
EARTHQUAKE
SUMMIT
2026
BUTLER COUNTY
EMERGENCY MANAGEMENT
HOMELAND SECURITY AGENCY
MISSOURI
DEPT OF PUBLIC SAFETY
EMERGENCY MANAGEMENT
CENTRAL UNITED STATES
EARTHQUAKE CONSORTIUM
MISSOURI - ILLINOIS - INDIANA - KENTUCKY
ARKANSAS - MISSISSIPPI - ALABAMA - TENNESSEE

Disaster Preparedness Kit in a "To Go Bucket"

Jim Watkins

Resources & Techniques for Earthquake Resilience

Brian Blake

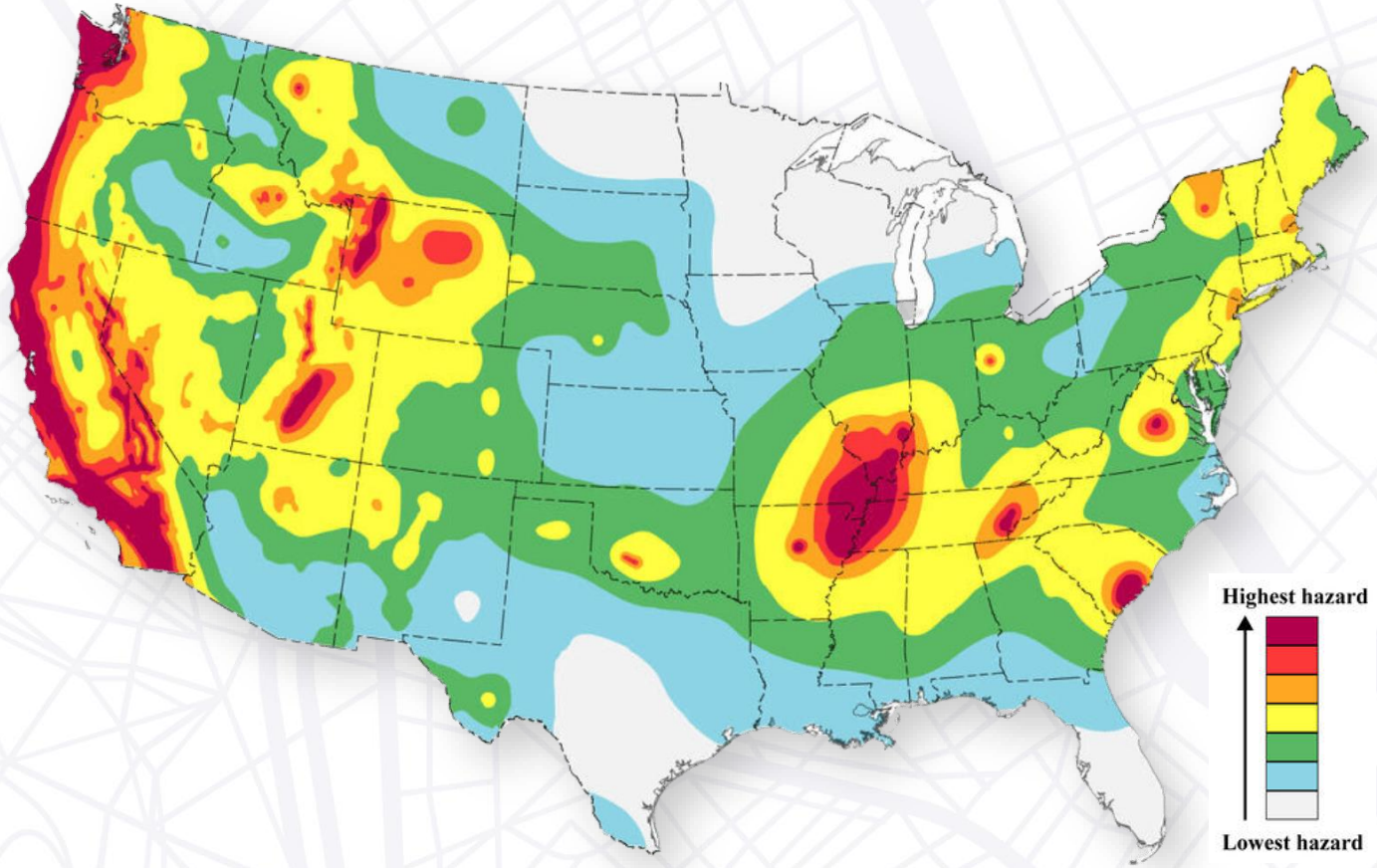
Executive Director

Central U.S. Earthquake Consortium

2026 Earthquake Summit | Poplar Bluff, Missouri

CUSEC: A partnership approach

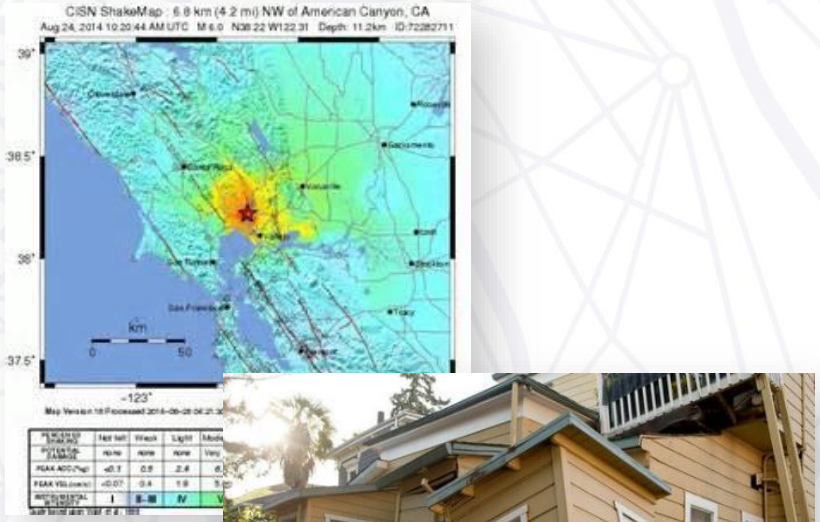
Mission: *"….the reduction of deaths, injuries, property damage and economic losses resulting from earthquakes in the central United States."*



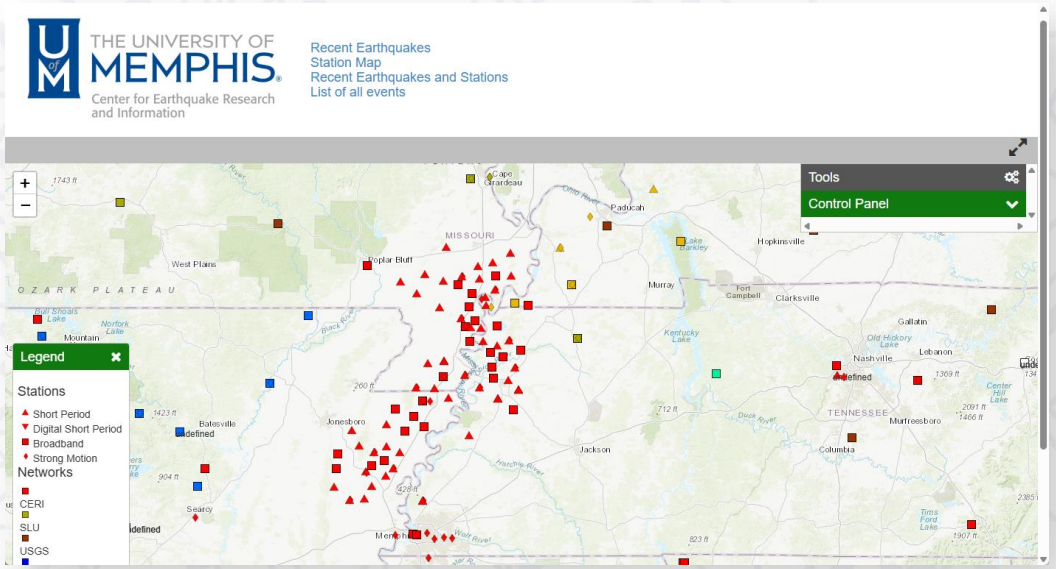
The “Big Enough One”…

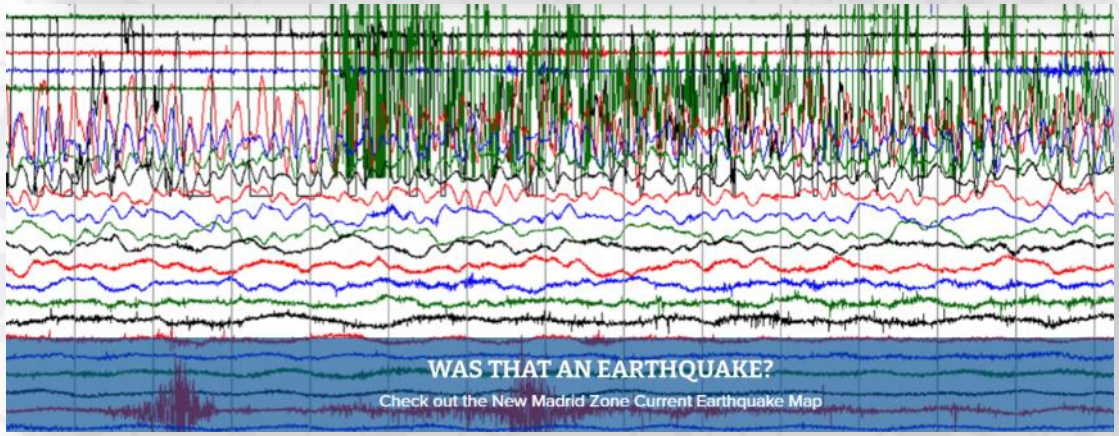
25-40% Probability (M6.0 or greater)

2014 M6.0 Napa, California Earthquake



- 1x fatality w/250 people seeking ER care
- 1,000 buildings off their foundations
- 1,400 buildings red tagged
- ~$500M-$1B in damages





Center for Earthquake Research & Information

- Earthquake Catalogue
- New Madrid Compendium
- Seismic Stations & Helicorder Displays

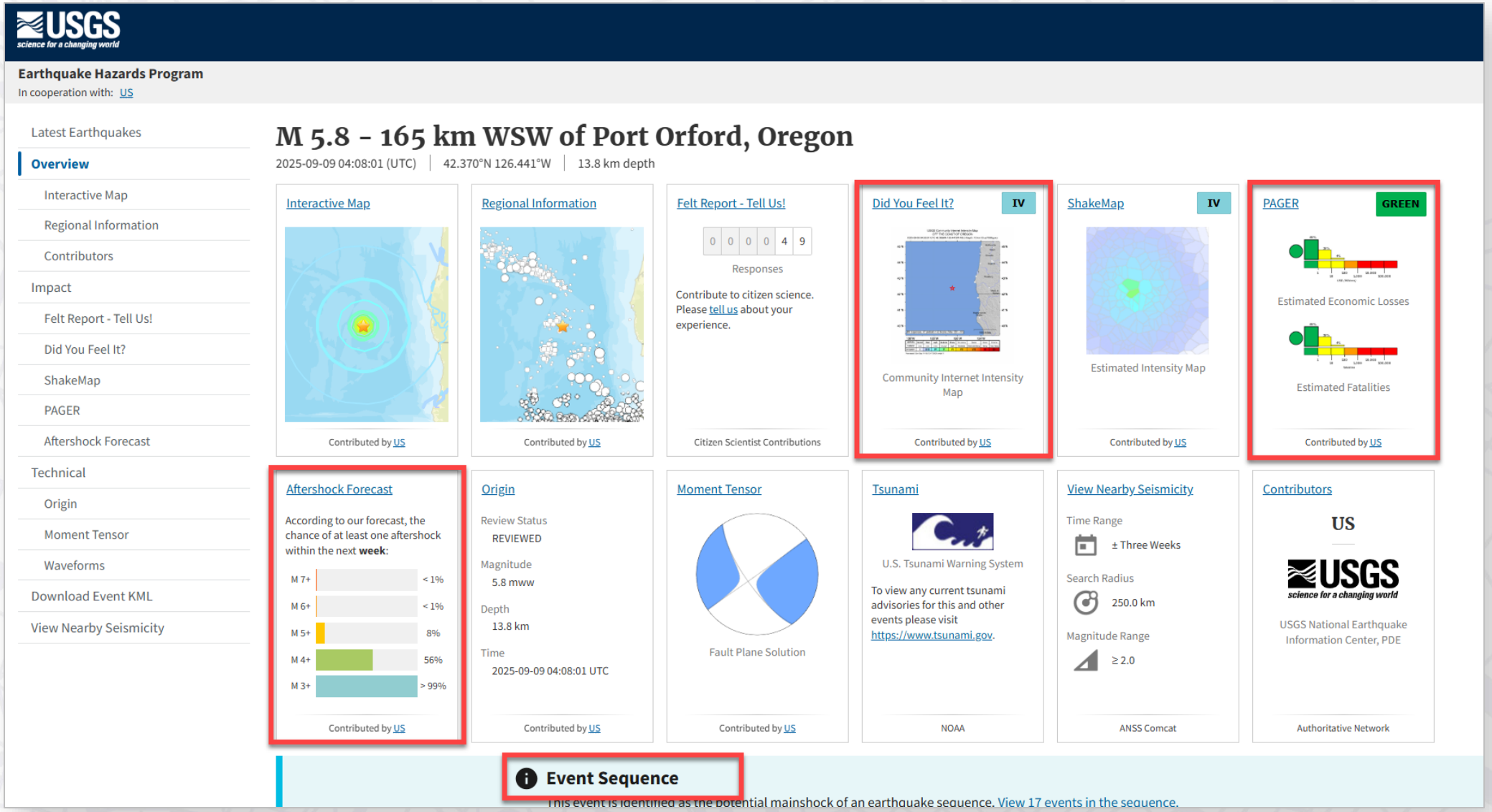
Available at www.memphis.edu/ceri/

U.S. Geological Survey

- **Real-time notifications & feeds**
  https://earthquake.usgs.gov/earthquakes/feed/
- **Historical earthquake info**
  https://earthquake.usgs.gov/earthquakes/map/
- **Did You Feel It?**
  https://earthquake.usgs.gov/data/dyfi/

