

Weather Ready Reminders of the 1967 Outbreak

Applying Yesterday's Lessons to Today's Vulnerability



April 21, 1967

Feb 28, 2017



Matt Friedlein & Mike Bardou
National Weather Service – Chicago/Romeoville, IL



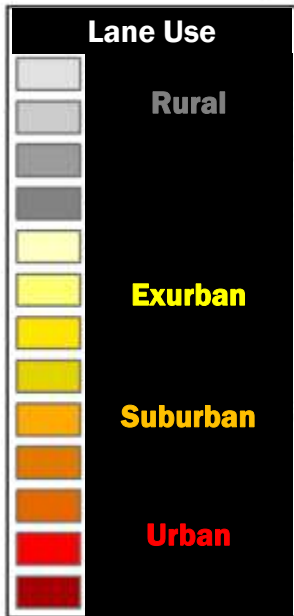
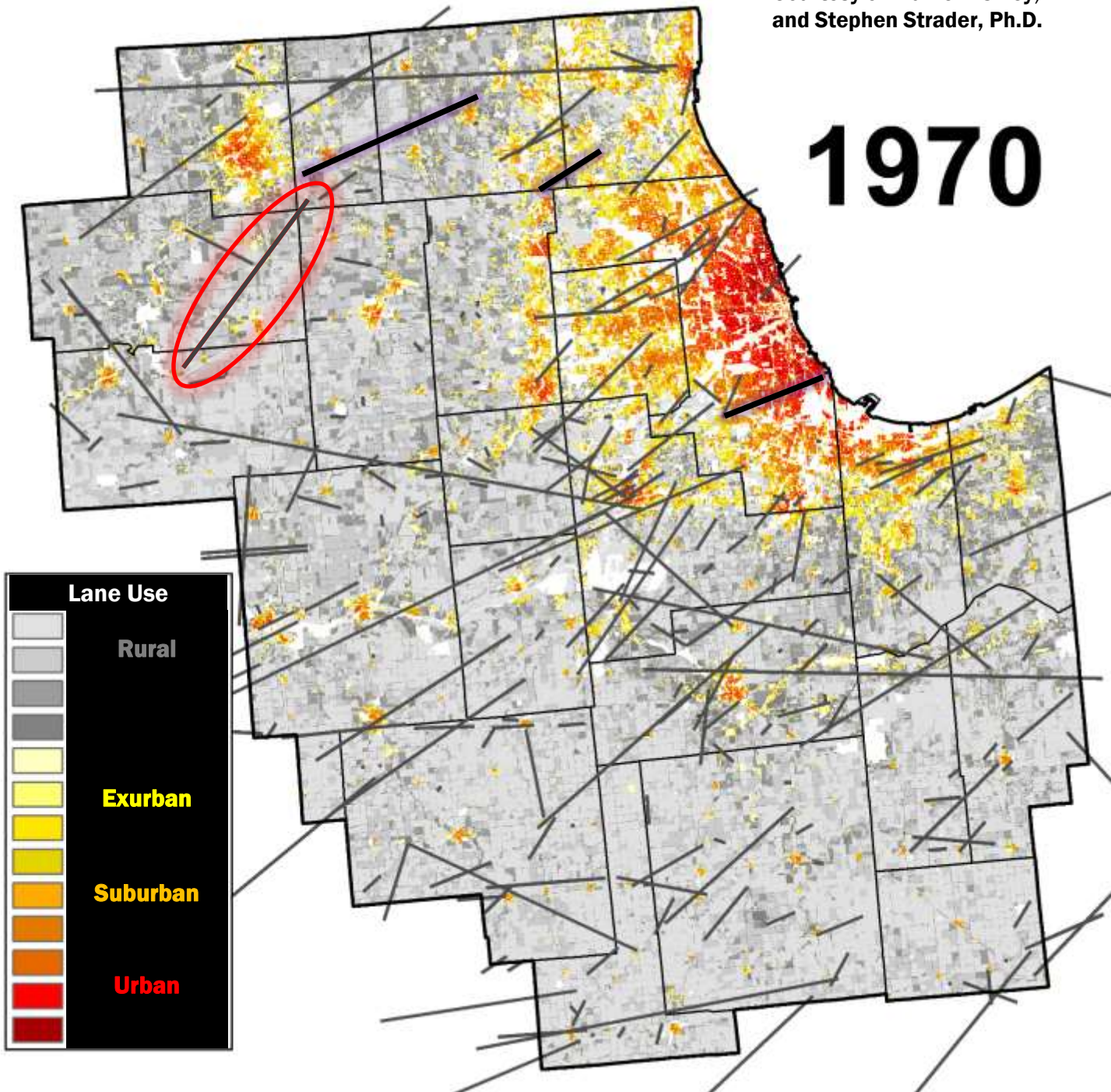
1967 Impacts: Vulnerable Groups



