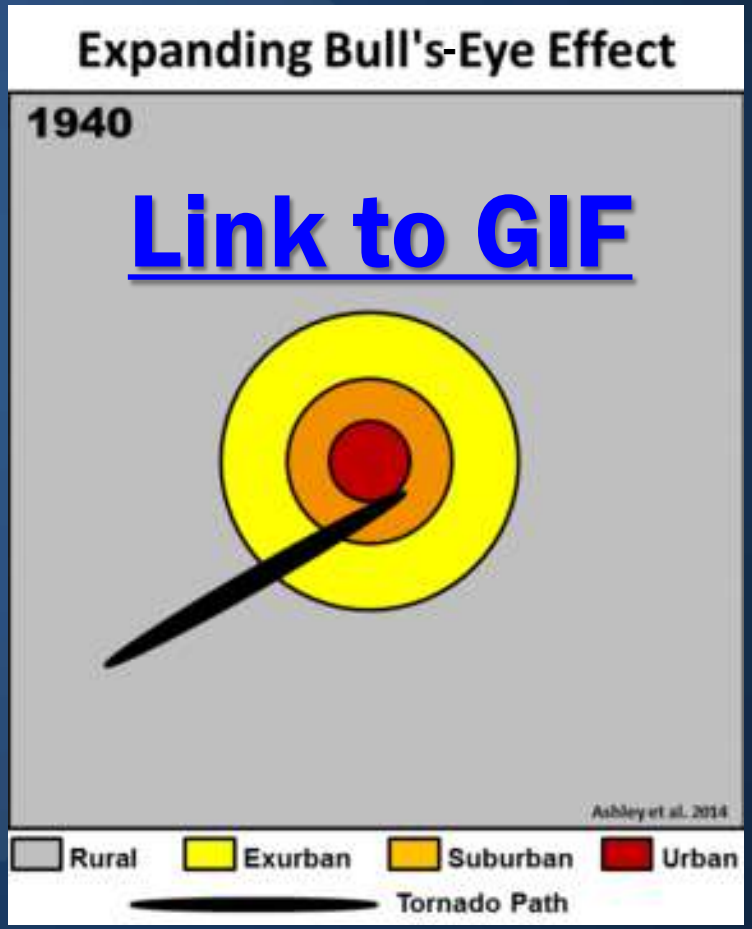
ABSTRACT

Exposure has amplified rapidly over the past half century and is one of the primary drivers of increases in disaster frequency and consequences. Previous research on exposure change detection has proven limited since the geographic units of aggregation for decennial censuses, the sole measure of accurate historical population and housing counts, vary from one census to the next. To address this shortcoming, this research produces a set of gridded population and housing data for the Chicago, Illinois, region to evaluate the concept of the "expanding bull's-eye effect." This effect argues that "targets"—people and their built environments—of geophysical hazards are enlarging as populations grow and spread. A collection of observationally derived synthetic violent tornadoes are transposed across fine-geographic-scale population and housing unit grids at different time stamps to appraise the concept. Results reveal that intensifying and expanding development is placing more people and their possessions in the potential path of tornadoes, increasing the likelihood of tornado disasters. The research demonstrates how different development morphologies lead to varying exposure rates that contribute to the unevenness of potential weather-related disasters across the landscape. In addition, the investigation appraises the viability of using a gridded framework for assessing changes in census-derived exposure data. The creation of uniformly sized grid data on a scale smaller than counties, municipalities, and conventional census geographic units addresses two of the most critical problems assessing historical changes in disaster frequencies and magnitudes—highly variable spatial units of exposure data and the mismatch between spatial scales of population/housing data and hazards.

1. Introduction

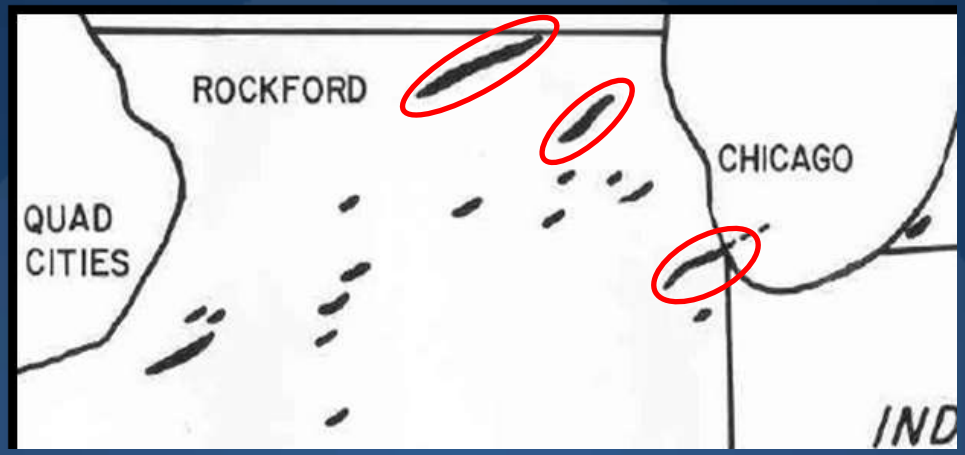
Over the past 80 years—the life span of an average

2012a), illustrating that weather hazard exposure landscape is not uniform or fixed, but rather is focused in specific areas and continually evolving.