Available at earthquake.usgs.gov

USGS Earthquake Event Page



Federal Emergency Management Agency

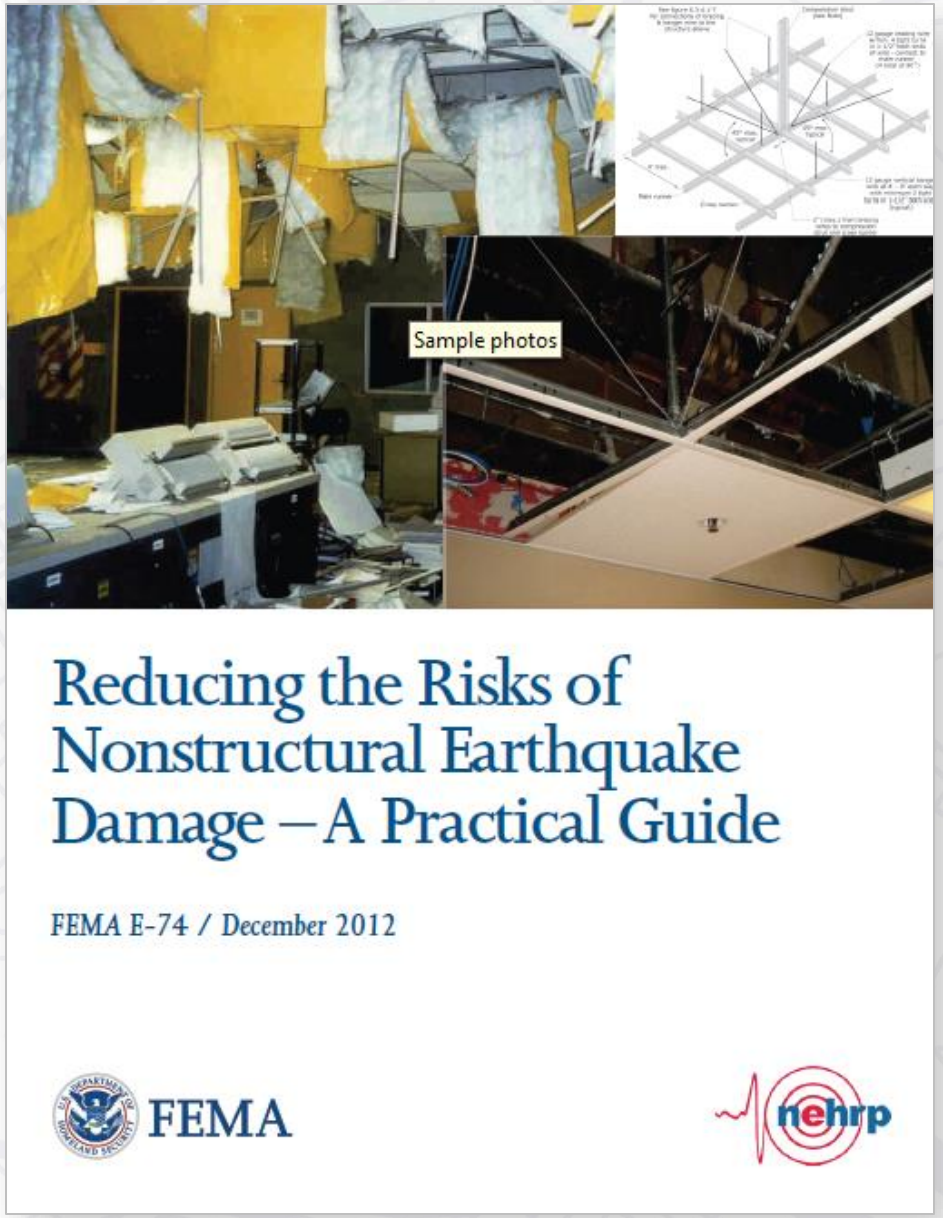
FEMA E-74

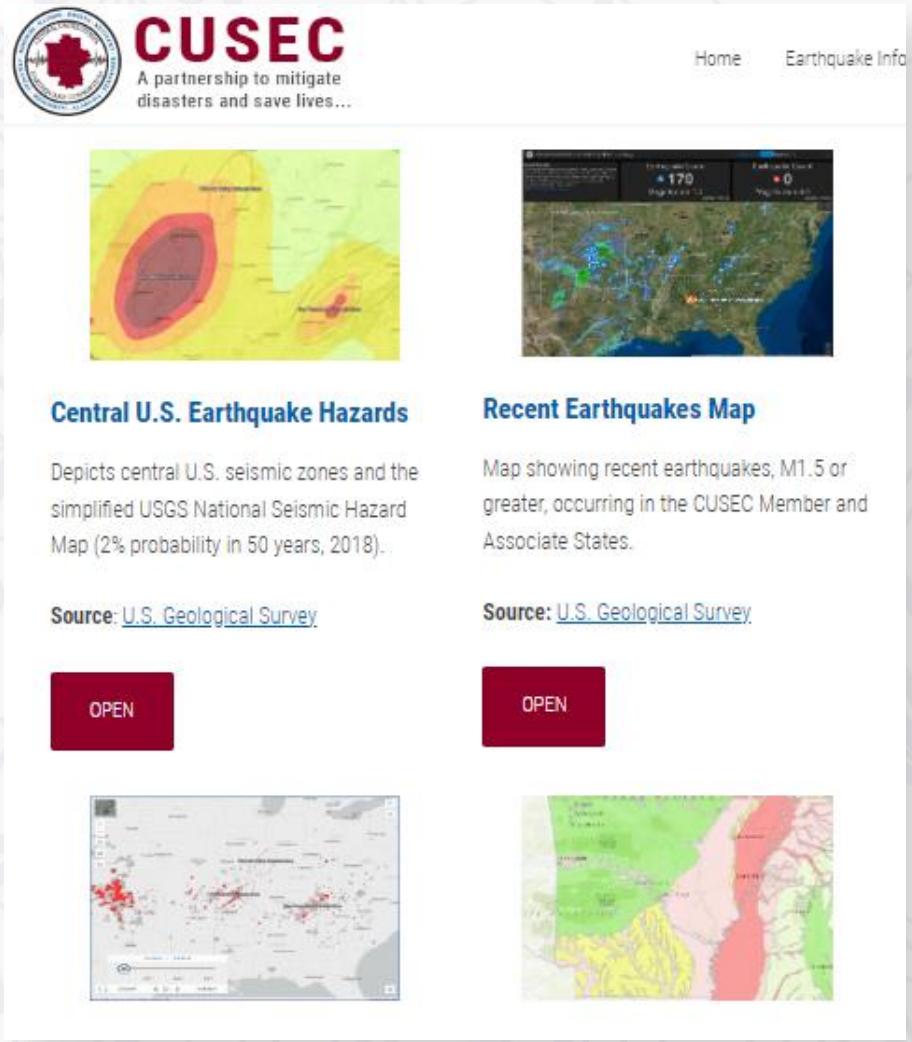
- Reducing the Risks of Nonstructural Earthquake Damage

NETAP Earthquake Training

QuakeSmart Program

https://www.fema.gov/emergency-managers/risk-management/earthquake



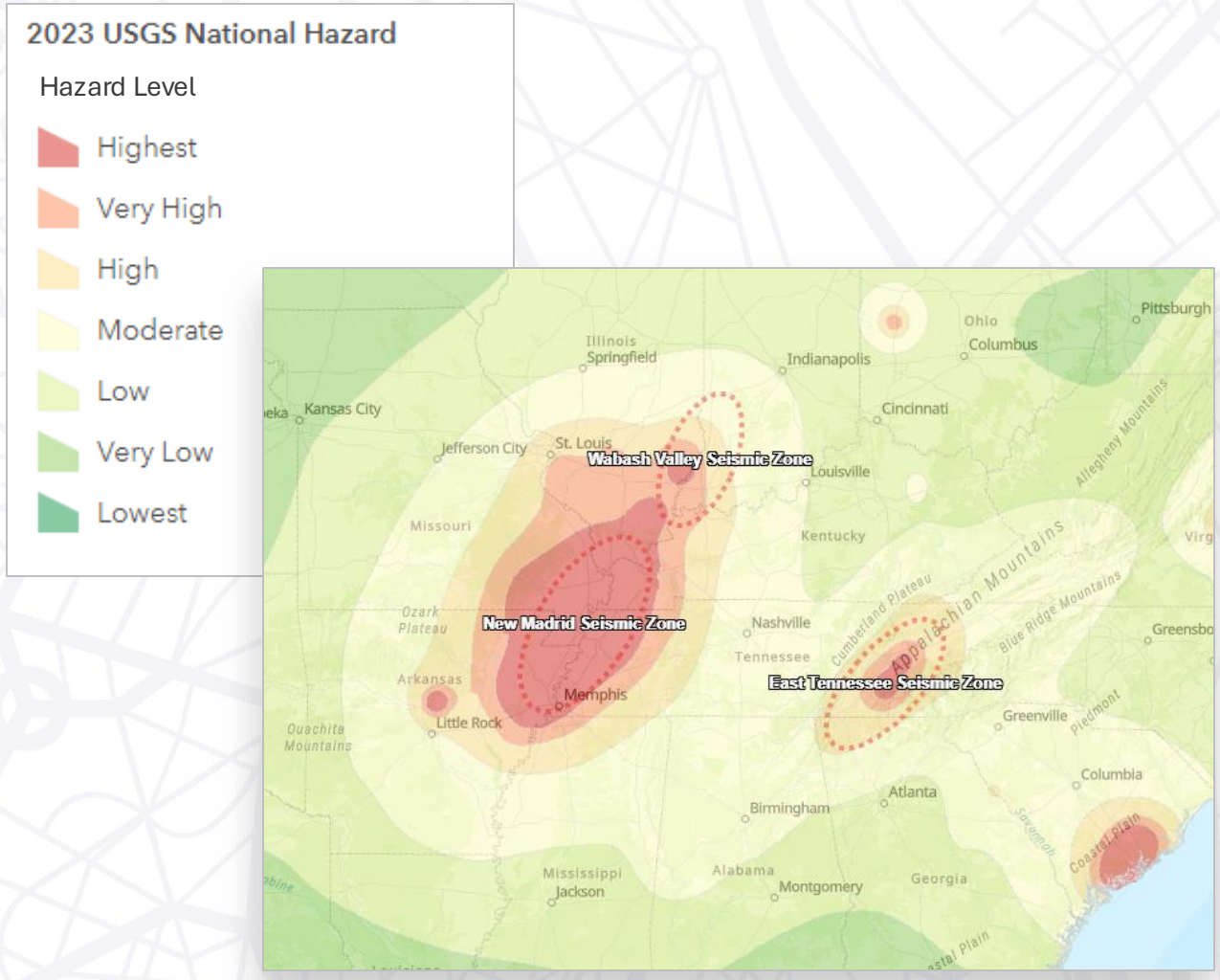


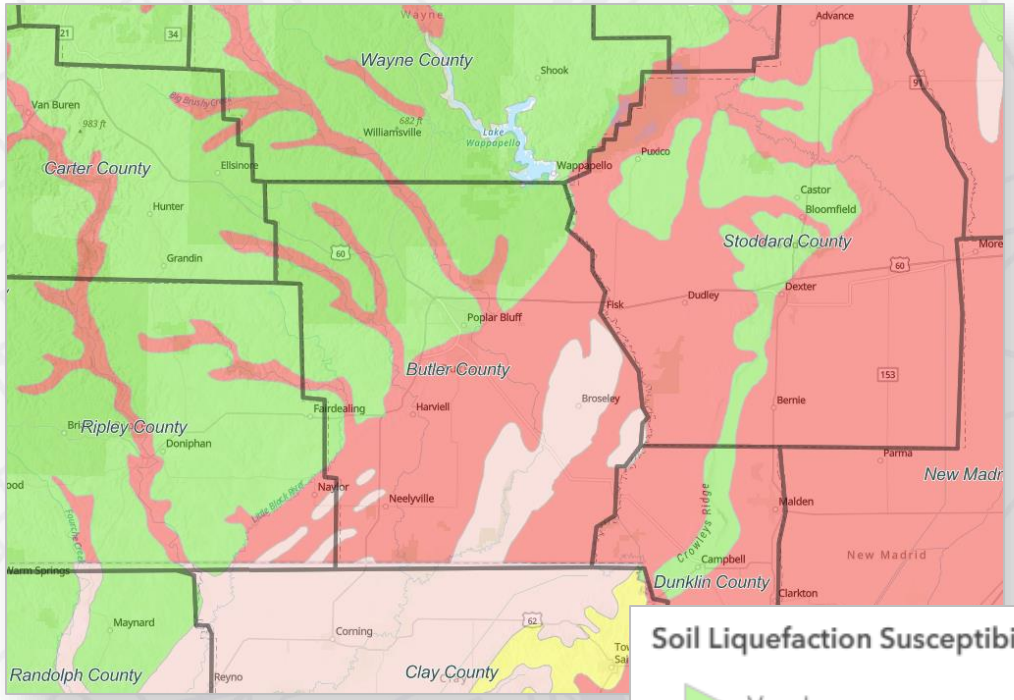
CUSEC Resources

- Earthquake Hazard Maps
- Liquefaction Maps
- Recent Earthquakes
- Publications
- Regional Information Sharing Platform (RISP)
- Earthquake Scenario Planning Tool