- **58 killed**
- **1000+ injured**
- **High school dismissal (Belvidere)**
- **Seth Plaine School destroyed (Lake Zurich)**
- **Heavy school damage (Oak Lawn)**
- **Busses tossed (Belvidere & Oak Lawn)**
- **Tri-State Tollway crossed**
- **Suburbia struck (Oak Lawn)**
- **Drive-in theater hit (Chicago Ridge)**
- **25-40 cars thrown at traffic jammed intersection (Oak Lawn)**
- **Dan Ryan crossed with semi flipped**

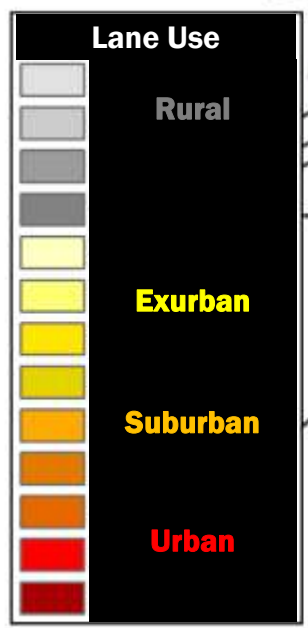
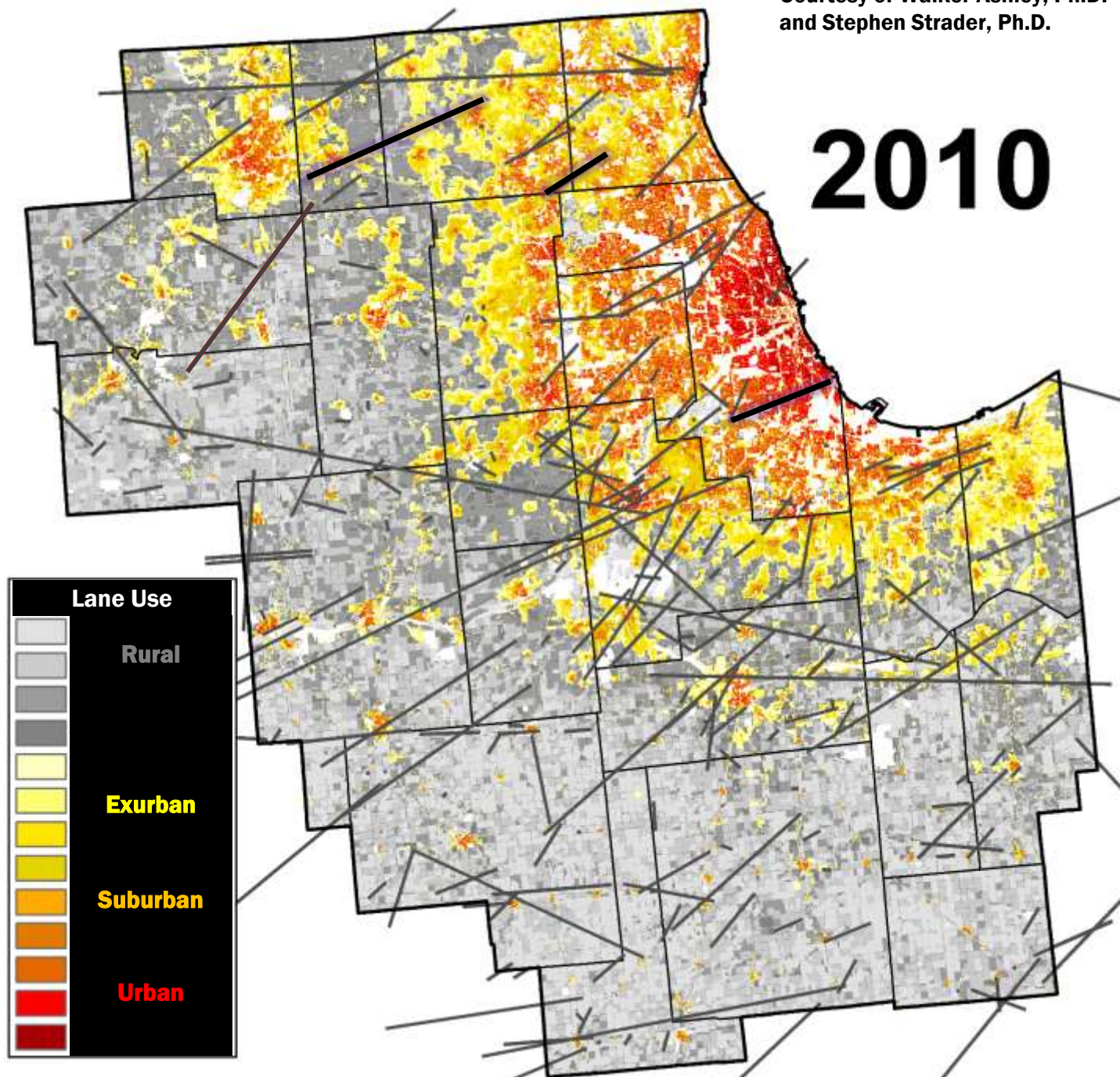
Courtesy of Walker Ashley, Ph.D.
and Stephen Strader, Ph.D.