Ashley et al. (2014) *Weather, Climate, and Society*; Strader and Ashley (2015) *Weatherwise*; Ashley and Strader (2016) *Bull. Amer. Meteor. Soc.*

The 1967 Tornado Paths if Today



Housing Units Impacted by the 21 April 1967 Violent Tornadoes

Tornado	1970	1980	1990	2000	2010	1970-2010 Housing Units Change	1970-2010 % change
Belvedere	686	1,073	1,224	1,703	2,268	1,582	230%
Lake Zurich	50	71	116	167	252	202	404%
Oak Lawn	3,955	4,318	4,419	4,515	4,580	625	16%
	4,691				7,100	+2,409	151%

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Oak Lawn Tornado Then and Now

Tornadoes Do Happen in Cities & Suburbs

Densely populated areas are every bit as susceptible to tornado strikes and recent years have shown this

Brooklyn, NY (2007)
Atlanta, GA (2008)
St. Louis, MO (2011)
Raleigh, NC (2011)
Tuscaloosa, AL (2011)
Joplin, MO (2011)
Springfield, MA (2011)
Moore, OK (1999 & 2013)
New Orleans, LA (2017)

Joplin, MO (2011)

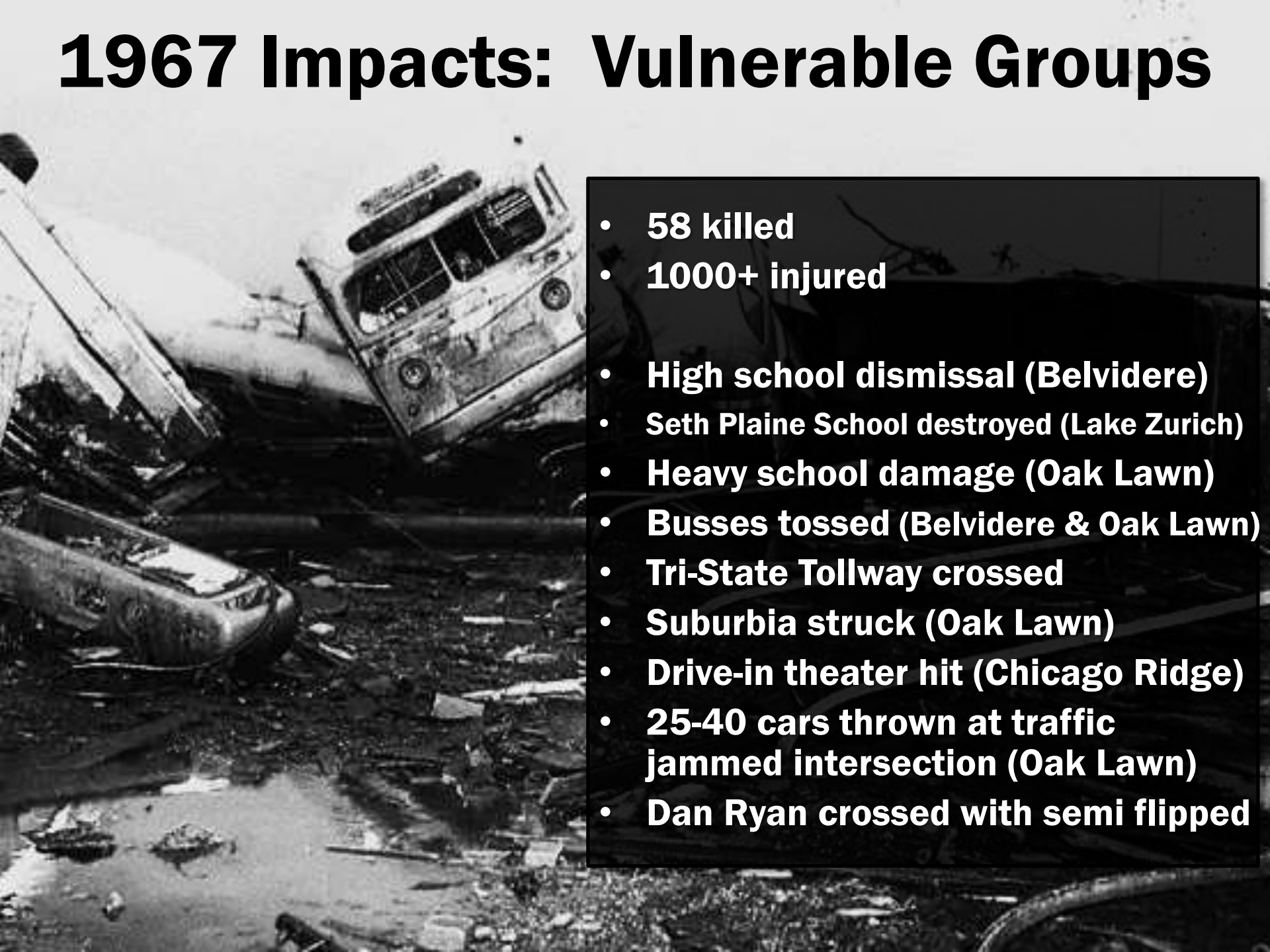
St. Louis, MO (2011)

Moore, OK (2013)

New Orleans, LA (2017)