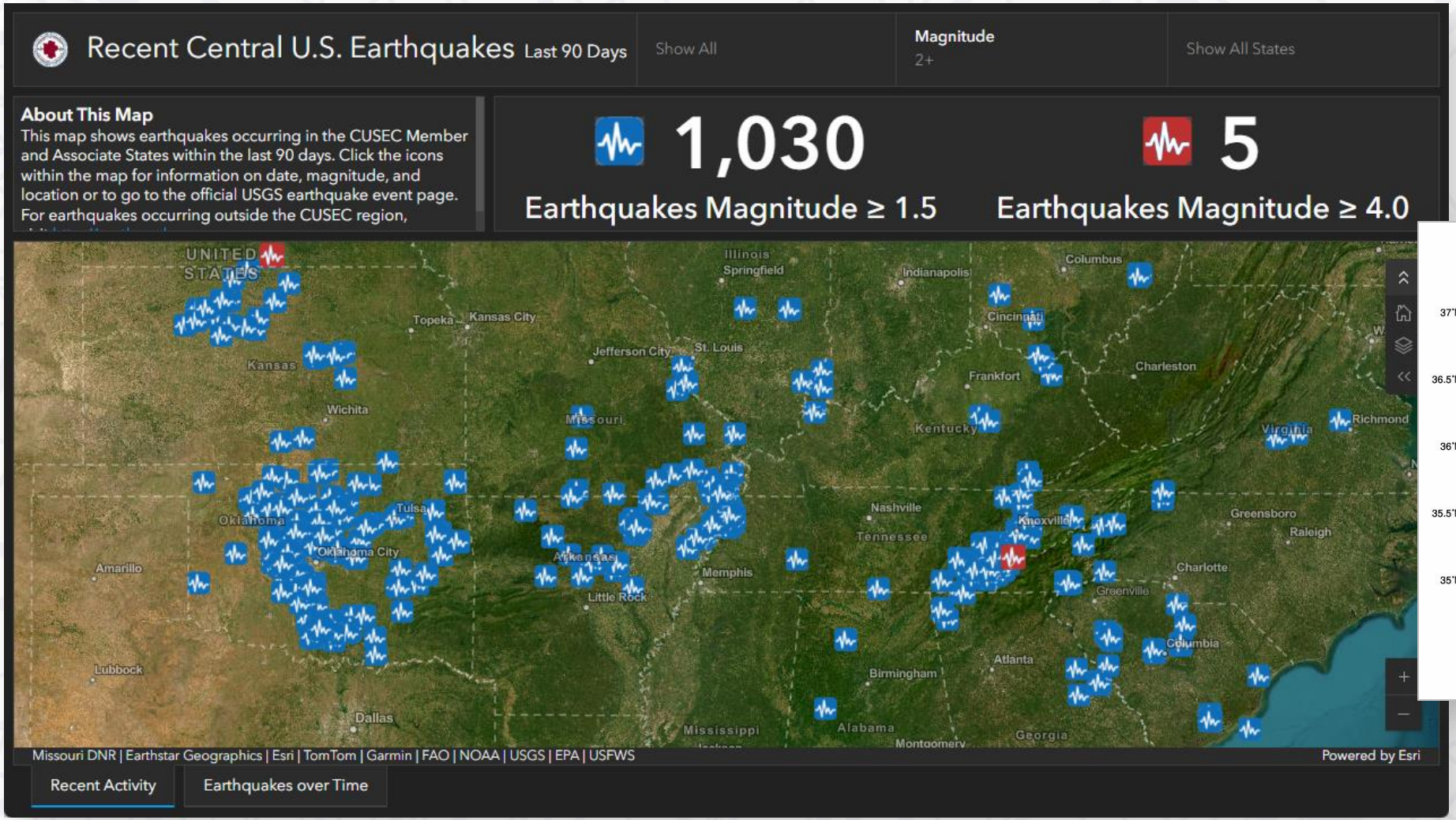
Available at www.cusec.org

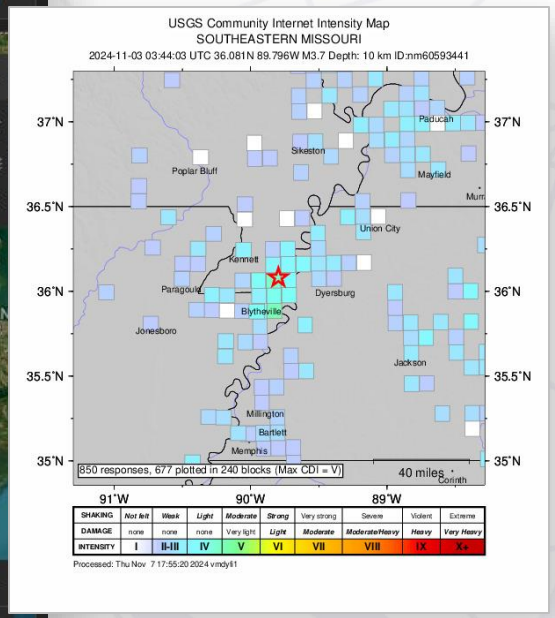
Seismic Hazard & Liquefaction Maps





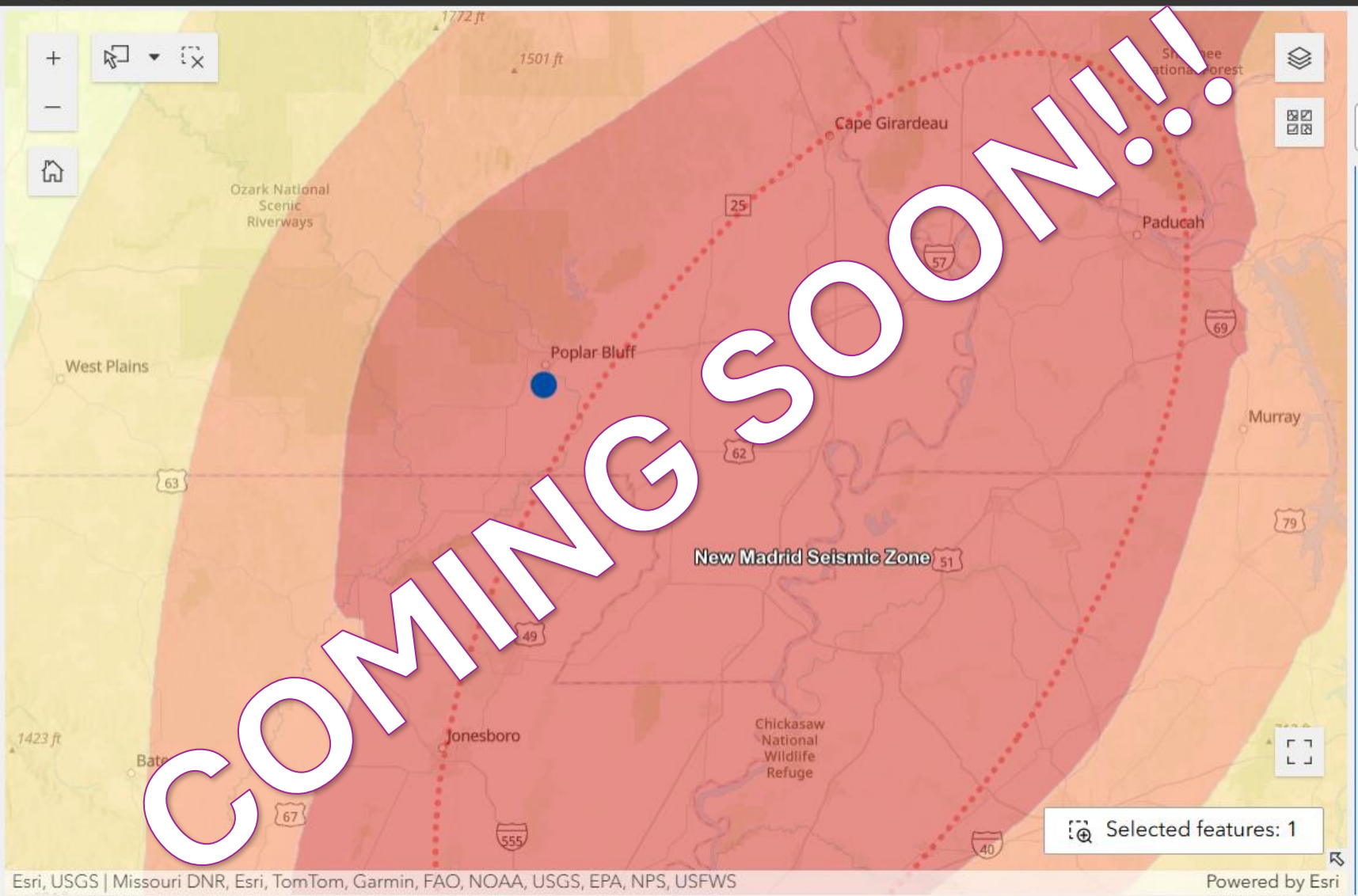
Recent Earthquakes Map





CUSEC Earthquake Hazard Assessment Tool

Print



Find Earthquake Hazards Near Me

Butler County, MO, USA

Butler County, MO

Census Tract 950900
Population 3,370 Building Value $695,991K
Agricultural Value $50,020K

EQ Hazards

Soil Liquefaction Susceptibility

The Liquefaction Risk at this location is

Very High

Loose, water-saturated soils here are very susceptible to liquefaction during strong shaking. Ground can lose strength, causing settlement, tilting, or lateral spreading.

Overview Map | Liquefaction | Seismic | NRI | SVI | Find My Risk | More..

New Madrid Seismic Zone Earthquake Scenario

Select State
None

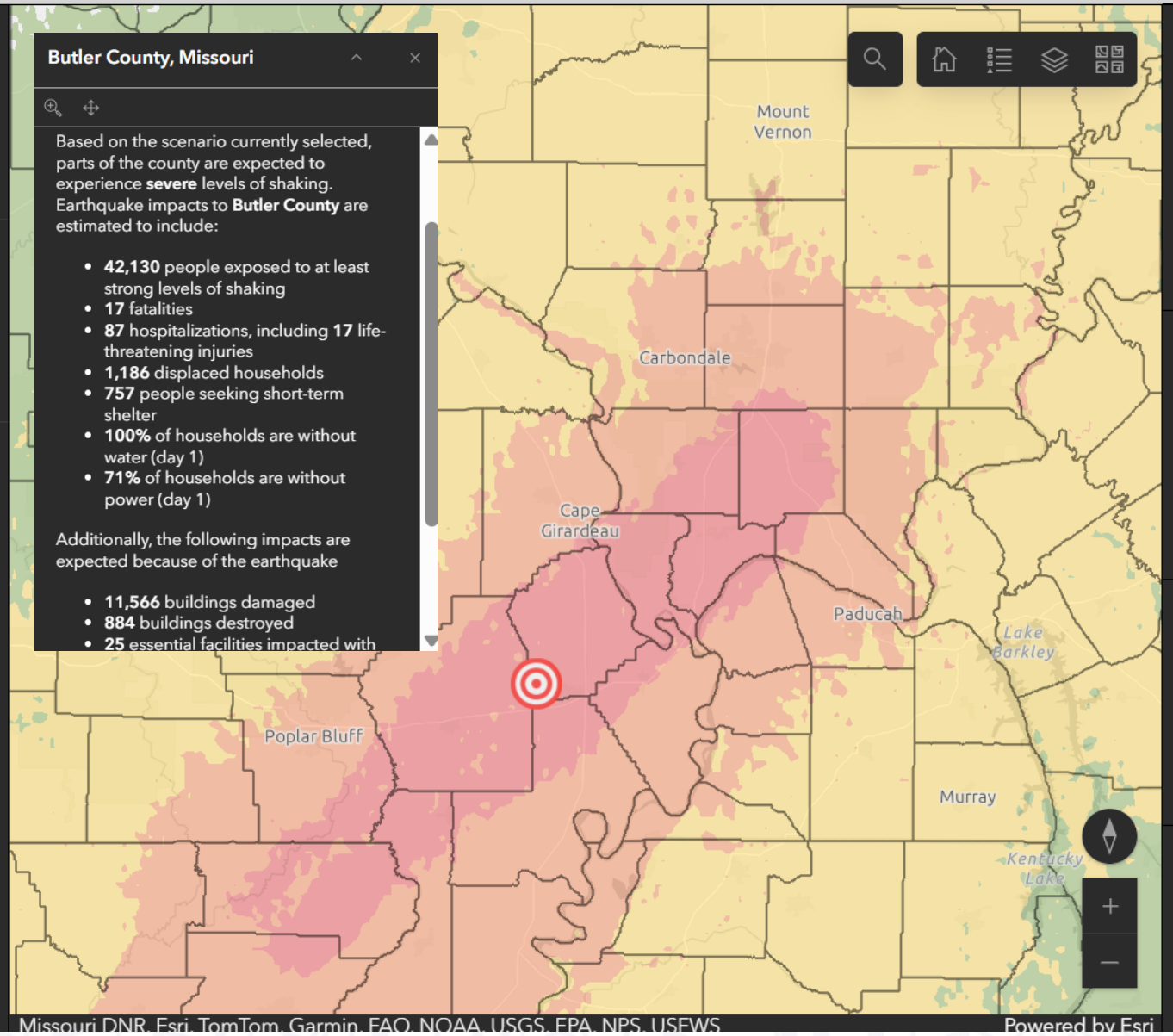
Select County
None

Earthquake Epicenter

Impacted Counties

Earthquake Shaking Intensity

- Severe
- Very Strong
- Strong
- Moderate



Estimated Population Exposed
811,897
To At Least Very Strong Shaking

Estimated Fatalities
533
2:00PM Earthquake

Injuries
3,495
Requiring Hospitalization

Displaced Households
20,862

Essential Facilities
1,131
w/Reduced Functionality

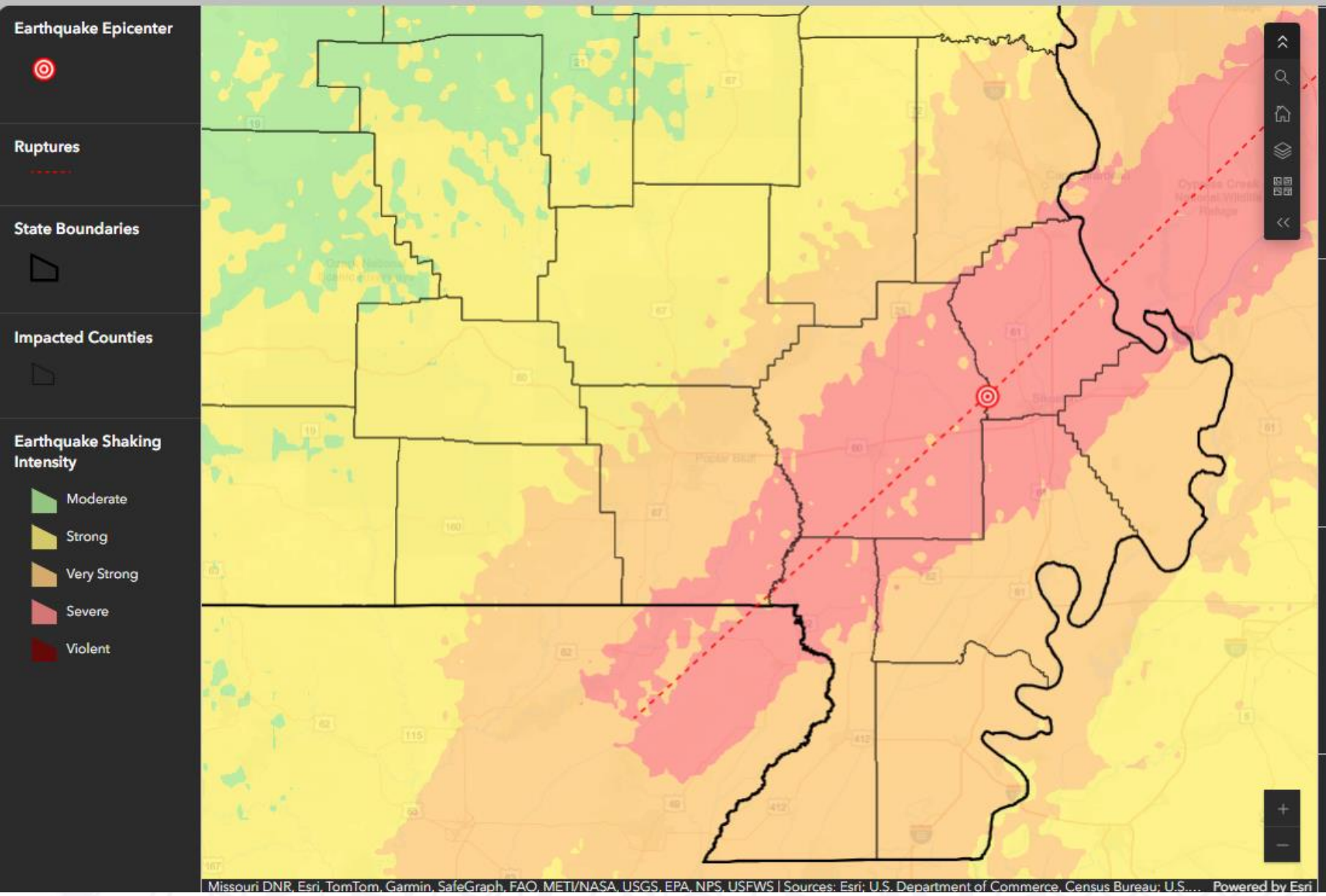
Buildings
152,264
At Least Moderately Damaged

Infrastructure Economic Loss
$34.6
Billion Dollars

Economic Loss
$74.8
Billion Dollars

New Madrid Seismic Zone (NMSZ) Scenario Dashboard

1. Select Earthquake Scenario	2. Select State	3. Select County
M7.5 NMSZ Commerce Fault ...	Missouri	No category selected