1970



Courtesy of Walker Ashley, Ph.D.
and Stephen Strader, Ph.D.

2010



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

APRIL 2014

ASHLEY ET AL.

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

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(Manuscript received 10 July 2013, in final form 26 September 2013)

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.

Expanding Bull's-Eye Effect

1940

[Link to GIF](#)



Ashley et al. 2014



The 1967 Tornado Paths if Today



Housing Units Impacted by the 21 April 1967 Violent Tornadoes

Tornado	1970	1980	1990	2000	2010
Belvedere	686	1,073	1,224	1,703	2,268
Lake Zurich	50	71	116	167	252
Oak Lawn	3,955	4,318	4,419	4,515	4,580

1970-2010 Housing Units Change	1970-2010 % change
1,582	230%
202	404%
625	16%

4,691

7,100

+2,409

151%

Oak Lawn Tornado Then and Now

OAK LAWN TORNADO

MAP # 1

[Link to GIF](#)



Drive-in theatre
now a shopping
center

Busy intersection
now one of many

Numerous dense
residential areas

TRANSMISSION LINE
Down

1 5 0 1 KILOMETER
CONTOUR INTERVAL 5 FEET

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)

1967 Impacts: Vulnerable Groups



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1967 Impacts: Vulnerable Groups

Schools & Activities

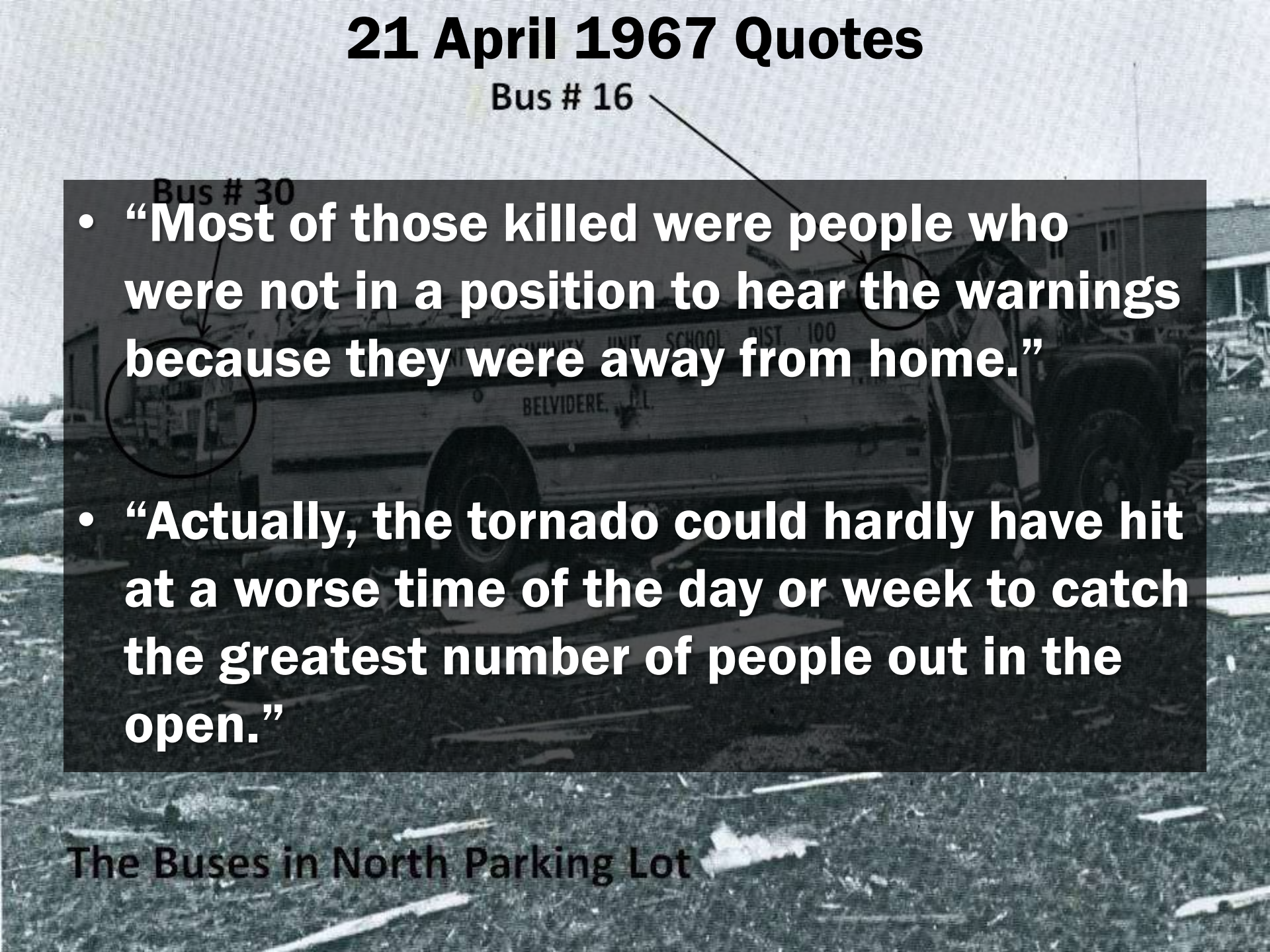
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Transportation & Motorists