National Weather Service Chicago: weather.gov/chicago/severeprepare

1967 Impacts: Vulnerable Groups



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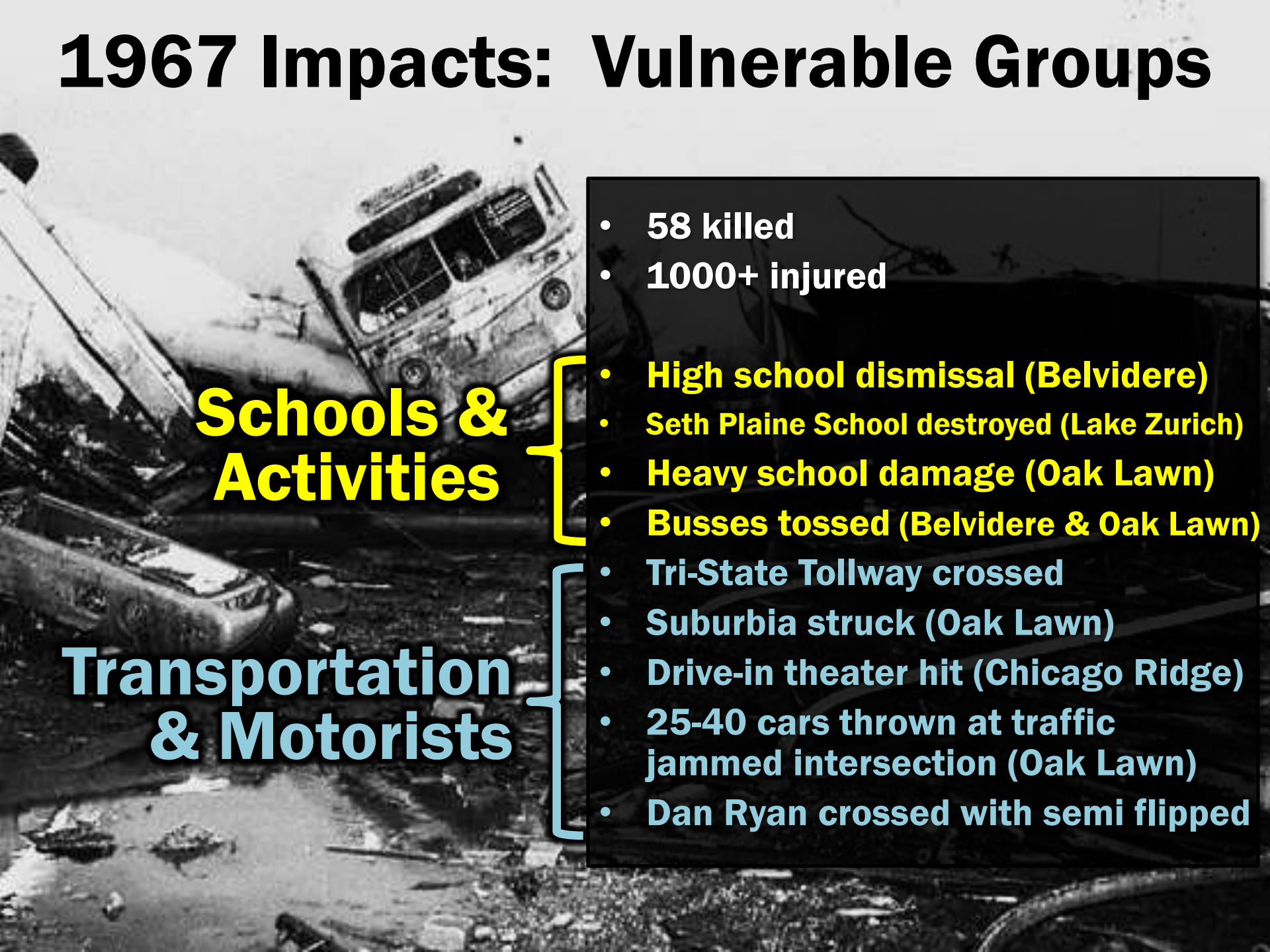

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Schools & Activities

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Transportation & Motorists

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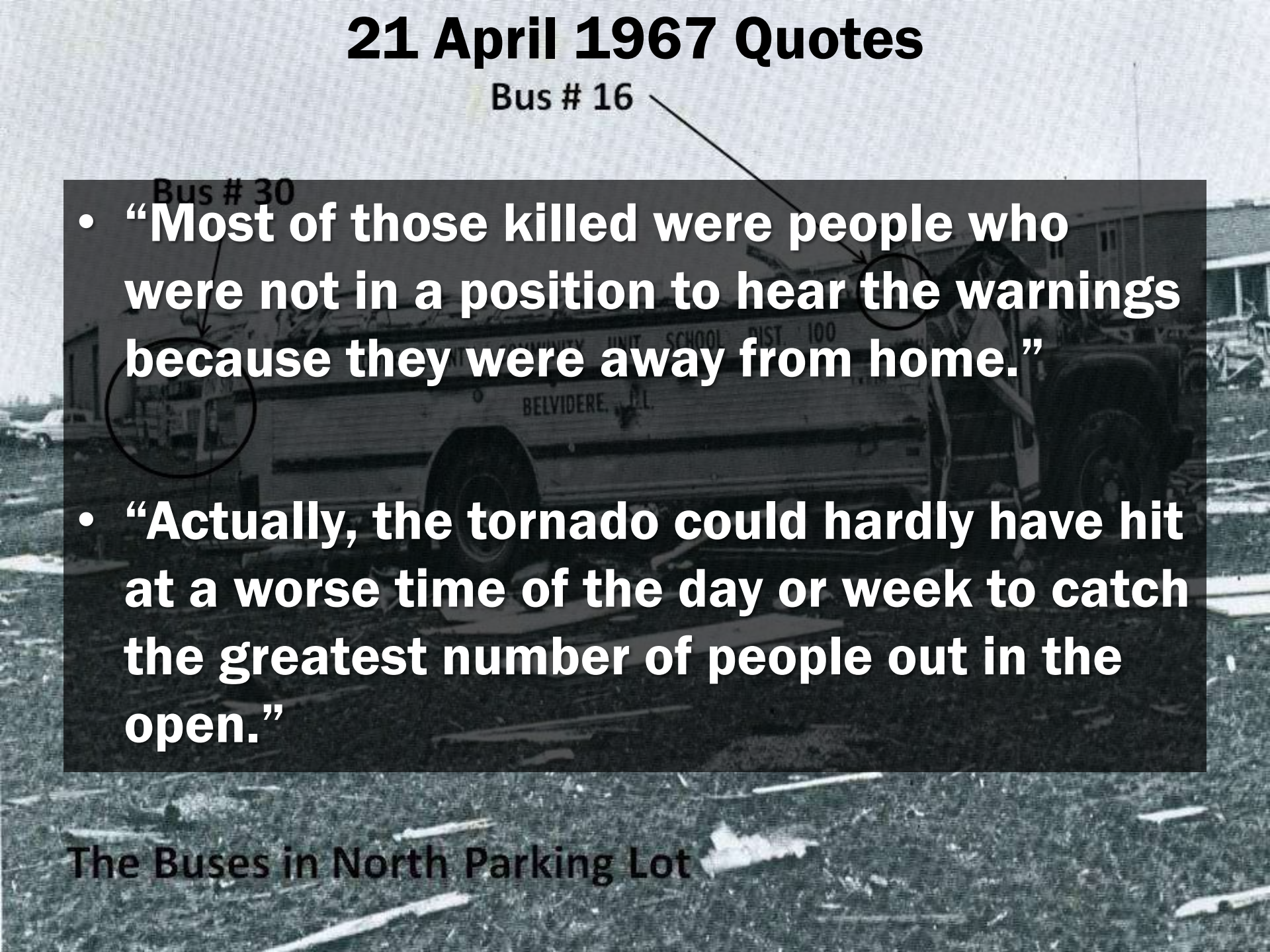
21 April 1967 Quotes