Estimated Population Exposed
263,526
To At Least Very Strong Shaking

Estimated Fatalities
317
2:00 PM Earthquake

Injuries
1,376
Requiring Hospitalization

Displaced Households
11,660

Essential Facilities
336
w/Reduced Functionality

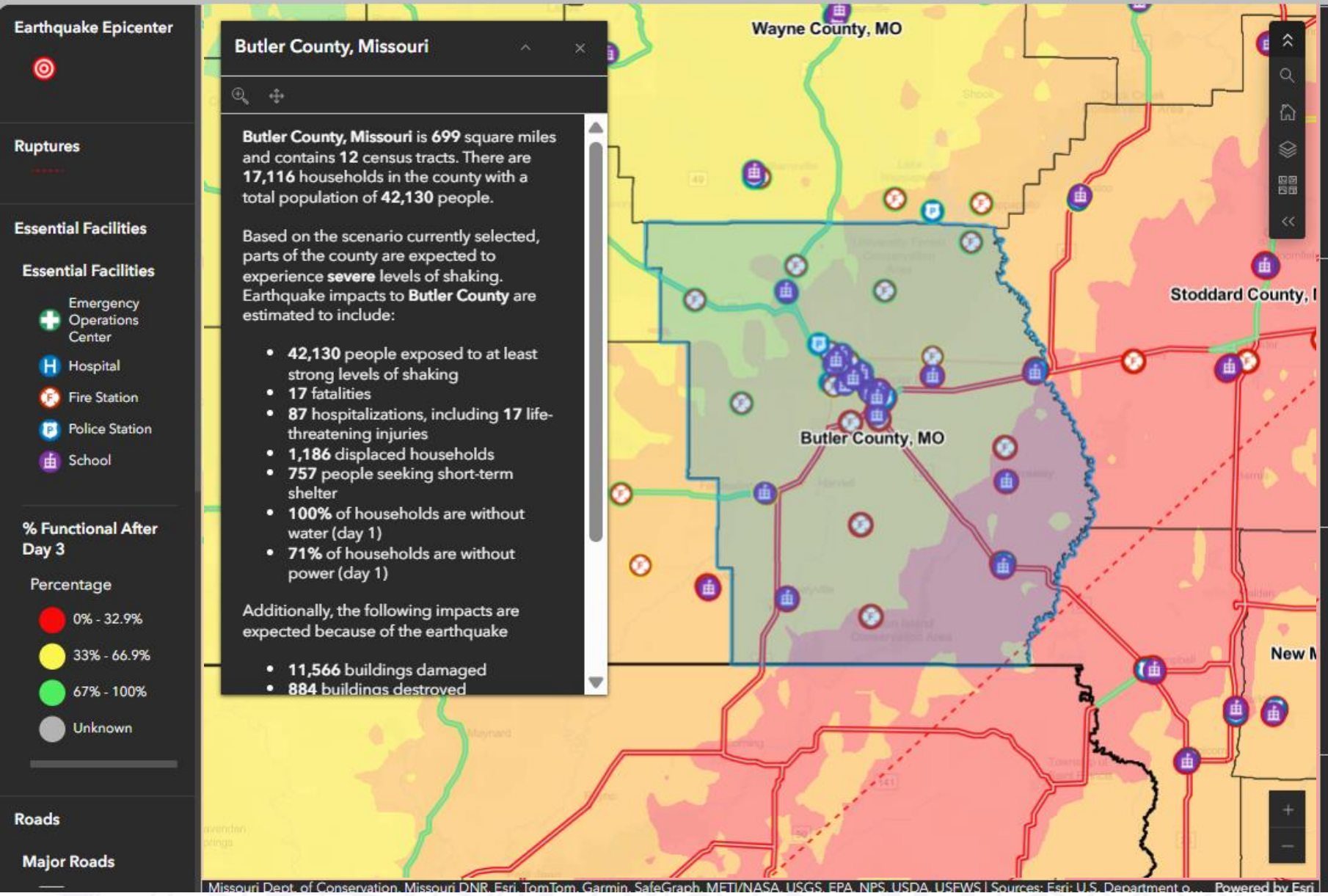
Buildings
54,308
At Least Moderately Damaged

Infrastructure Economic Loss
$11.2 Billion

Total Economic Loss
$28.9 Billion

New Madrid Seismic Zone (NMSZ) Scenario Dashboard

1. Select Earthquake Scenario	2. Select State	3. Select County
M7.5 NMSZ Commerce Fault …	Missouri	Butler County



Estimated Population Exposed
42,130
To At Least Very Strong Shaking

Estimated Fatalities
17
2:00 PM Earthquake

Injuries
87
Requiring Hospitalization

 # Displaced Households
1,186

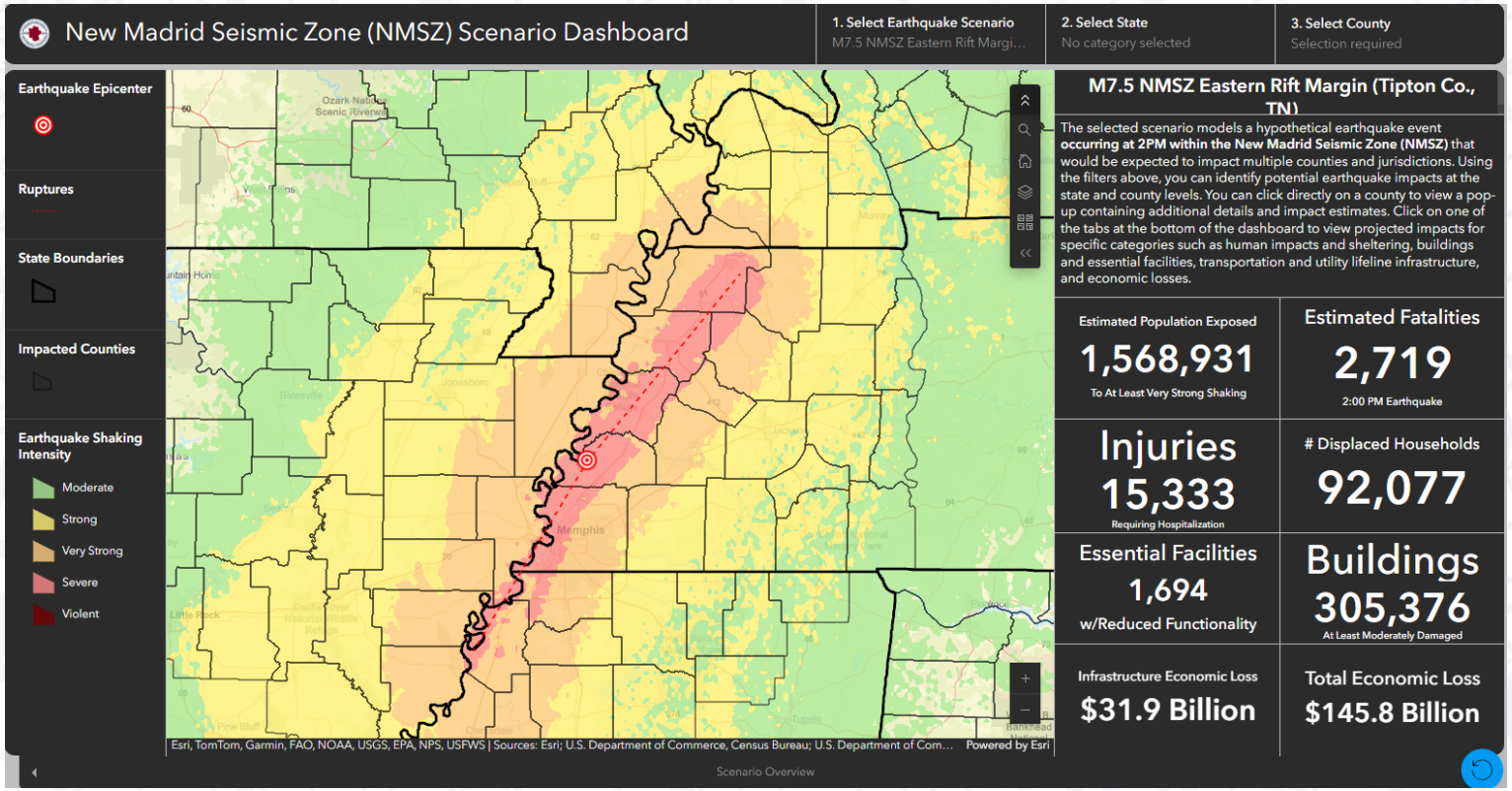
Essential Facilities
34
w/Reduced Functionality

Buildings
6,507
At Least Moderately Damaged

Infrastructure Economic Loss
$672.9 Million

Total Economic Loss
$2.2 Billion

Earthquake Scenario Tool Access



https://cusec.org/earthquake-scenario-planning-tool-access-form/

Let’s do a “Hazard Hunt”...

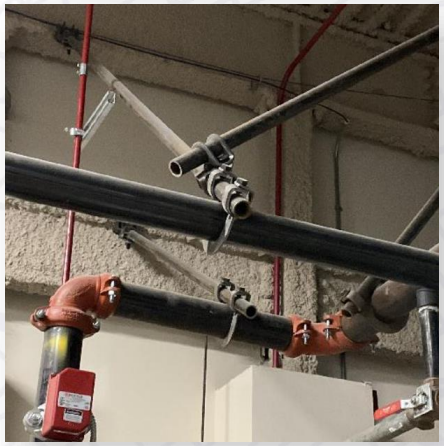
Techniques for effectively mitigating risks

Mitigating Earthquake Risks

Ask yourself can it....

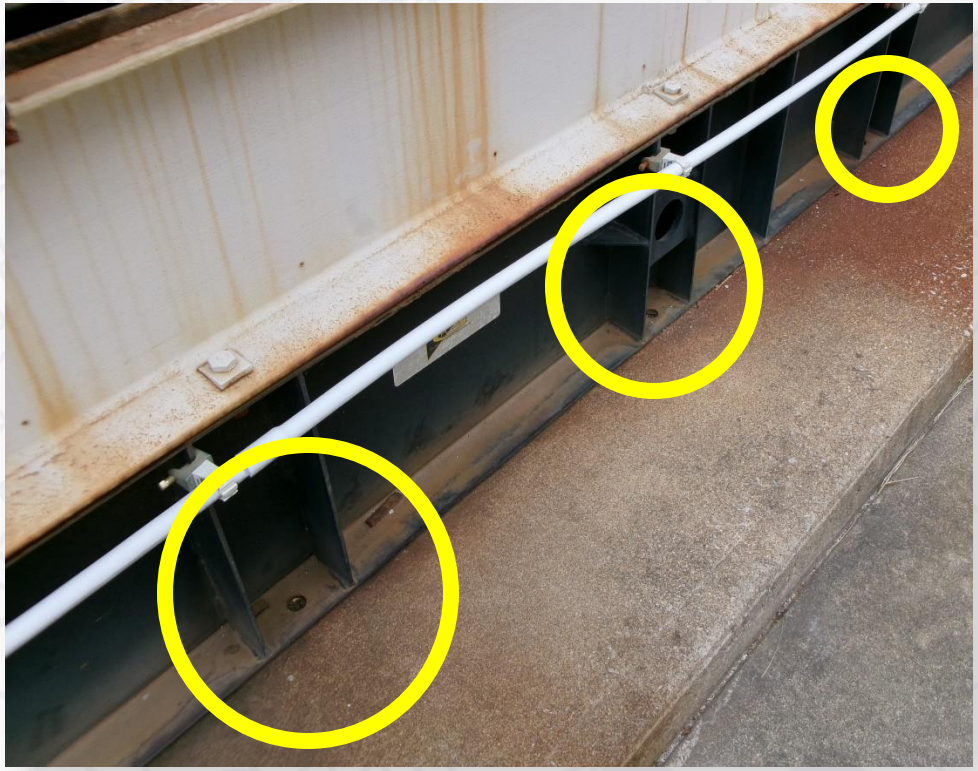
1) Hurt me or someone else?
2) Block egress?
3) Explode?
4) Bankrupt me?
5) Be easily replaced?

Above Ceiling Risks



Below Ceiling Risks

Emergency Generators



Automatic Gas Shut-Off Valves

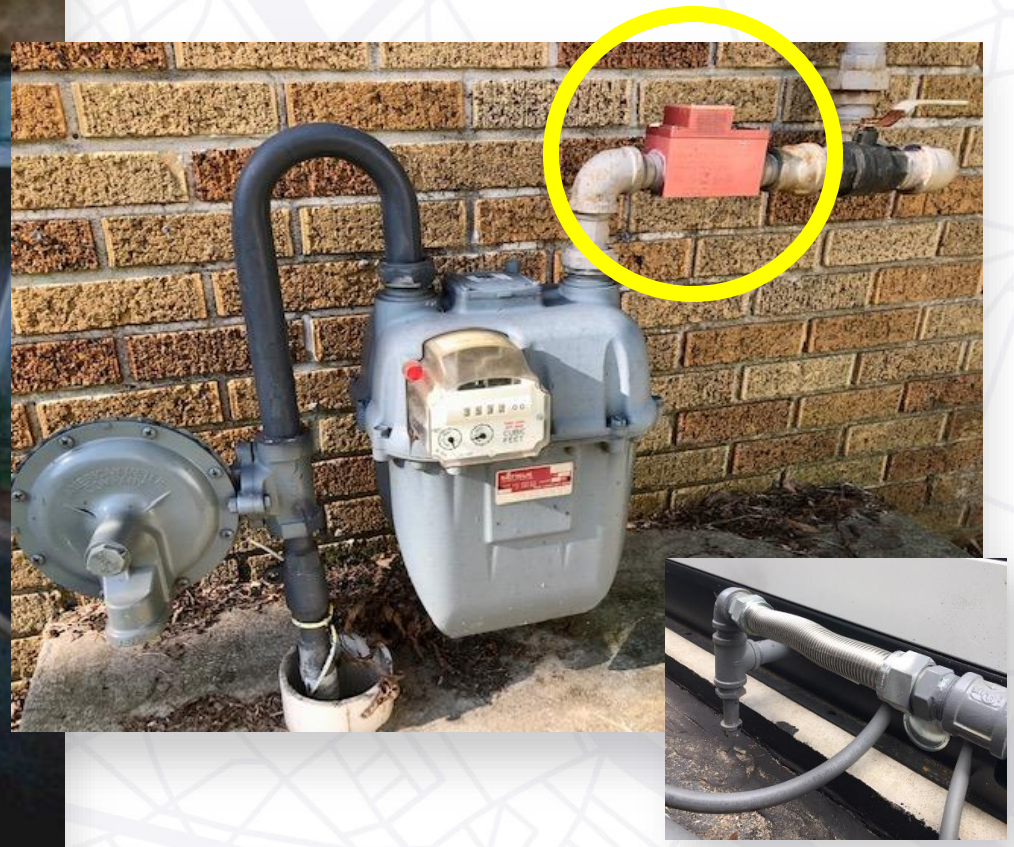
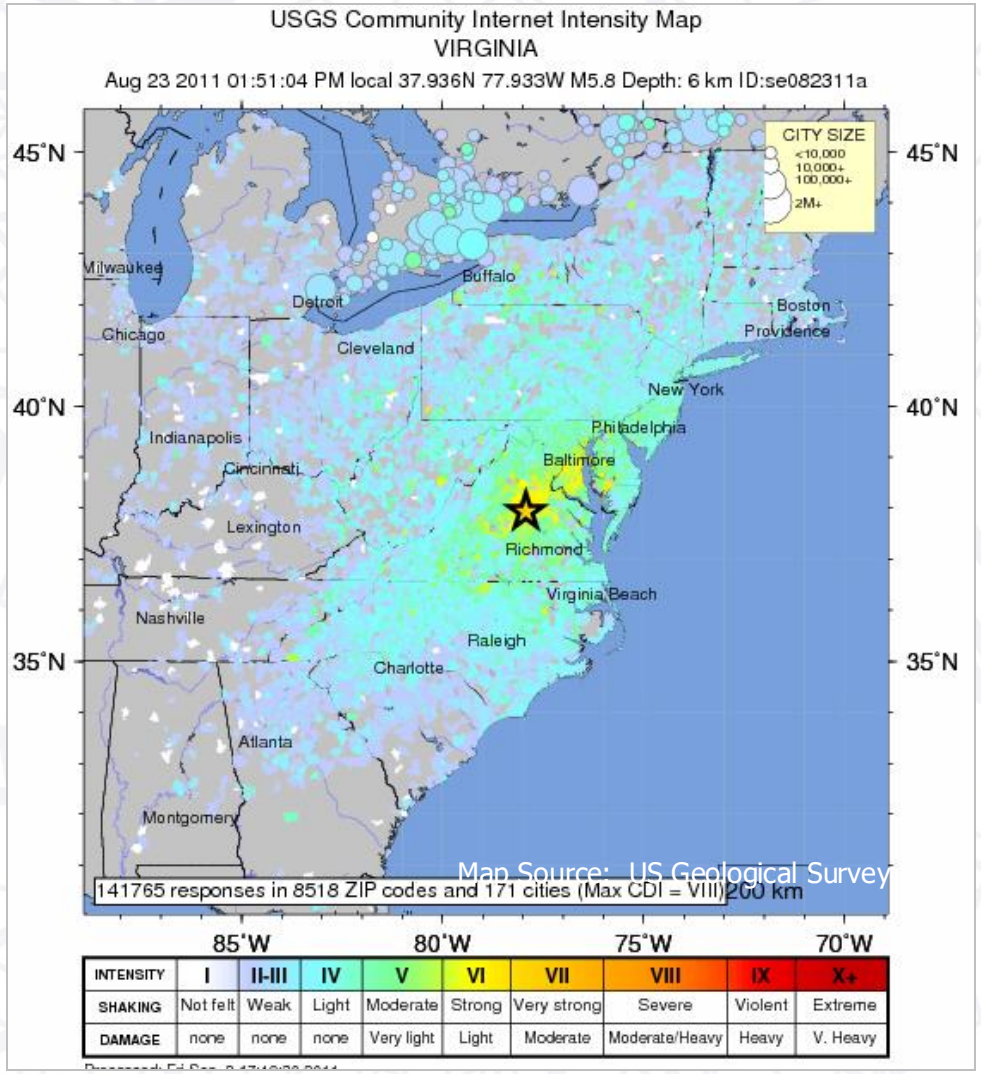