- Tri-State Tollway crossed
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21 April 1967 Quotes

Bus # 16

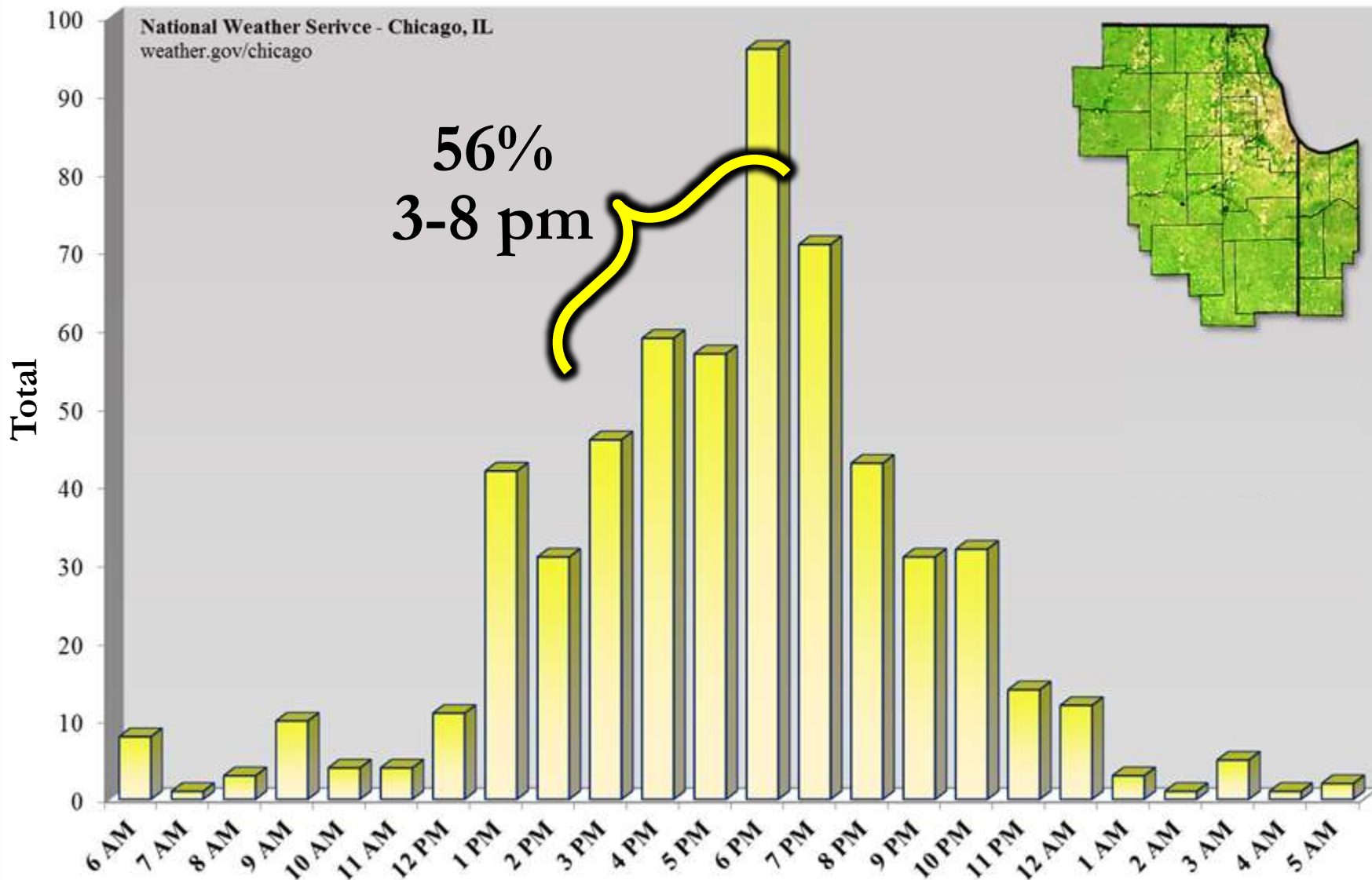
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- **“Most of those killed were people who were not in a position to hear the warnings because they were away from home.”**
 - **“Actually, the tornado could hardly have hit at a worse time of the day or week to catch the greatest number of people out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