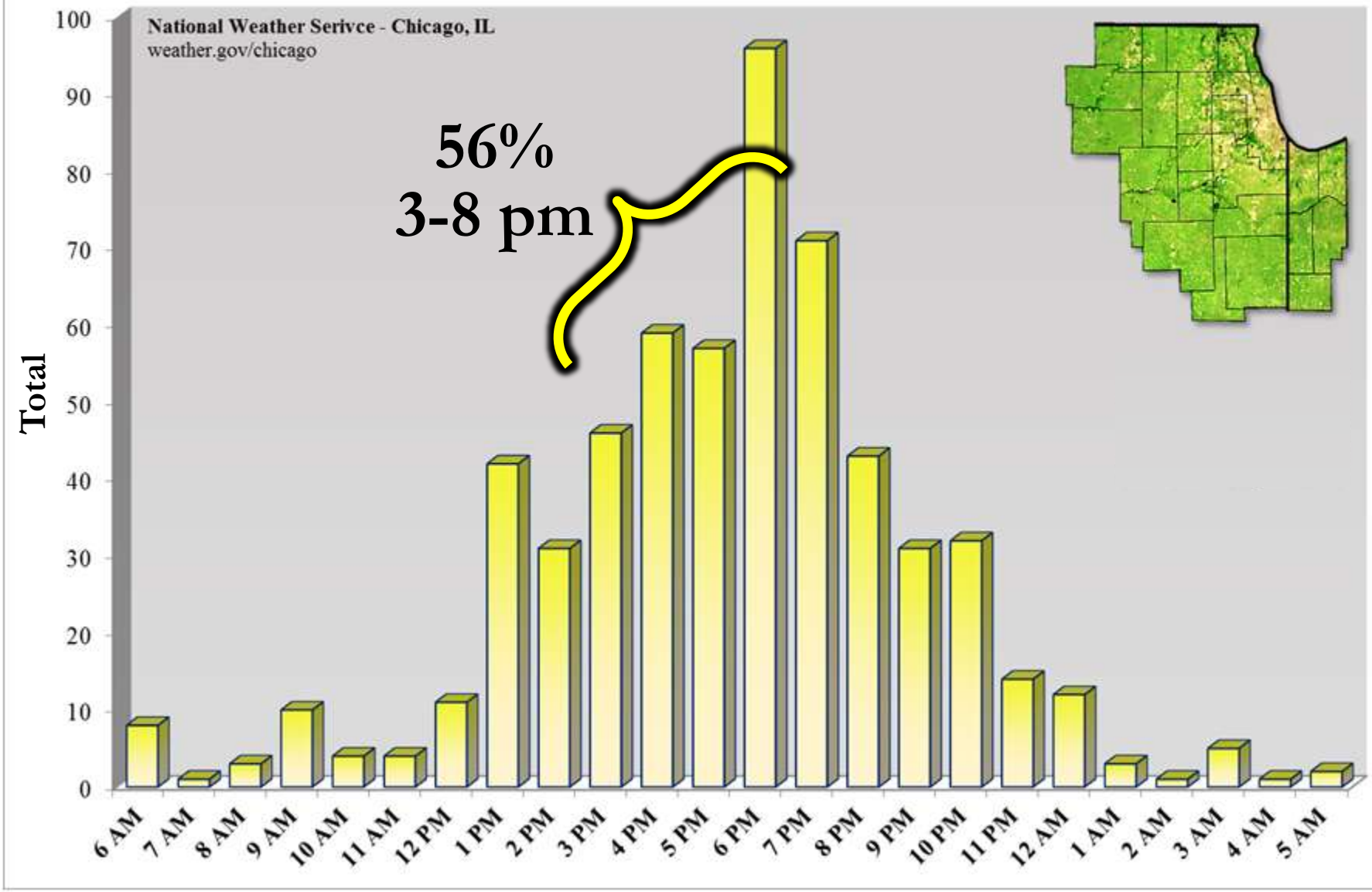


- “Most of those killed were people who were not in a position to hear the warnings because they were away from home.”
- “Actually, the tornado could hardly have hit at a worse time of the day or week to catch the greatest number of people out in the open.”