Photo Source: CNN/AP

M5.8 Mineral, VA Earthquake – August 2011



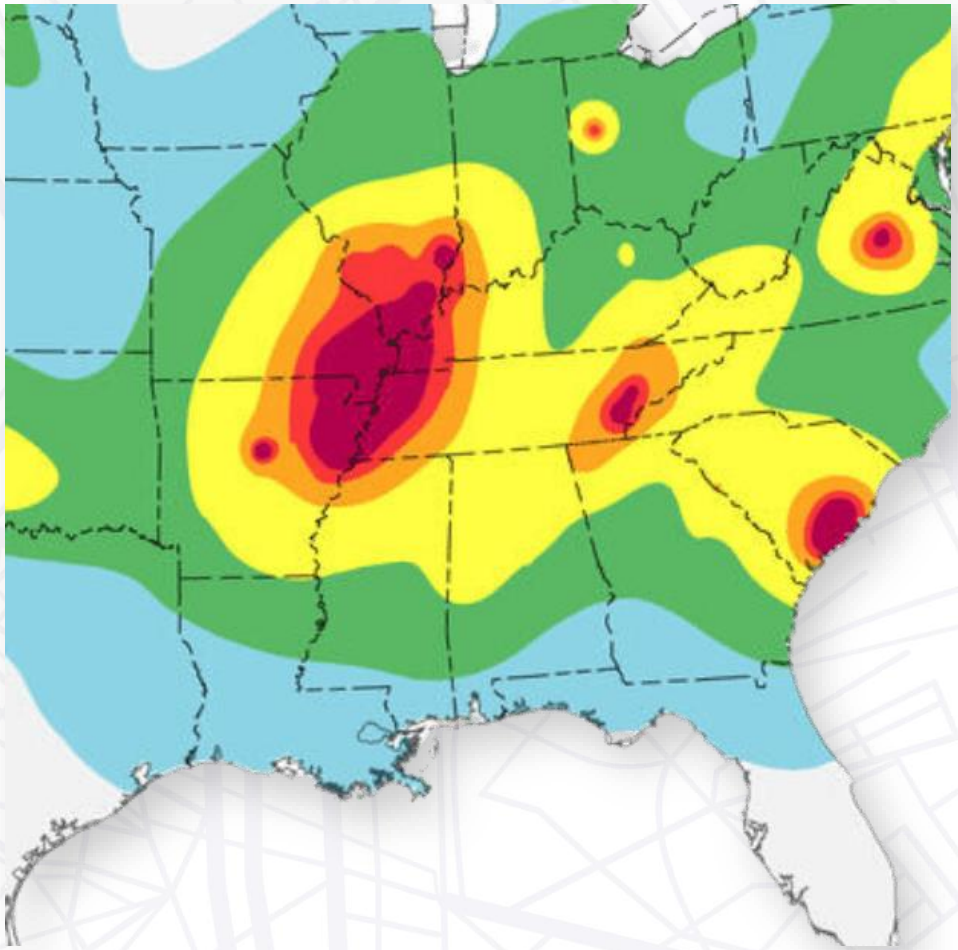
Map Source: US Geological Survey

- MMI Intensity VII
- Felt over the entire eastern seaboard w/148,000 + felt reports
- Largest earthquake in 50+ years in the region

Louisa County, VA

Consider Earthquake Insurance!

Earthquake insurance coverage decreasing



Low to no understanding of coverage exclusions, pricing, or deductibles by consumers and sometimes, their agents…

Know How to Protect Yourself

In *most* situations and building types:

Drop on to your hands and knees, where you are.

- If you can't get back up, DON'T get down to begin with…

Know How to Protect Yourself

In *most* situations and building types:

Cover your head and neck with one arm and hand.

- *If a sturdy table or desk is nearby*, crawl underneath it for shelter
- *If no table/desk,* crawl against a wall or next to low furniture for sideways protection

Know How to Protect Yourself

In *most* situations and building types:

Hold On to your shelter until shaking stops

- Be ready to move with your shelter
- *If not under a shelter*, hold on to your head/neck with both arms and hands

3rd Thursday Annually:

October 15, 2026

Great ShakeOut Earthquake Drills

Annual Earthquake Drill

Resources for:

- How to be safe and prepare for earthquakes
- How to conduct an earthquake drill
- Organizations and communities, including manuals, templates, and more

Available at www.shakeout.org

Brian Blake

Central U.S. Earthquake Consortium

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Newsletter Signup

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State Emergency Management

"Stronger Community Better Response"

How Voluntary And Community Organizations Can Help Prepare, Respond, and Recover From Disasters Like an NMSZ Event.

MISSOURI
DEPT OF PUBLIC SAFETY
SERVICE
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SECURITY
EMERGENCY MANAGEMENT

State & Community Organizations Active in Disaster (VOAD/COAD)

MO VOAD

The goal for a COAD is to have a coordinated management system among all affected jurisdictions within a county that supports emergency human services."

(Mass Care/Emergency Assistance Functions)

- **Sheltering /Feeding**
- **Pets & Service Animals**
- **Distribution of Emergency Supplies**
- **Disability / Access & Functional Needs**
- **Reunification**
- **Volunteer & Donations Management**

Stronger Community-Better Response Video (Next)

Stronger Community - Better Response

State & Community Organizations Active in Disaster (VOAD/COAD)

MO VOAD

Work together proactively (Blue Skies) to:

- ✓ **BUILD TRUST!!!**
- ✓ **Support Local Emergency Management (*Mass Care Coordinator/IST – Critical Thinking, Problem Solving, Action Coordinating)**
- ✓ ***Reduce risks and vulnerabilities***
- ✓ **Build capacities**
- ✓ **Strengthen connections**

Stronger Community - Better Response

MO VOAD

NMSZ Evacuation Process

ERC	ERS	CAS	EAS
Evacuee Reception Center	Emergency Respite Site	Consolidated Assistance Site	Evacuation Assembly Site

Stronger Community - Better Response

MO VOAD

NMSZ Evacuation Process

ERC	ERS	CAS	EAS
Evacuee Reception Center	Emergency Respite Site	Consolidated Assistance Site	Evacuation Assembly Site

What happens to those who may choose not to evacuate (or aren't able)? How can they be helped?

Today's Sessions: "To Go Bucket" & "100 Hour Plan"

Or Other Information on a How to Shelter in Place???

State & Community Organizations Active in Disaster (VOAD/COAD)

Help in Preparing – "Makes Sense"

Disasters are becoming more frequent and severe, necessitating a deeper focus on building disaster resiliency nationwide.

- **1980 – 2010 (30 Yrs.) America had 159 $1B+ disasters.**
- **2020-2023 – There've been 60 such events. (277% Increase)**

Additional Data to the above information:

- ***2024-2025 – Another 50 such events***
- ***Today's Generation is experiencing close to 3x the historic rate.***
- ***Emphasizing why stronger local coordination and whole community partnerships in preparedness are more important than ever!***

Important Data

Paul Taylor
Former Administrator
FEMA Region 7
Kansas City, MO
('24 LinkedIn Post)

Preparing Makes Sense
(Source: Do 1Thing.com)

TRUST

Today
We need more than just the right Message!
We Need
The "Right Messengers!"

"It isn't what we don't know that kills us, it's what we know that ain't so."

Mark Twain

New Madrid Seismic Zone Threat

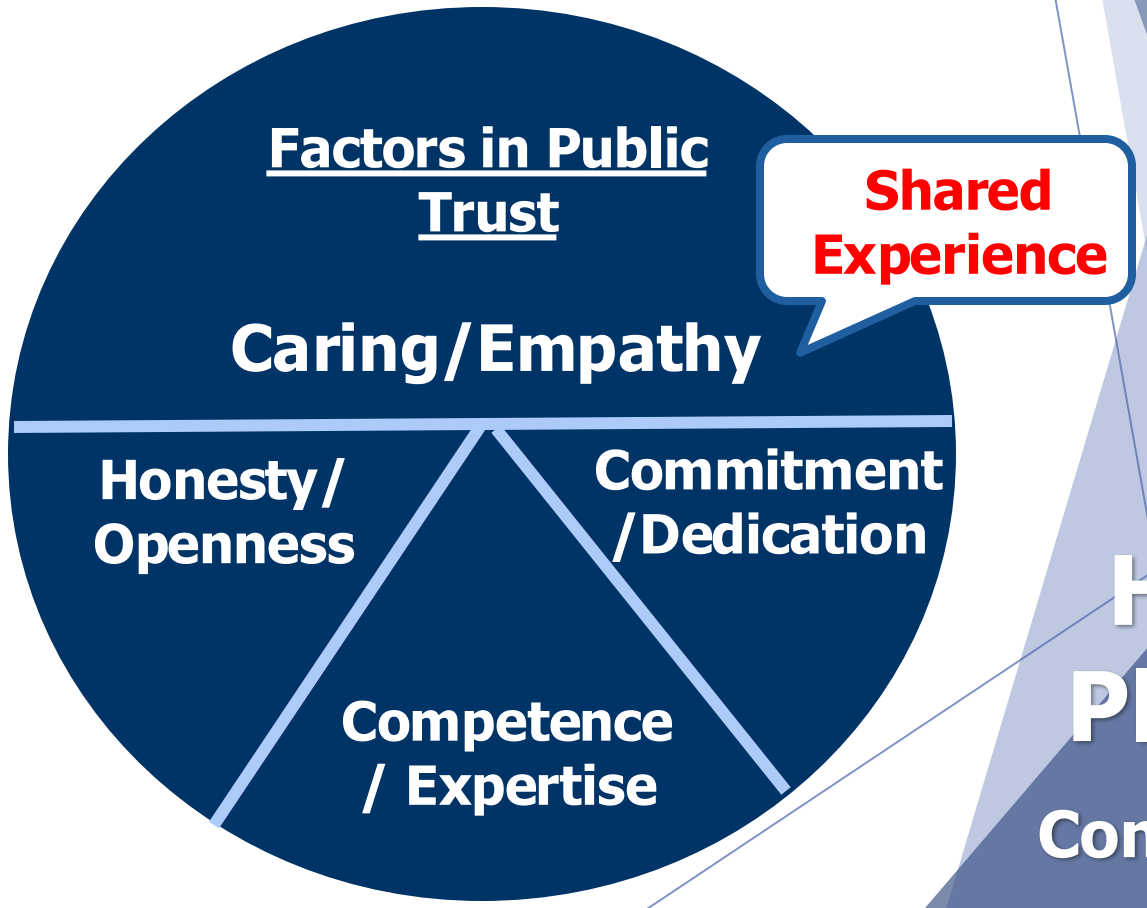
All-Hazard Planning Considerations

Preparing Makes Sense
(Source: Do 1Thing.com)

(Key Important Factor)
(Source: Do 1Thing.com)

TRUST

- People who **do not trust** public officials are **half as likely to obey** emergency instructions
- **People who lack trust are often the same people who lack resources**



New Madrid Seismic Zone Threat

All-Hazard Planning Considerations

Setting the Stage:

Shared Experiences

Personal Experiences That:

Either Build
Or
Destroy Trust

MO VOAD

Setting the Stage:

Shared Experiences

1975-2023

"If I would've only….

Dealing with the:

- ***Woulda's***
- ***Shoulda's***
- ***Coulda's***

MO VOAD

Preparing Makes Sense
(Source: Do 1Thing.com)

TRUST

National Public Response

- 52% of families don't have an emergency plan
- 51% would not know what to do if told to "shelter in place"
- 36% say they have done nothing to prepare

New Madrid Seismic Zone Threat

All-Hazard Planning Considerations

Preparing Makes Sense
(Source: Do 1Thing.com)

TRUST

Intend Not To Act

- Don't believe they will be personally affected by disaster (54%)
- Preparedness won't be effective (45%)
- Haven't thought about it (52%)

Community & Faith-Based Partners can be an extremely helpful resource.

New Madrid Seismic Zone Threat

All-Hazard Planning

Considerations

Preparing Makes Sense
(Source: Do 1Thing.com)

TRUST

(Key Important Factor)
(Source: Do 1Thing.com)

- The older someone is, the less likely they are to follow emergency instructions!
- It takes three messages (or a message and two confirming sources) to move most people to action!

*"**Believing** a warning message increases the likelihood of responding to it."*
- Dennis Mileti

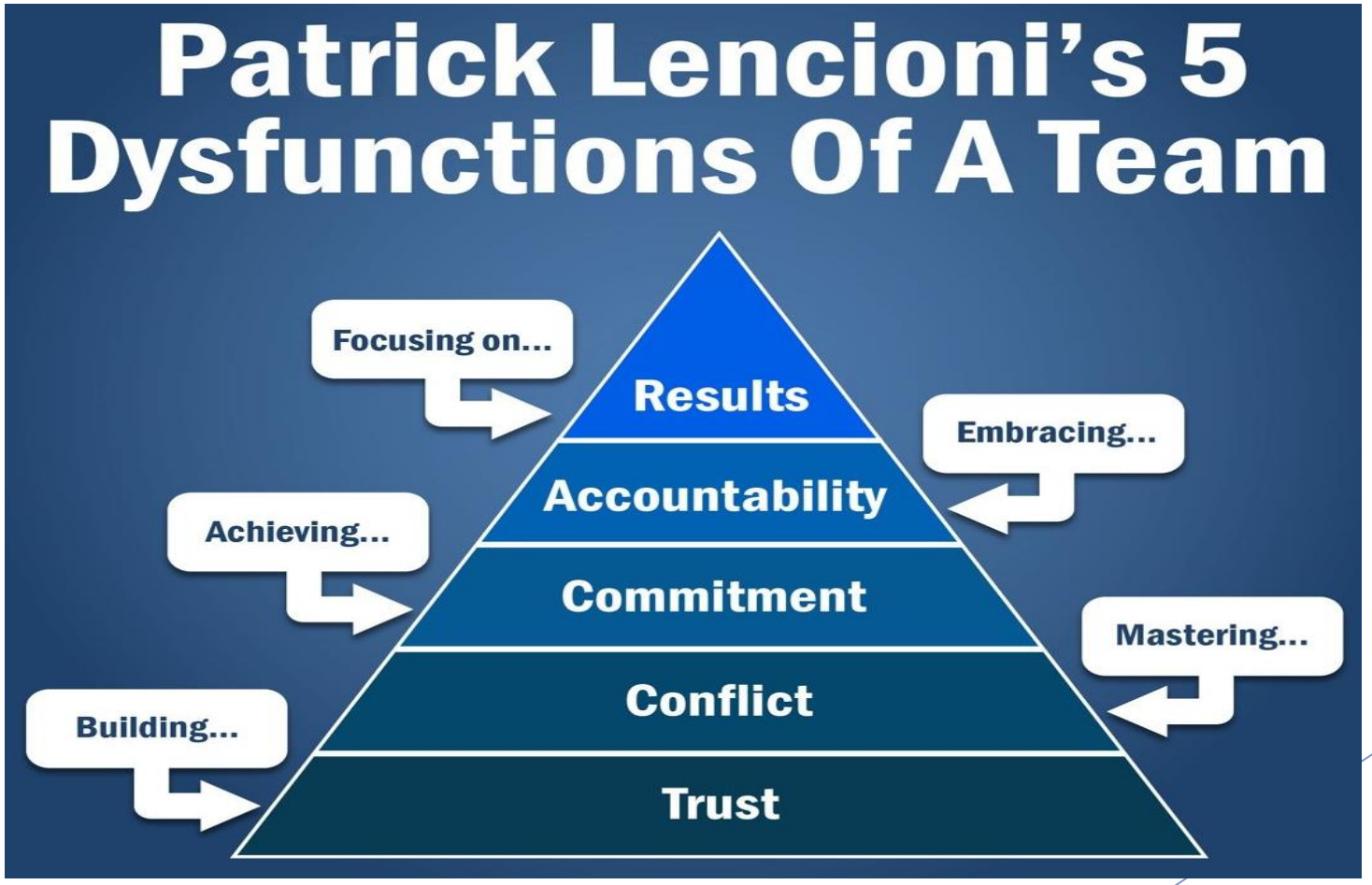
New Madrid Seismic Zone Threat

All-Hazard Planning Considerations

Preparing Makes Sense
(Source: Do 1Thing.com)