The Buses in North Parking Lot

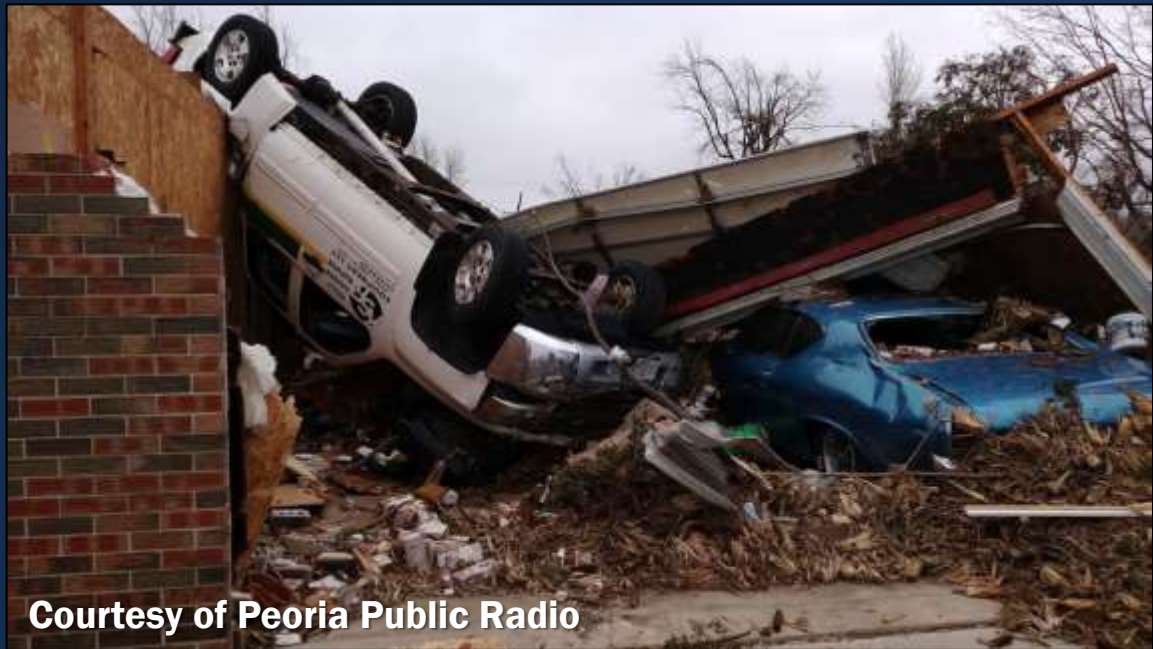


Tornadoes by Time of Day

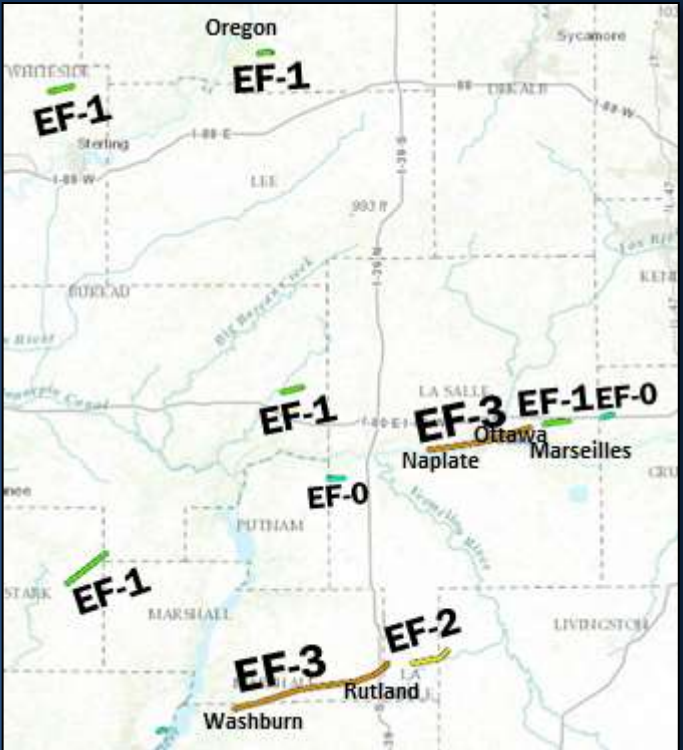
Northern Illinois & Northwest Indiana: 1950-2015