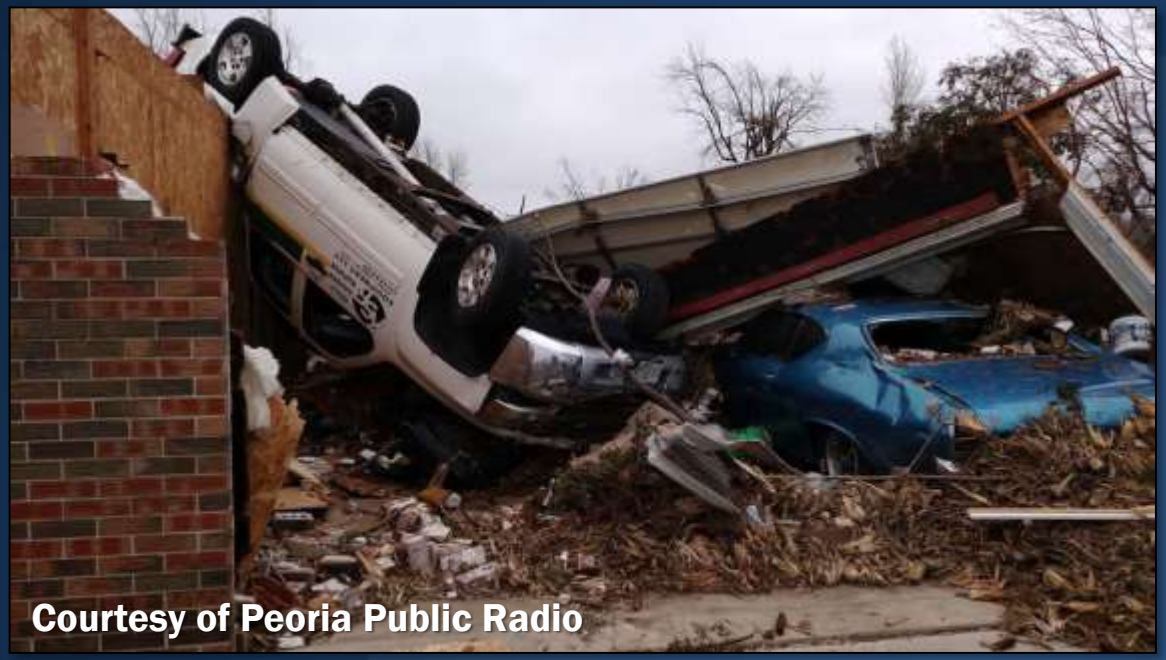
The Buses in North Parking Lot

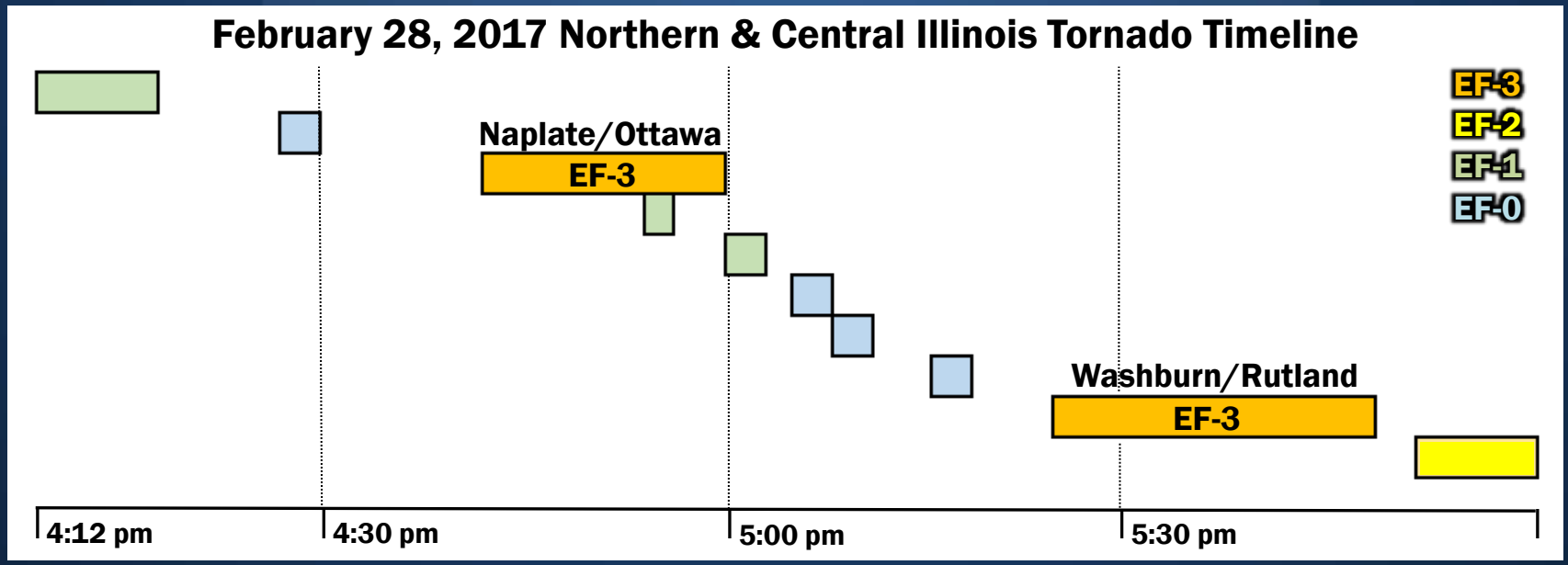
Tornadoes by Time of Day

Northern Illinois & Northwest Indiana: 1950-2015

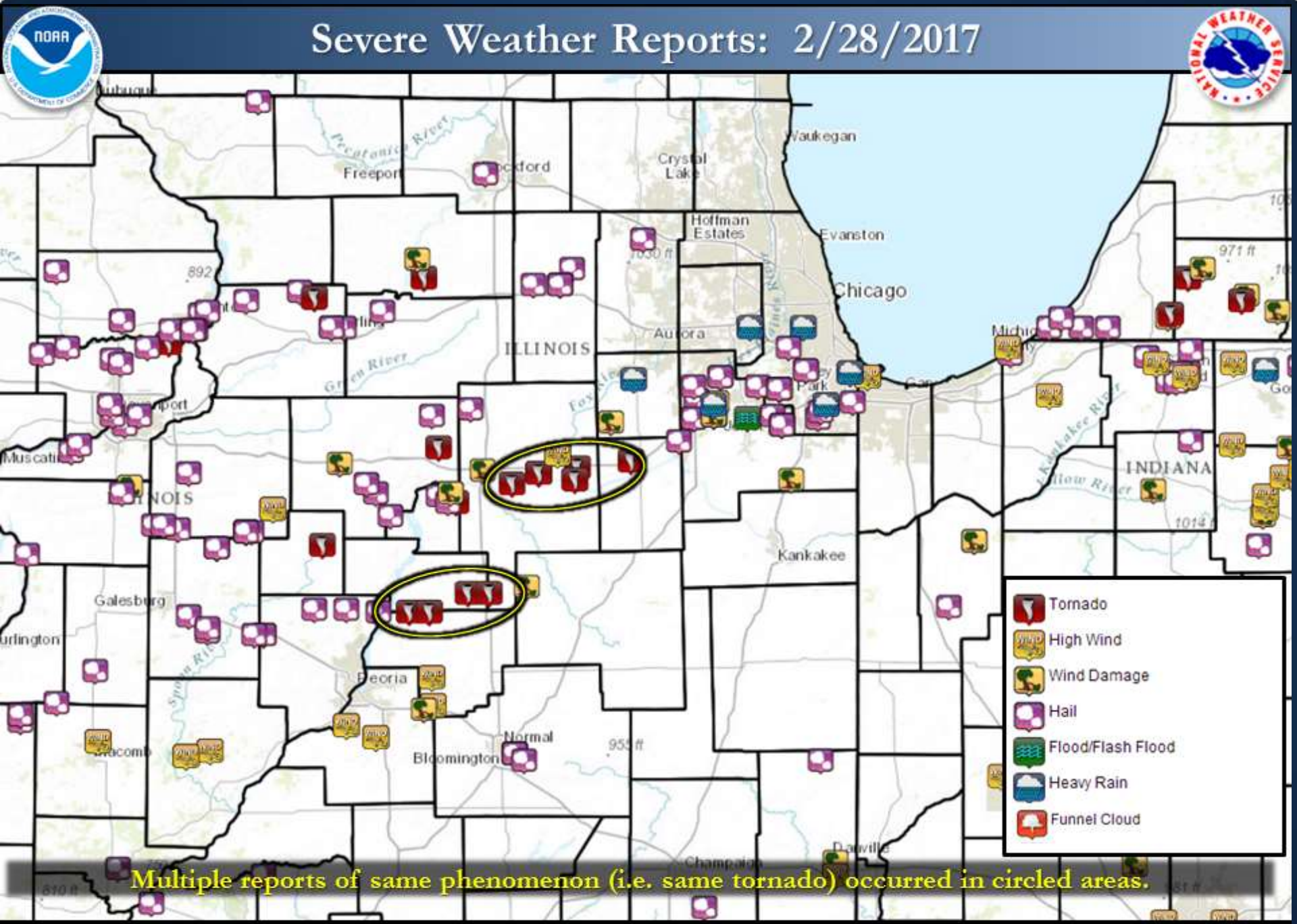


February 28, 2017 Tornadoes





Severe Weather Reports: 2/28/2017



Over the Past Half Century…

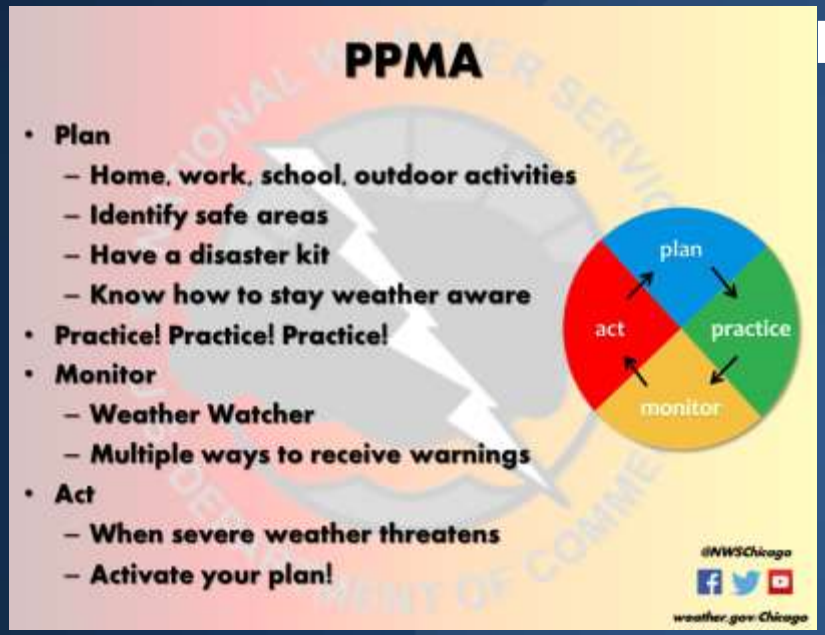
Tornado Prediction and Communications Evolution

Vulnerability

- Exposure to hazards (extreme weather)
- Misunderstanding of the message
- Not comprehending the threat
- “It cannot happen to me”
- Large groups requiring earlier decisions
- Proper & timely enacting of the safety plan

Plan, Practice, Monitor, Act!

Severe Weather Preparedness



weather.gov/chicago/severeprepare

Building a Weather-Ready Nation

- Weather awareness is key!
- Ask yourself these questions:
  - Do you have a preparedness plan for your home, workplace or school?
  - Do you have means to monitor the weather?
  - Do you have multiple ways to receive warnings?
  - What actions would you take if hazardous weather impacts you?

PPMA – a step further

- Goal is to not put yourself in a vulnerable situation
  - What will you be doing during the time of greatest risk?
  - How will you monitor weather information?
  - How will you receive warnings?
  - Can you adjust your plans or your route?
- weather.gov/chicago/severeprepare

February 28, 2017

- "Out of season" severe weather event
- After school activities?
- Afternoon commute?
- What were you doing that afternoon?