TRUST

(Key Important Factor)
(Source: Do 1Thing.com)

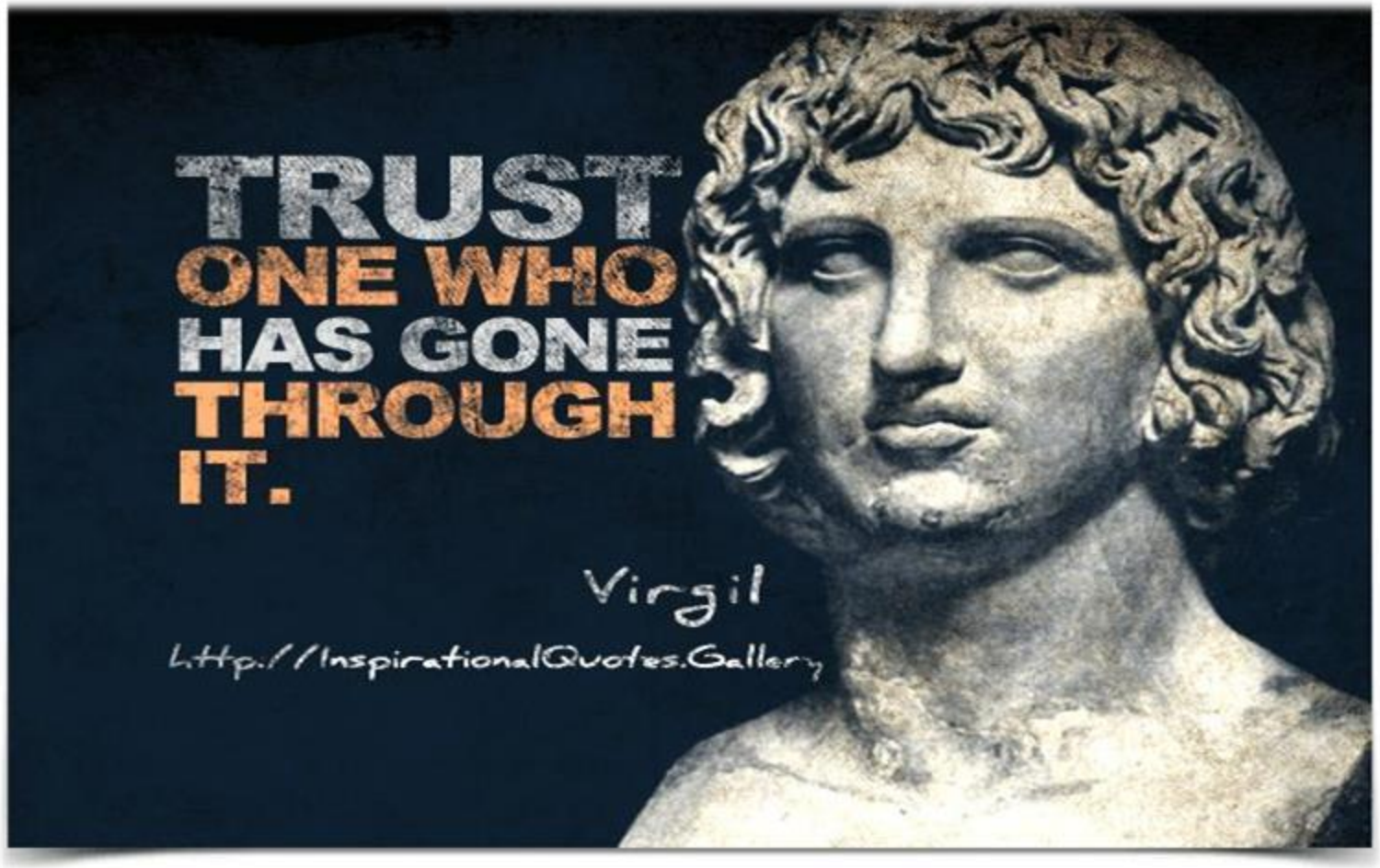


New Madrid Seismic Zone Threat

All-Hazard Planning Considerations

State & Community Organizations Active in Disaster (VOAD/COAD)

MO VOAD



Virgil
(Publius Vergilius Maro)
Roman Poet 70BC-19BC

State & Community Organizations Active in Disaster (VOAD/COAD)

MO VOAD

MU Extension
University of Missouri

New Program:
Neighboring for Emergency Management and Disaster Response

Benefits:

- **Enhanced Preparedness** -

"Neighbor relationships are not just a convenience – they are a necessity in disaster management."

- **Strengthened Response Capabilities** – ***"In a disaster, your first responders are often the people next door."***
- ***Facilitating Recovery*** – ***"Neighbors play a vital role…"***
- ***Long-Term Community Resilience*** – ***"…contribute by strengthening social cohesion, trust and capacity."***

David L. Burton – Community Development Specialist, MU Extension
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Conne Burnham – Emergency Management Coordinator/State Specialist, MU Extension
burnhamc@missouri.edu

the partnership

State & Community Organizations Active in Disaster (VOAD/COAD)

MO VOAD

How Will The Whole Community Approach Benefit Missouri Before and After An NMSZ Event?

(Something to think about) -

- ***It wasn't raining when Noah built the Ark!***

Howard Ruff
Financial Advisor & Author
"The Ruff Times"
(1930 – 2016)

Coming *together* is a *beginning*.

Keeping *together* is *progress*.

Working *together* is *success*.

Henry Ford (1913)

Community Organizations Active in Disaster (COAD)

MO VOAD

Jody Dickhaut

Emergency Human Services Manager / State Voluntary Agency Liaison (VAL)
State Emergency Management Agency
Jody.Dickhaut@sema.dps.mo.gov
573-694-1968

MISSOURI DEPT OF PUBLIC SAFETY – SERVICE SAFETY SECURITY – EMERGENCY MANAGEMENT

Community Organizations Active in Disaster COAD

Questions??

For specific COAD Resources, scroll down to "Resources"

- **"Disaster Leadership Team Resource Library"**
- **"Extension Disaster Education Network"**
- **"National VOAD Resource Library"**
- **"MO COAD Manual"**

Scan here or visit sema.dps.mo.gov/programs/emergency-human-services.php to access resources and more!

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Recognition of the Great New Madrid Earthquake Series & the Impacts of Future Earthquakes & their Aftershocks

Greg Hempen, PhD, PE, RG
HM.AEG, LM.ASCE, F.GSA
Consulting Geophysicist, EcoBlast, LC

Earthquake Summit
March 24, 2026

Henry Howe Woodcut, Historical Collections of the Great West (Cincinnati, 1854, p.239)

OUTLINE

The 1811-12 New Madrid Earthquake Series

- Note the paleoseismic, historic & instrumental seismicity of the CUS region.
- Provide a plausible NMES scenario- 3 Principal Events.

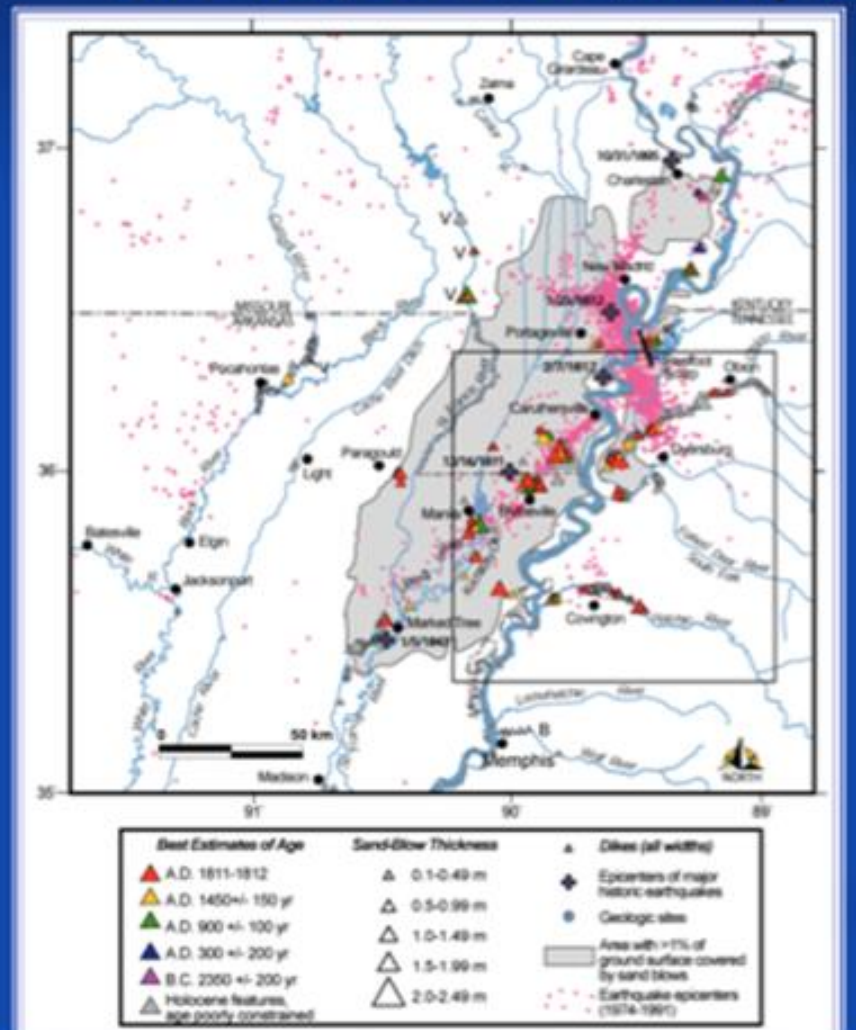
Impacts of Larger Quakes & their Aftershocks

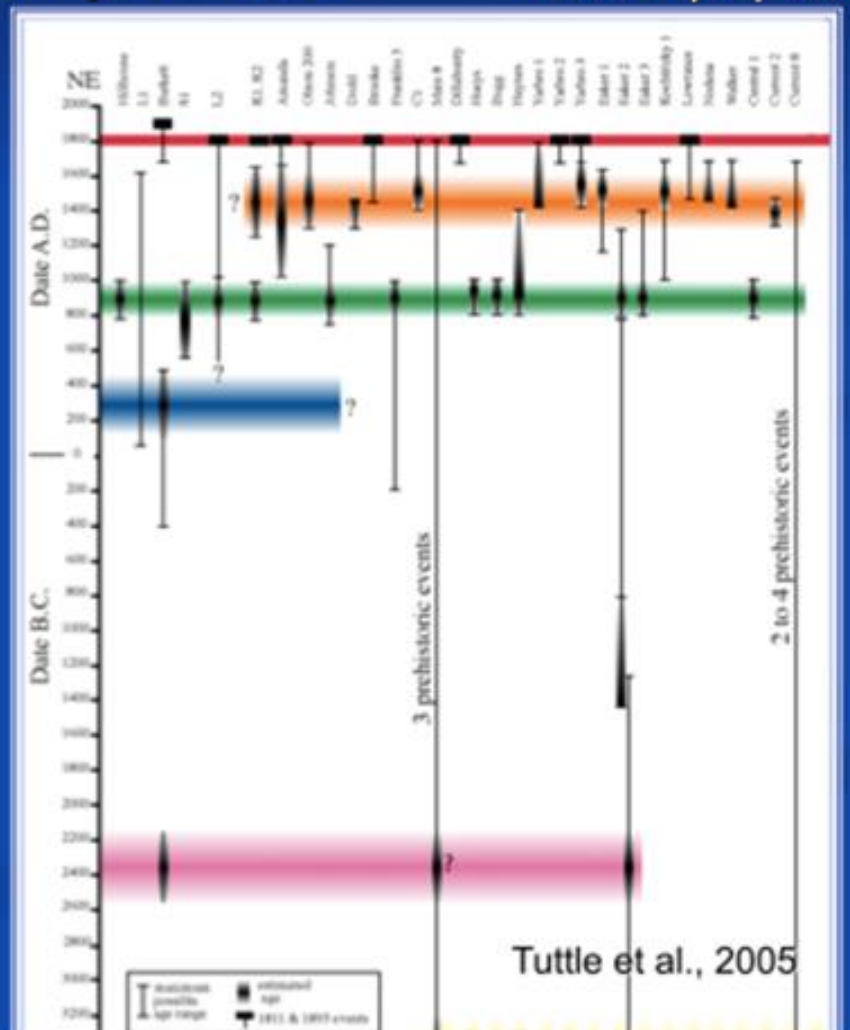
- Considerable Design, Response & Recovery Advances have developed over the last 15 years.
- Several concerns remain for mitigating, responding to, and recovering from a *New Madrid Series Earthquake*.