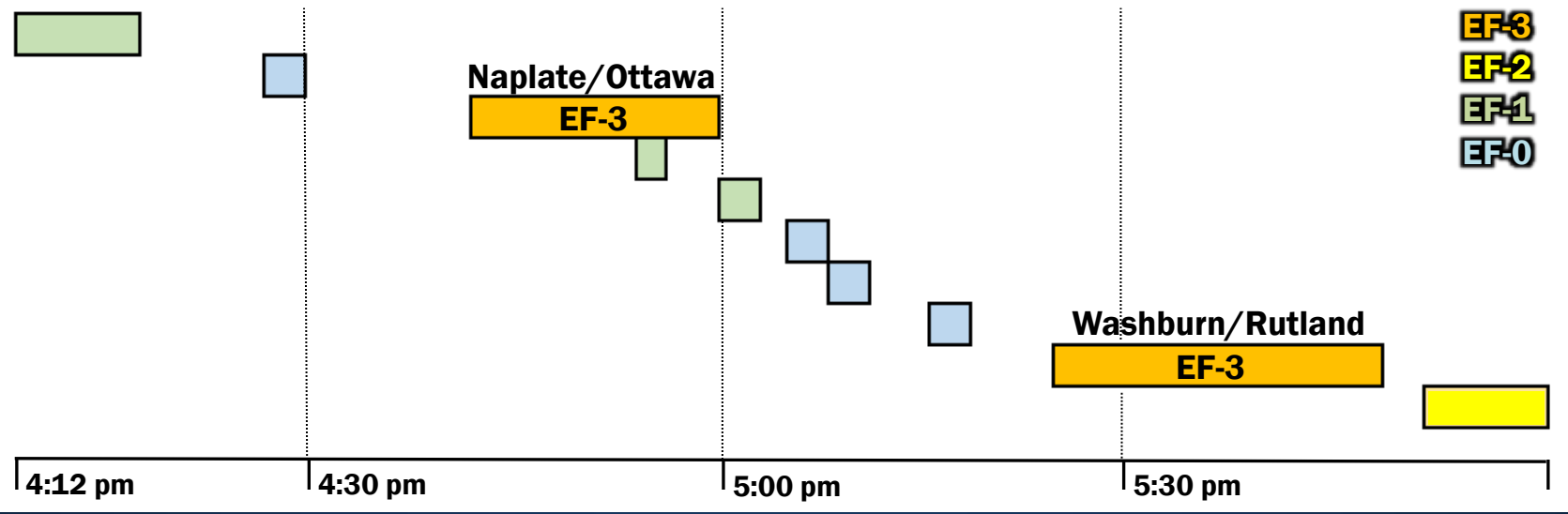
February 28, 2017 Tornadoes



Courtesy of Peoria Public Radio

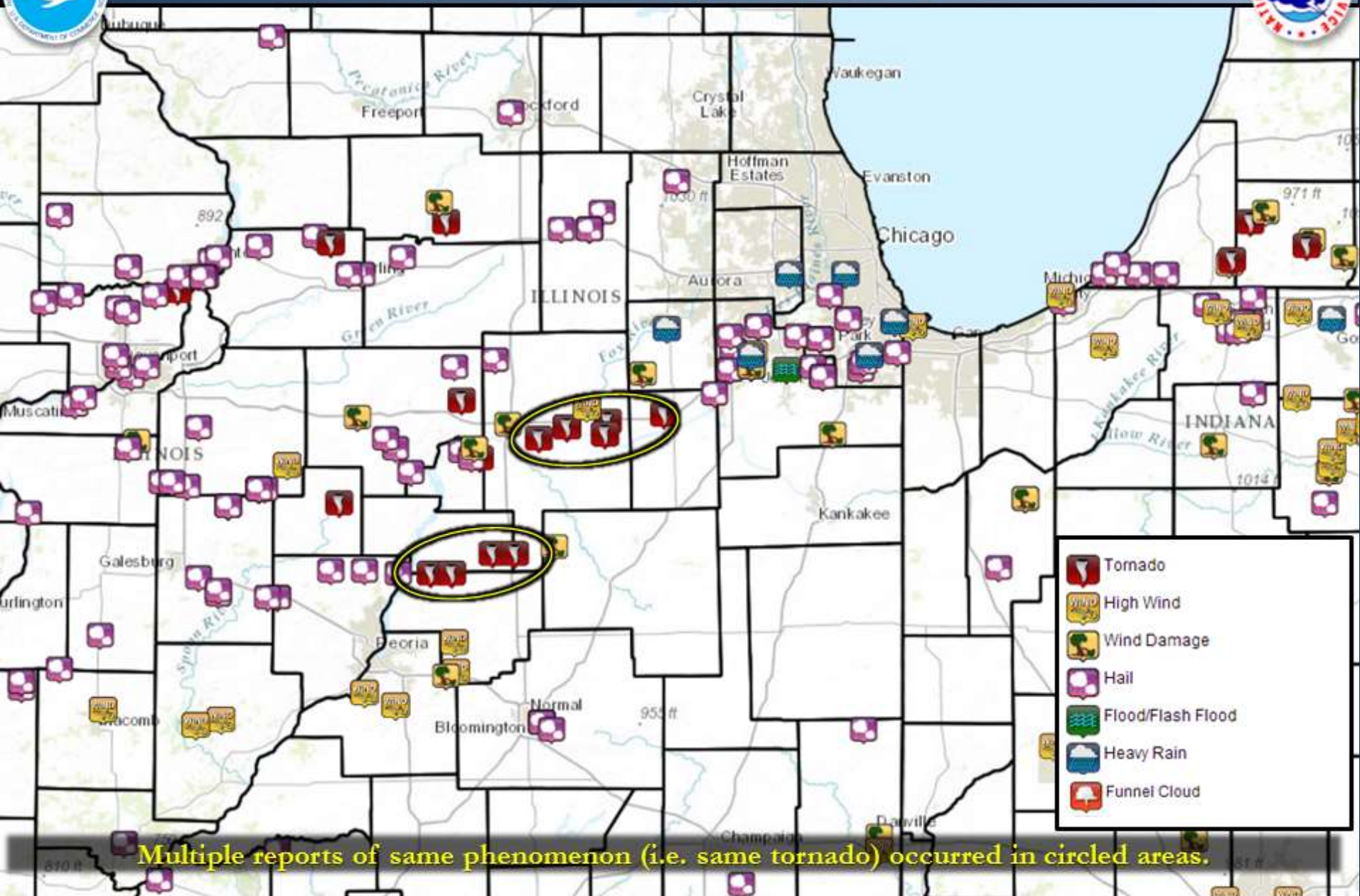


February 28, 2017 Northern & Central Illinois Tornado Timeline





Severe Weather Reports: 2/28/2017



Multiple reports of same phenomenon (i.e. same tornado) occurred in circled areas.



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

PPMA

- **Plan**
 - Home, work, school, outdoor activities
 - Identify safe areas
 - Have a disaster kit
 - Know how to stay weather aware
- **Practice! Practice! Practice!**
- **Monitor**
 - Weather Watcher
 - Multiple ways to receive warnings
- **Act**
 - When severe weather threatens
 - Activate your plan!



@NWSChicago
 f t v
 weather.gov/Chicago

MAKE SURE YOU KNOW

Severe Weather Safety

This is a checklist of five basic things you should know about severe weather safety. Knowing this information and utilizing these tips should improve your chances of being safe if severe weather threatens. Be sure that you, and your family or coworkers, are familiar with everything on this list.

- Three Basic Things to Include in Your Severe Weather Safety Plan**
 - Where to Shelter
 - How to Reach Each Other (communication)
 - Meet-up spot if You Get Separated
- Knowing Important Sources of Weather Information**
 - NWS Chicago Weather Watcher Page
 - Watches and Warnings
- Have Multiple Ways to Get Weather Information**
- Ensure Wireless Emergency Alerts are Enabled on Smartphone**
- "Get In, Get Down, Cover Up"**