Weather Watcher

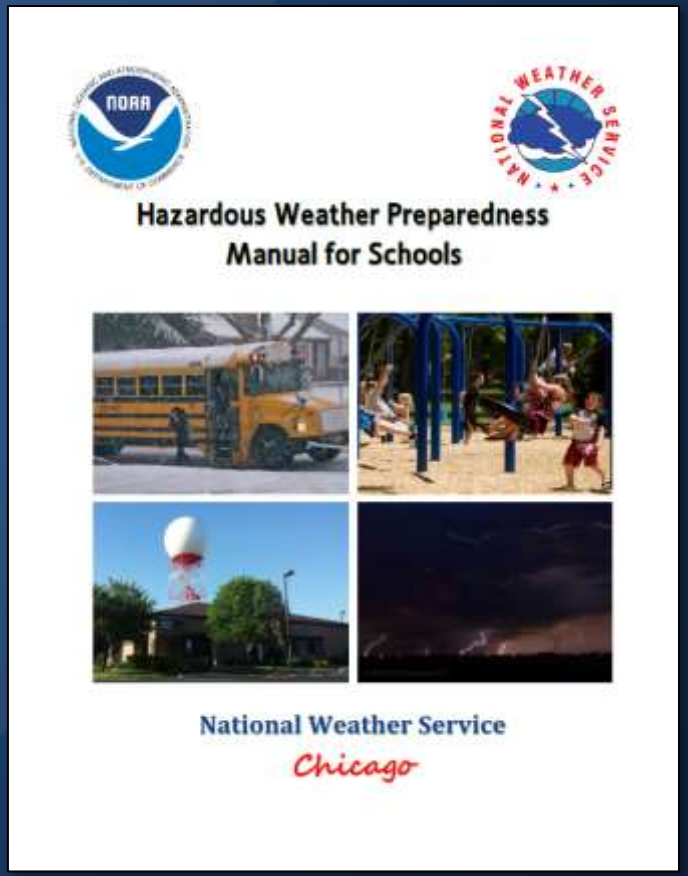
- **Designate one!**
  - Familiar with weather information/sources
  - Authority to enact severe weather plan
  - Access to internet
  - NOAA Weather Radio
  - Mobile apps
  - Lightning detection?
  - weather.gov/chicago/wx_watcher

Schools

- **Unique Challenges**
  - **Multiple facilities**
  - **Outdoor facilities**
  - **Before and after school activities**
  - **Transportation**

Schools

- Have sheltering/evacuation plans
  - for all facilities
  - after school activities
- Transportation plans
- Weather Watcher
- Drills
- School Preparedness Guide
- weather.gov/chicago/severeprepare



Schools – Activities

- Calculate time needed to evacuate/shelter
- Lightning risk with all storms
- Designate a Weather Watcher

Transportation Planning

- Identify shelters along routes
- Weather Watcher mode
- Identify timing of greatest threat
- Communication with school or dispatch
- Consider altering your schedule


Argyle, IL 11/2010

Transportation Action!

- Activate your plan!
- Consider not releasing students
  - lightning
  - warnings
- Seek shelter

Transportation Action! – Last Resort

- Remain calm and assess the situation!
- Determine the tornado's direction of movement. Can you drive away from it?
- Too much traffic? Seek shelter in a nearby building.
- Lie flat in a nearby ditch or depression. Get as low as possible -- that is where the wind speed is the lowest!

HIGHWAY OVERPASSES ARE *NOT* SAFE SHELTER!

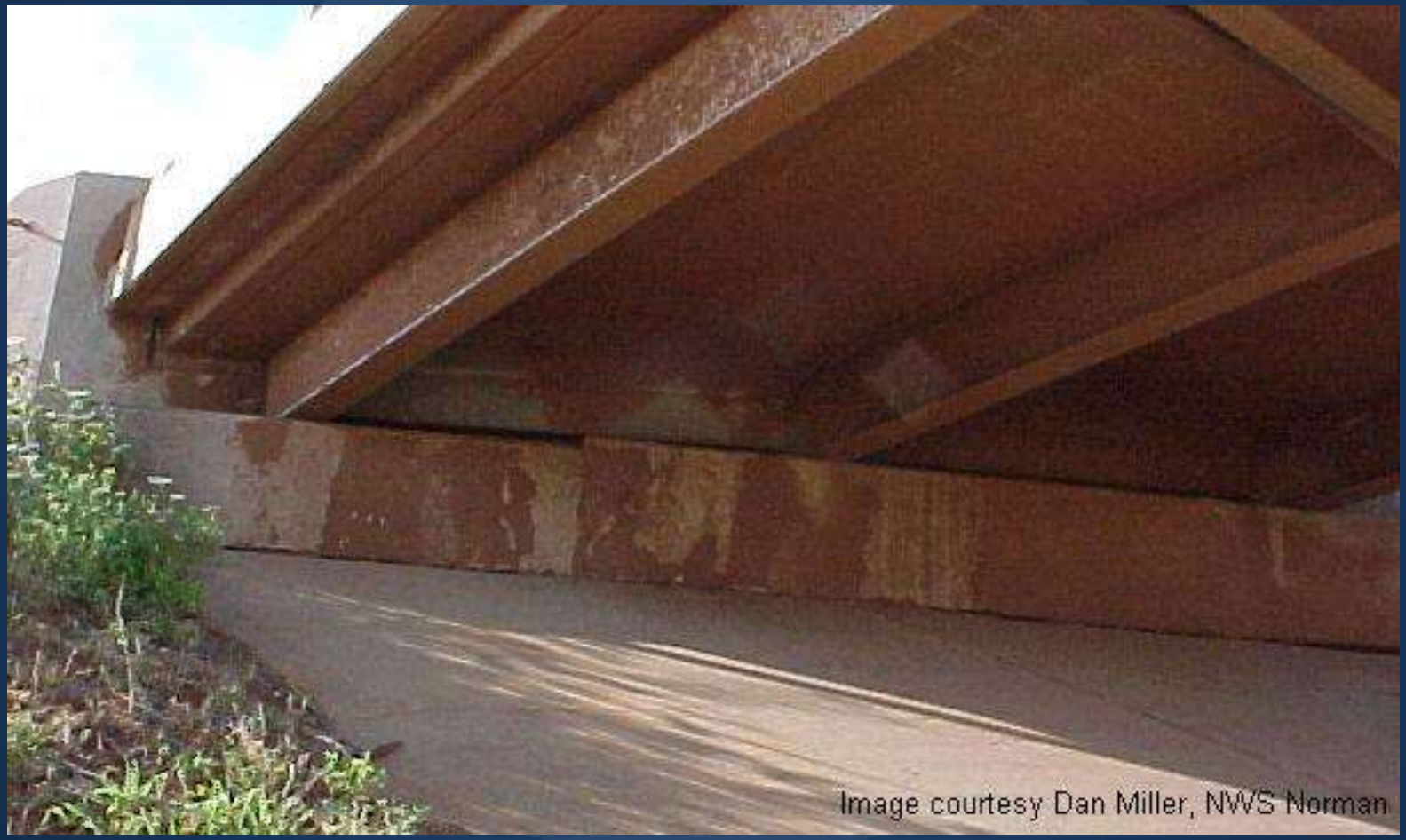
Why you should never take shelter under a highway overpass:

- You're exposed to higher wind speeds with no protection
- Wind and flying debris become channeled underneath
- Your parked car could block traffic and put others at risk

National Weather Service – Chicago, IL
weather.gov/Chicago

Created by:
NWS Kansas City, MO

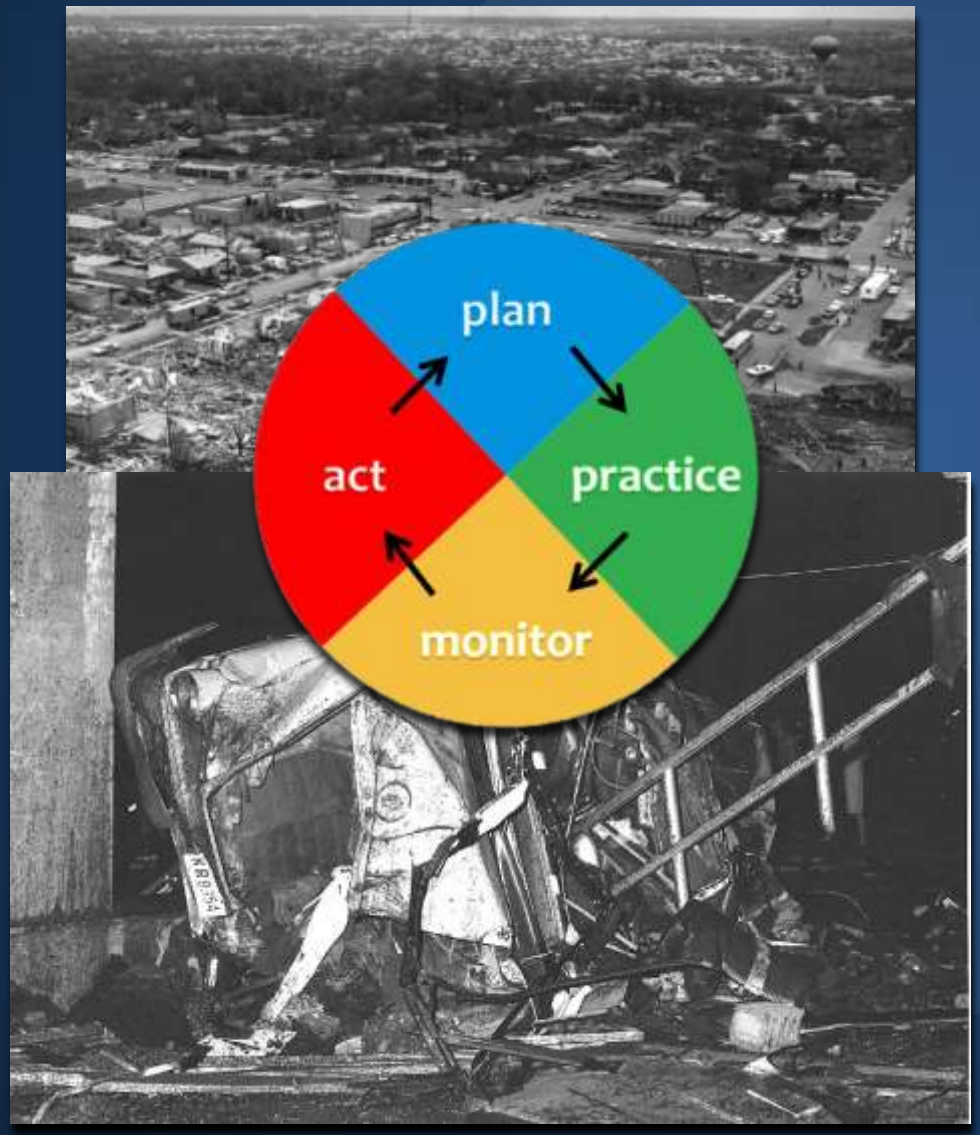
Moore, OK 1999



Other Issues

- Blocks traffic
- Prevents Emergency Personnel from reaching affected areas
- Potential major traffic disaster in situations of low visibility

Where We're At



- Vulnerability
- ✓ Awareness
- ✓ Science
- ✓ Communication
- ✓ Preparedness
- ✓ #BeAForce

Weather Ready Reminders of the 1967 Outbreak

Thank you!

Matt Friedlein & Mike Bardou

National Weather Service – Chicago/Romeoville, IL

Hazard Exposure Information

Special Thanks To: ***Walker Ashley, Ph.D. (NIU)*** ***washley@niu.edu*** ***Stephen Strader (Villanova)*** ***stephen.strader@villanova.edu***