Paleoseismic Record of NMSZ

- **Timing of New Madrid Paleoearthquakes**
  - Significant earthquakes induced liquefaction in AD 1450, AD 900, 2350 BC, and possibly AD 300

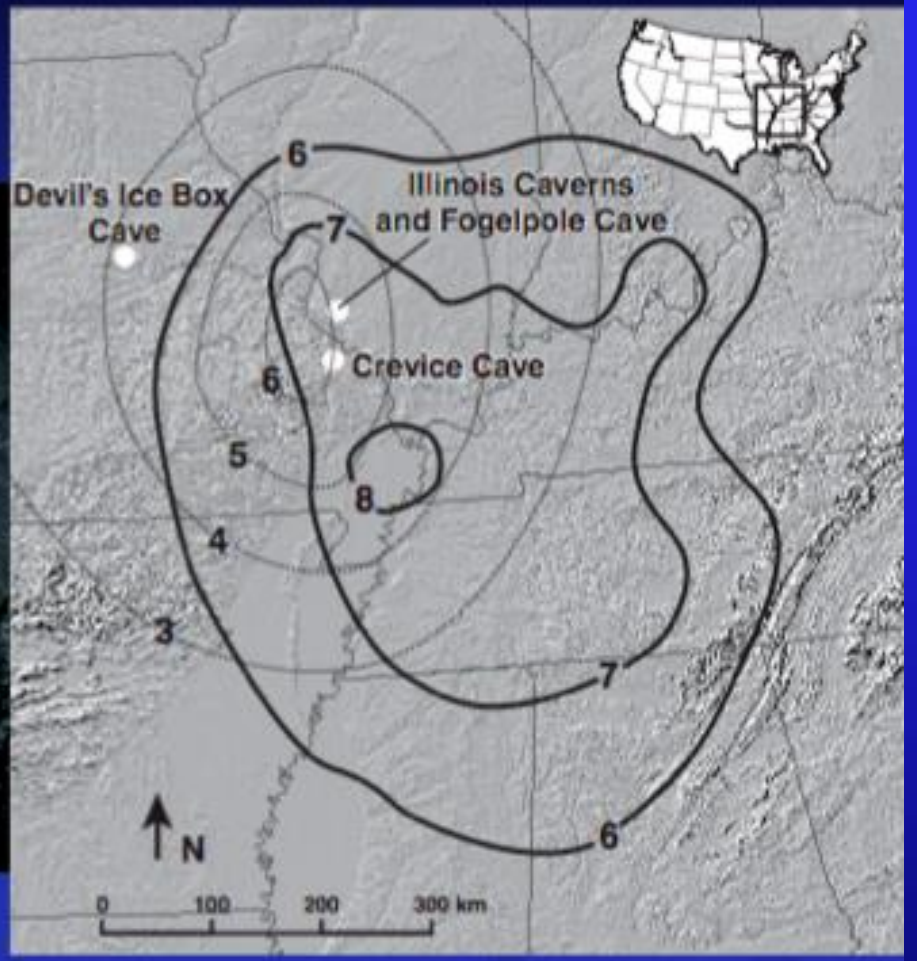
Tuttle, 9/2008





Major Earthquakes Recorded by Speleothems in Midwest Caves

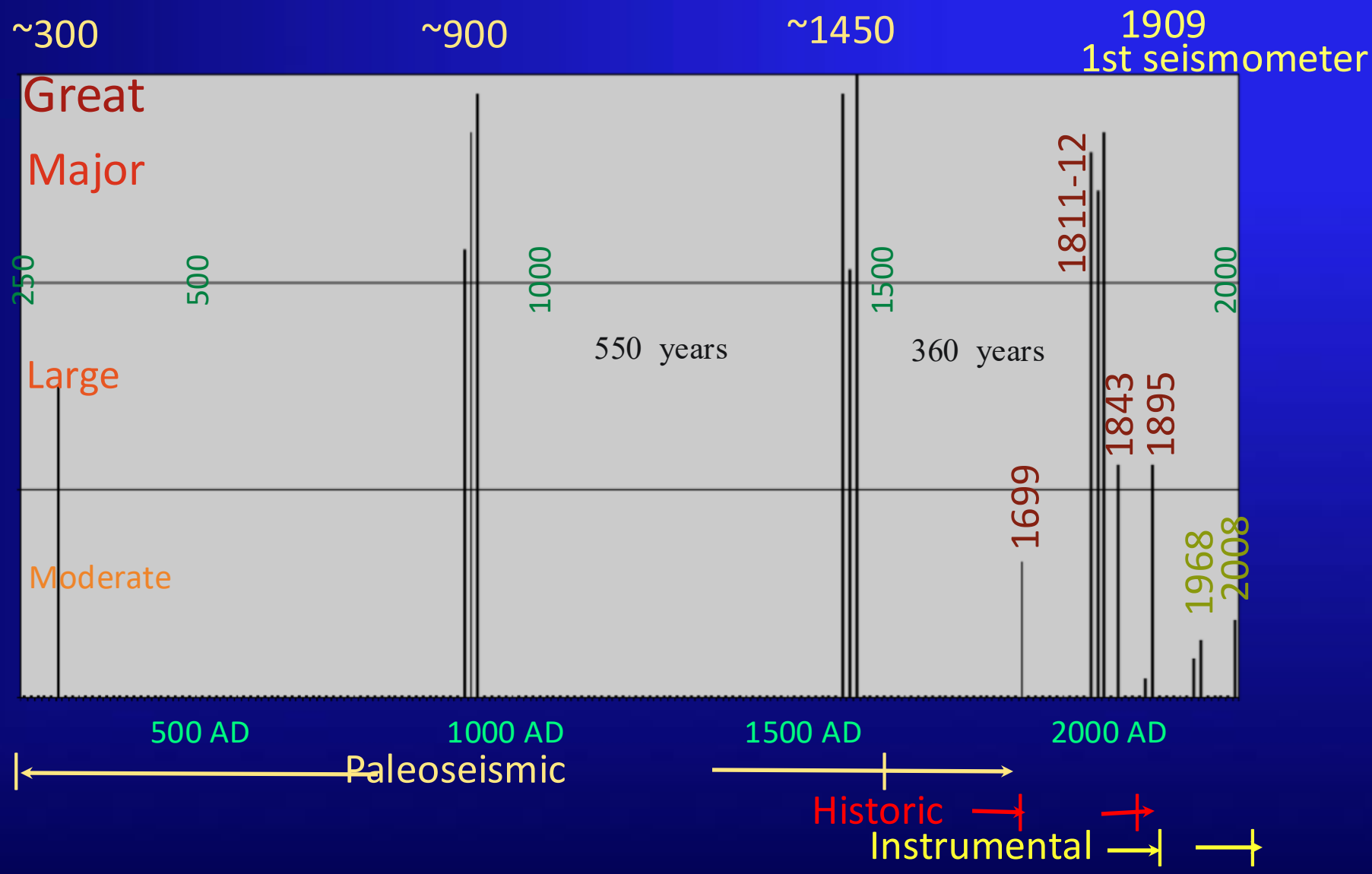
(Panno et al., submitted)



- Speleothem initiation/regrowth in ILL & MO caves coincides with many earthquakes in regional chronologies (1811-1812, AD 1450, AD 900, 1620 BC, 2350 BC, 3500 BC, 4520 BC, 9300 BC); extend record back in time and into areas where other techniques can not be used.

Tuttle, 9/2008

PALEO, HISTORIC & INSTRUMENTAL EVENTS



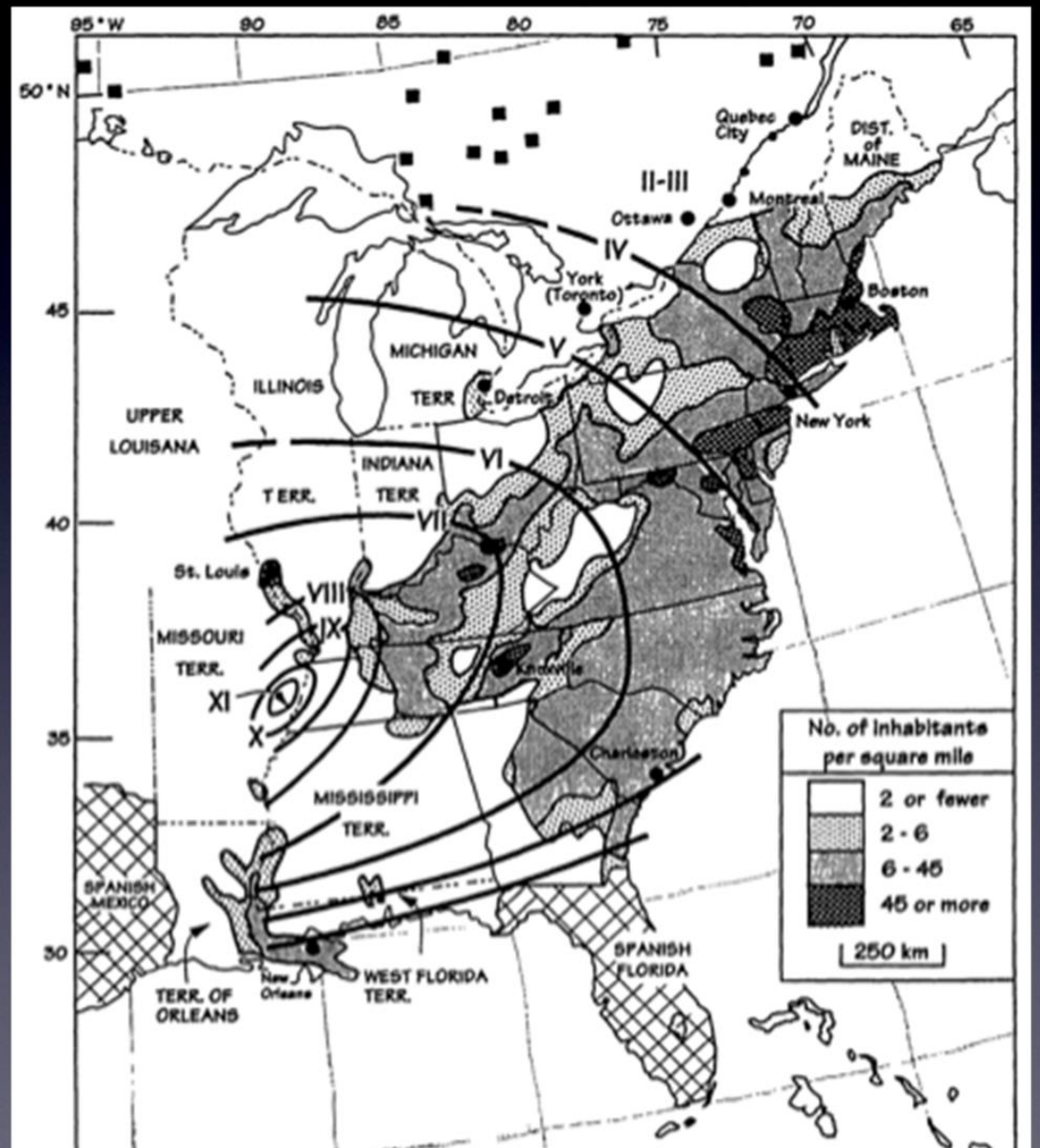
Modified Mercalli Intensity

- Scale: I (barely perceptible) to XII (total destruction).

	Shaking	Perception	Damage
X	Extreme		Very Heavy
IX	Violent	General panic.	Heavy
VIII	Severe	Car steering affected.	Mod. to Strong
VII	Very Strong	Most run outdoors.	Moderate
VI	Stong	Felt by all.	Light
V	Moderate	Sleepers awakened.	Very Light

- Isoseismal maps, contours of MMI impacts, may provide details that help resolve areas of greater hazard.
- Development of “Did You Feel It?”, the rapid, USGS MMI system from internet accounts.

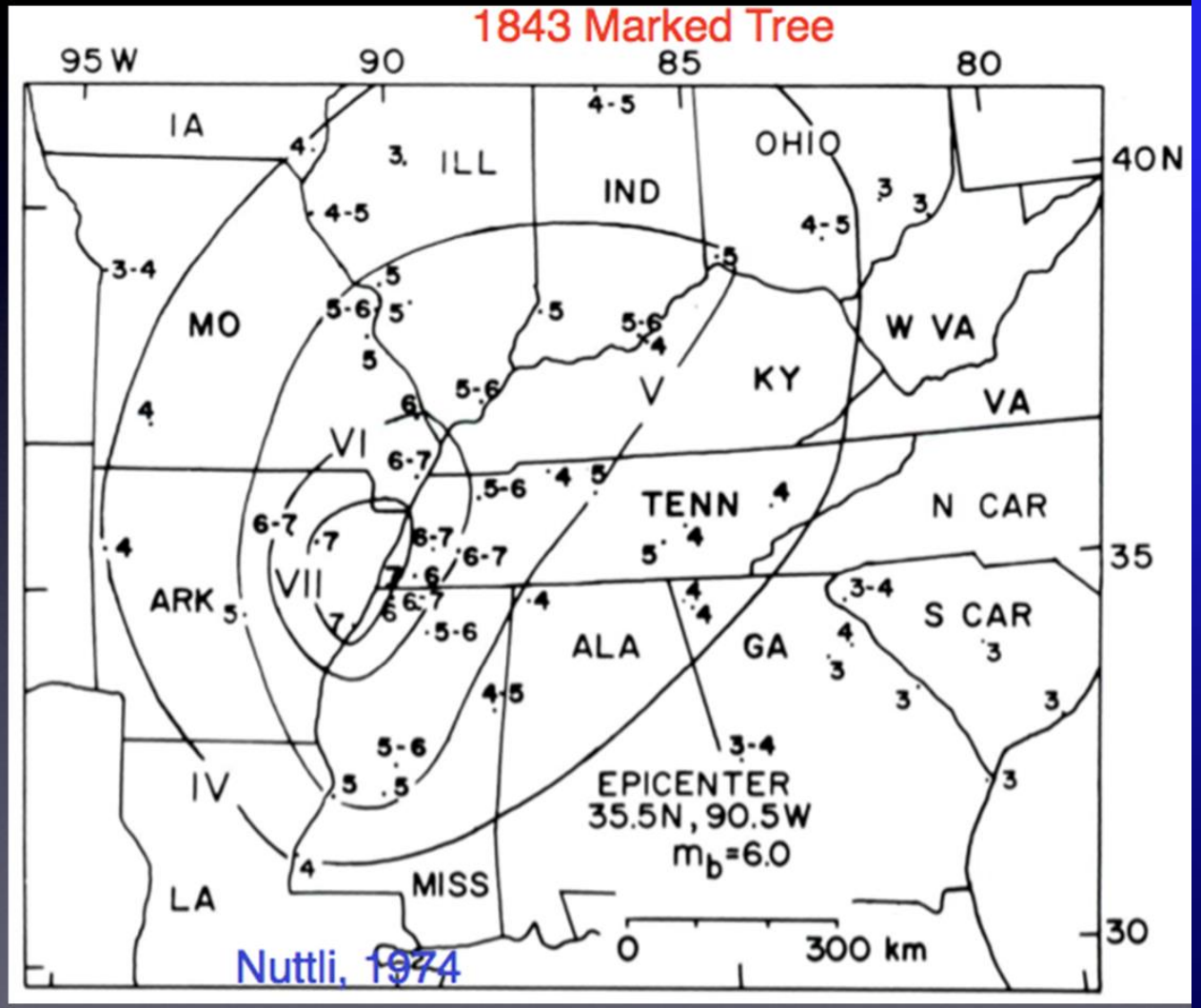
ISOSEISMAL & POP. DENSITY MAP



Johnston & Schweig, 1996.