★ **Self-Assessment: Can you check all five boxes?**

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SEVERE WEATHER SAFETY PLAN

Three basic things everyone in your home or business should know...

- 1. Pick A Spot**

 Find a safe normal sheltering location, and let everyone know that's where they should go during severe weather.
- 2. How To Get In Touch**

 Everyone should know how to reach one another afterwards. In disasters, texting is often better than calling.
- 3. Choose a "Meet Up Spot"**

 It's a good idea to have a standard meet up spot that everyone knows.

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HAVE MULTIPLE WAYS TO GET WEATHER INFO



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When a TORNADO WARNING is Issued

"Get In, Get Down, Cover Up"

- 1. Get In**
 Get into a sturdy building and put as many walls between you and the outside as possible.
- 2. Get Down**
 Get as low in the building as possible – the basement or the lowest floor.
- 3. Cover Up**
 Flying and falling debris are a storm's number one killer. Use pillows, blankets, helmets, etc. to cover up and protect yourself.

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WATCH VS. WARNING

Do YOU know the difference?

You should be...

WATCH

BE ALERT! Severe storms or tornadoes **MIGHT** form and affect your area.



WARNING

TAKE ACTION! A severe storm or tornado is **expected** in your area.



ACT IMMEDIATELY. GET IN, GET DOWN, AND COVER UP.

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weather.gov/chicago/severeprep

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?**



Weather-Ready Nation

National Oceanic and Atmospheric Administration

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/severeprep**

February 28, 2017



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

Northeast of Washburn, IL: February 28, 2017
Photo courtesy of Cameron Nixon



Cameron J. Nixon

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**

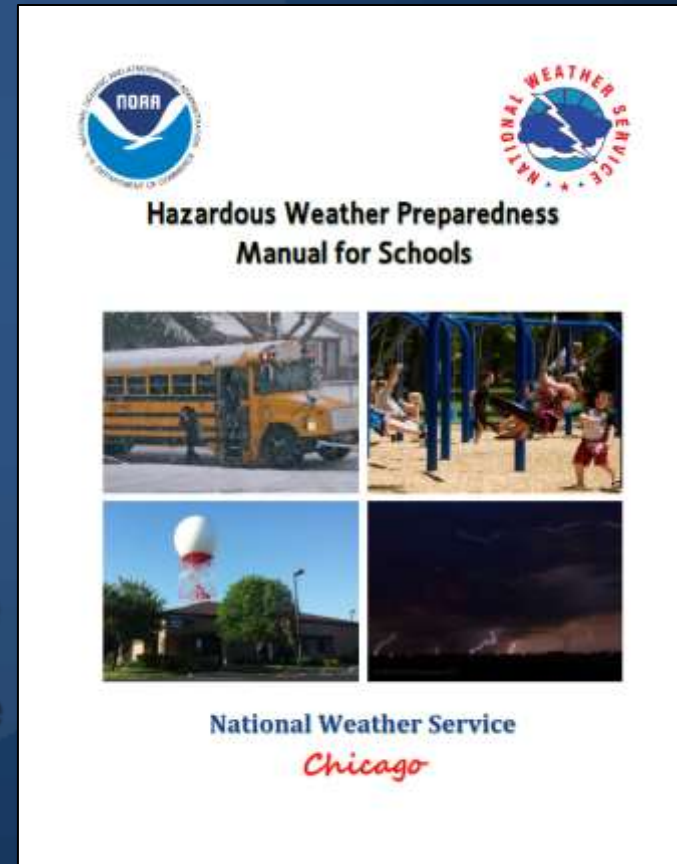
- **Transportation**



Schools



- **Have sheltering/evacuation plans**
 - for all facilities
 - after school activities
- **Transportation plans**
- **Weather Watcher**
- **Drills**
- **School Preparedness Guide**
- **[weather.gov/chicago/severeprep](https://www.weather.gov/chicago/severeprep)**



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**



Transportation Action!



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



NWS Chicago

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



Image courtesy Dan Miller, NWS Norman

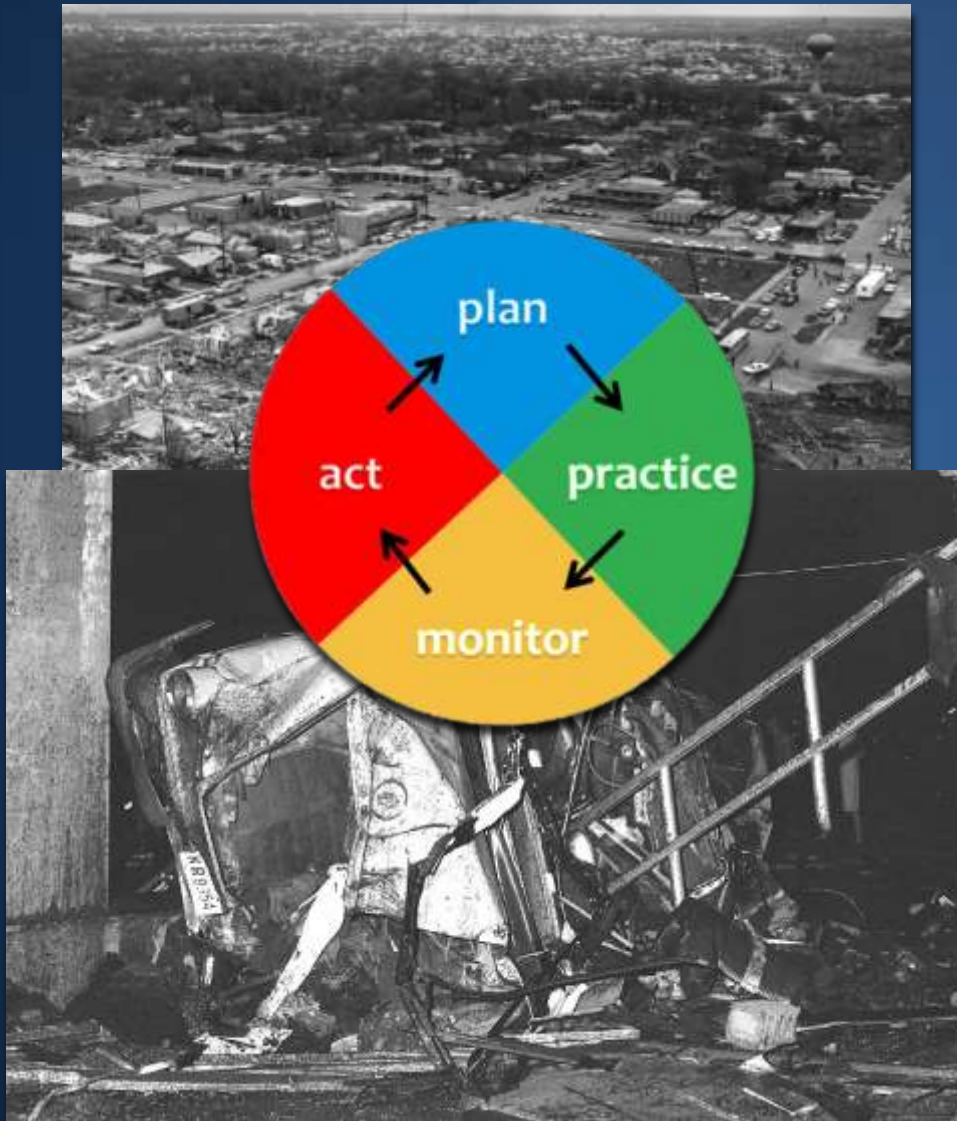
Other Issues

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



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Where We're At



 **Vulnerability**

 **Awareness**

 **Science**

 **Communication**

 **Preparedness**

 **#BeAForce**