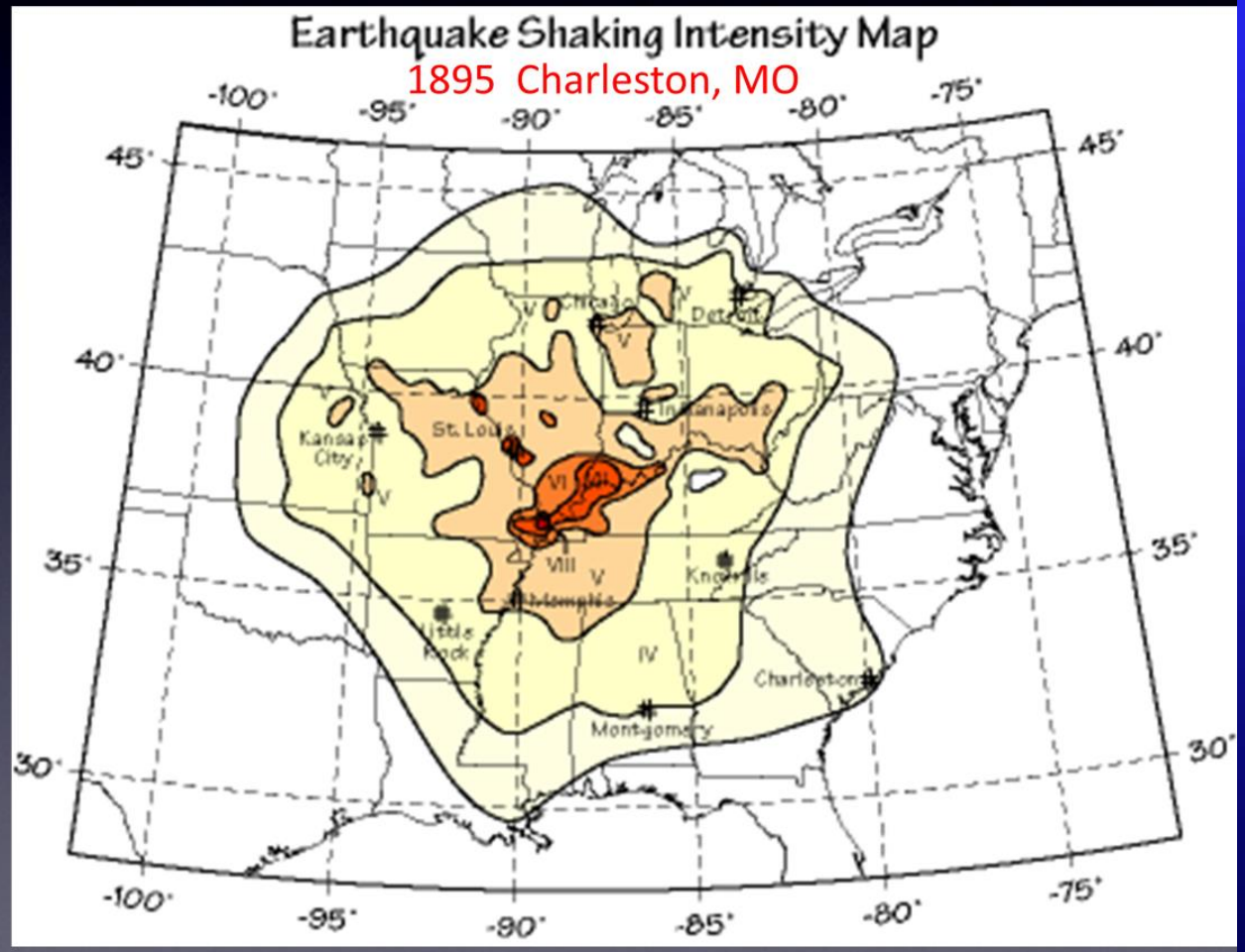
ISOSEISMAL MAPS

- 1843 Mw 6.2



ISOSEISMAL MAPS

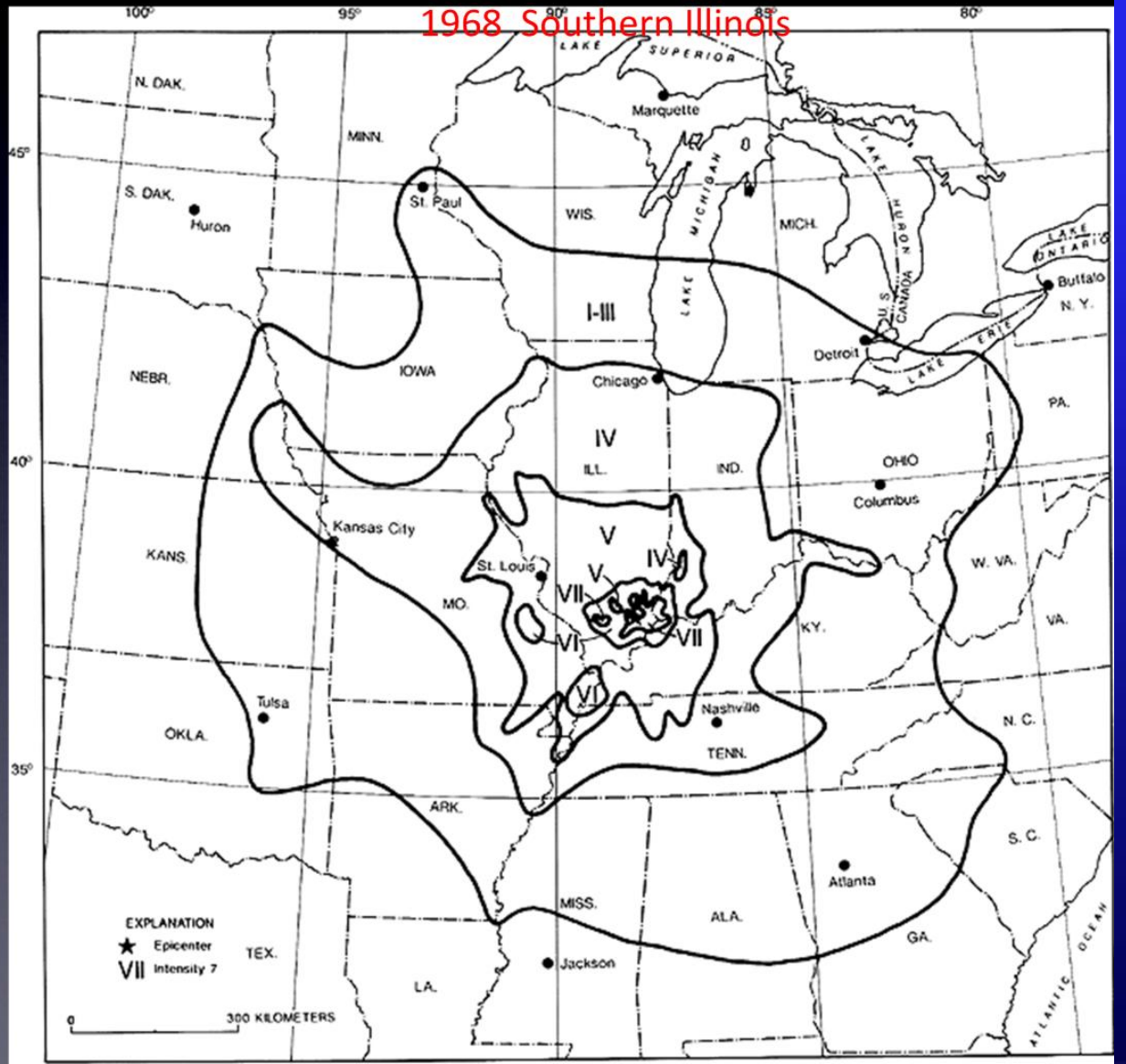
- 1843 Mw 6.2
- 1895 Mw 6.2



St. Louis University

ISOSEISMAL MAPS

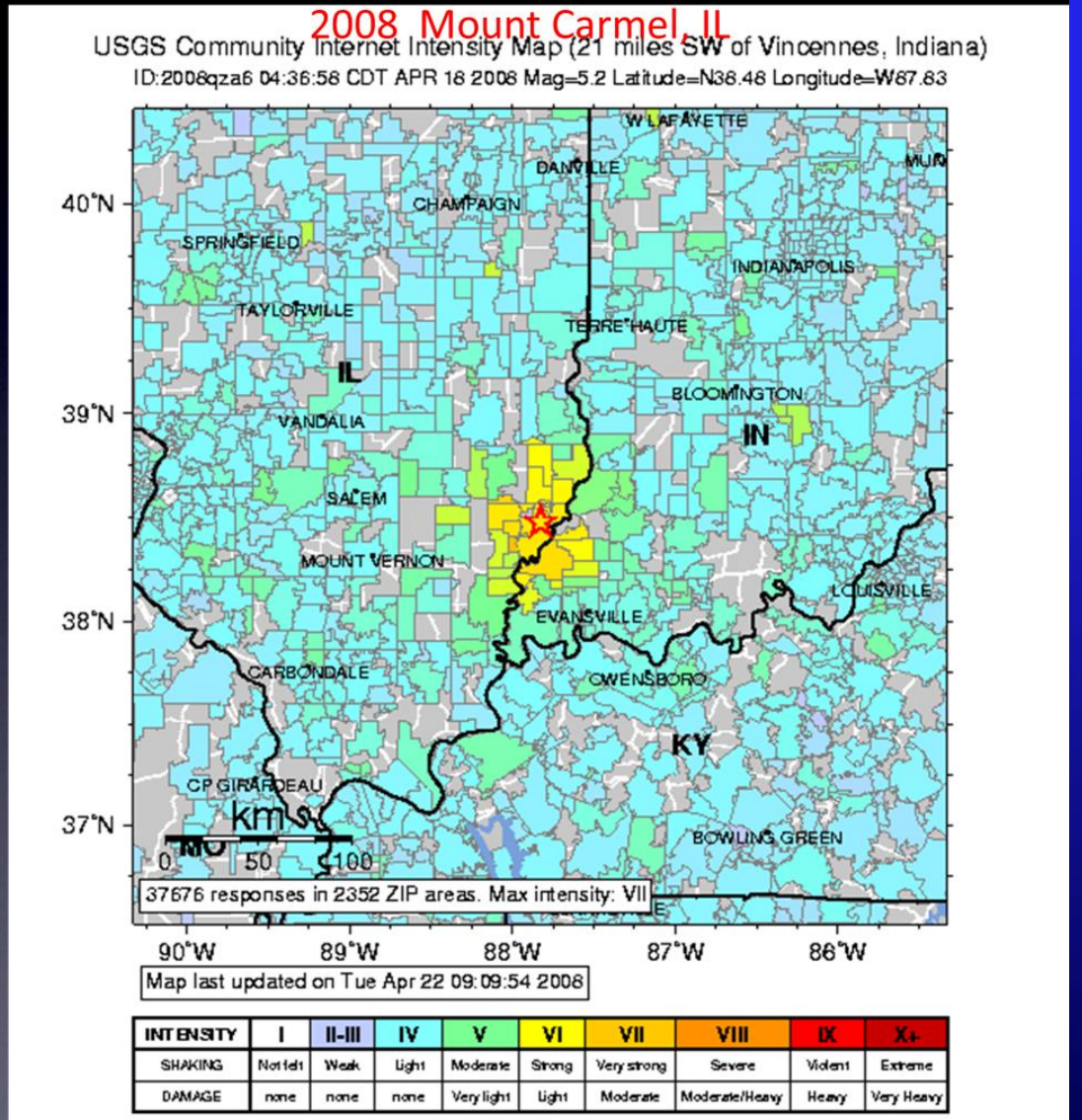
- 1843 Mw 6.2
- 1895 Mw 6.2
- 1968 Mw 5.1



St. Louis University

ISOSEISMAL MAPS

- 1843 Mw 6.2
- 1895 Mw 6.2
- 1968 Mw 5.1
- 2008 Mw 5.2



USGS

CONCEPTUAL RISK OF THE GREAT 1811-12 NM SERIES

- Use of advances in Central US seismological studies to resolve the daily maximum event, its location & its isoseismal map.
- Research on the historic accounts & recognizing the sites' characteristics for those accounts clarify the facts.
- *CONCEPTUAL* implies a satisfactory explanation, but the hypothesis may be moot or revised in the future with new data.
- Drs. Chris Cramer, Greg Hempen, & Kent Moran, 2011.

SEVERAL STUDY ADVANCES

- USGS resolved the probabilistic procedures and produced US National Seismic Hazard Maps.
- Modeling of the crustal velocity structure has developed from recent earthquakes recorded with the more dense, seismographic array.
- Numerical simulations of the 1811-1812 principal earthquakes and other earthquakes.
- USGS Urban Hazard Mapping Studies:
  - Evansville, IN; Memphis,TN; & St. Louis Metro, MO.
- CUSEC State Geologists' Soils Map created.

1811-12 NM SERIES DATE

Principal Event OR Aftershock of Principal Event

- Series of three principal events, like prior paleoseismic series, defines three sequences.
- Aftershocks since Principal Event played for each day through March 15th.
- Sum of sequence events by day & by moment magnitude range.
- Largest daily event shown as an Isoseismal Map with median MMI values.

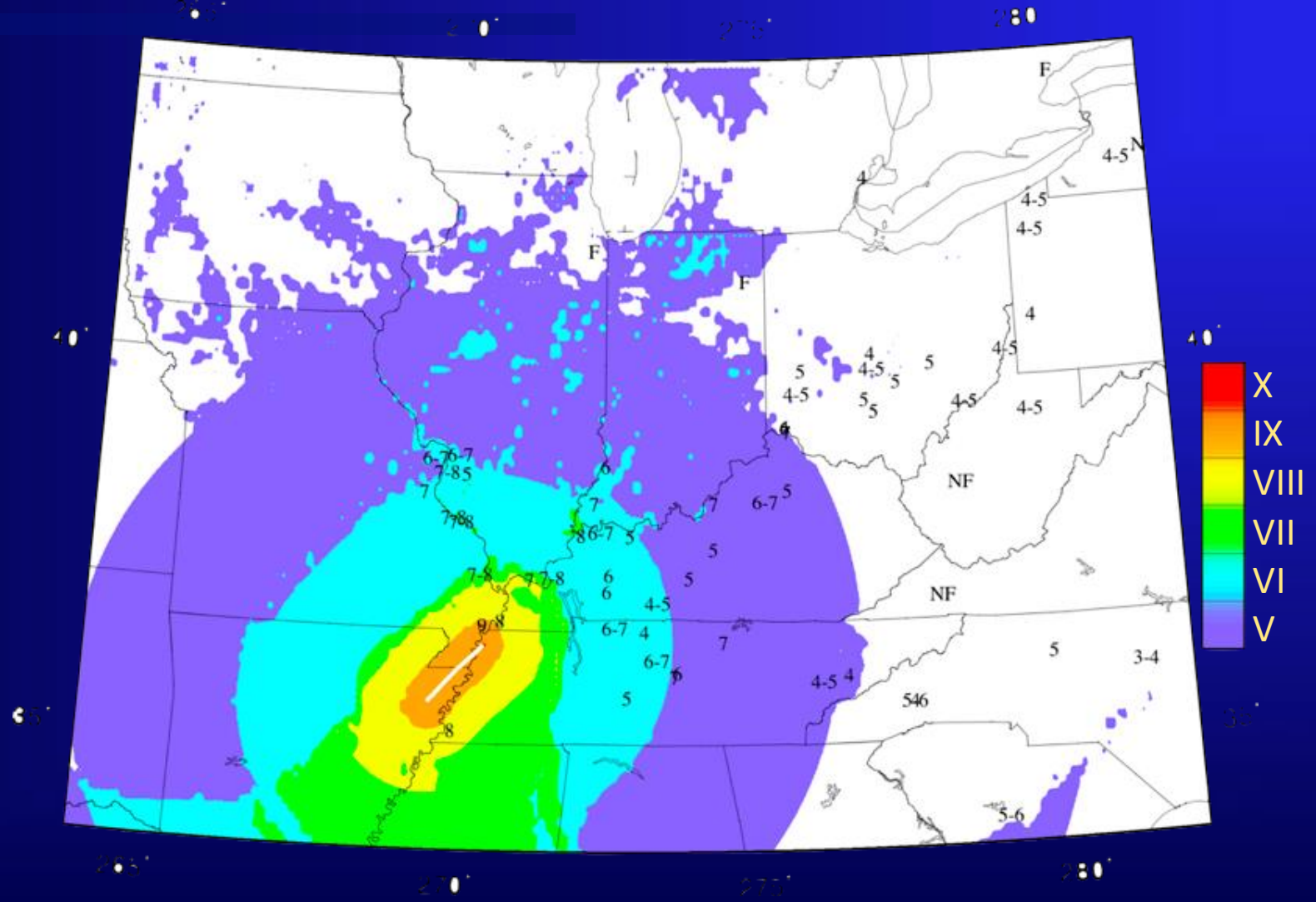
Sequence

Number of events since Principal's Date

Mw	No.
~7.7	1
>6.7	2
6-6.7	1
5-6	1
4-5	
2.5-4	16

DECEMBER 16, 1811

First Principal Event



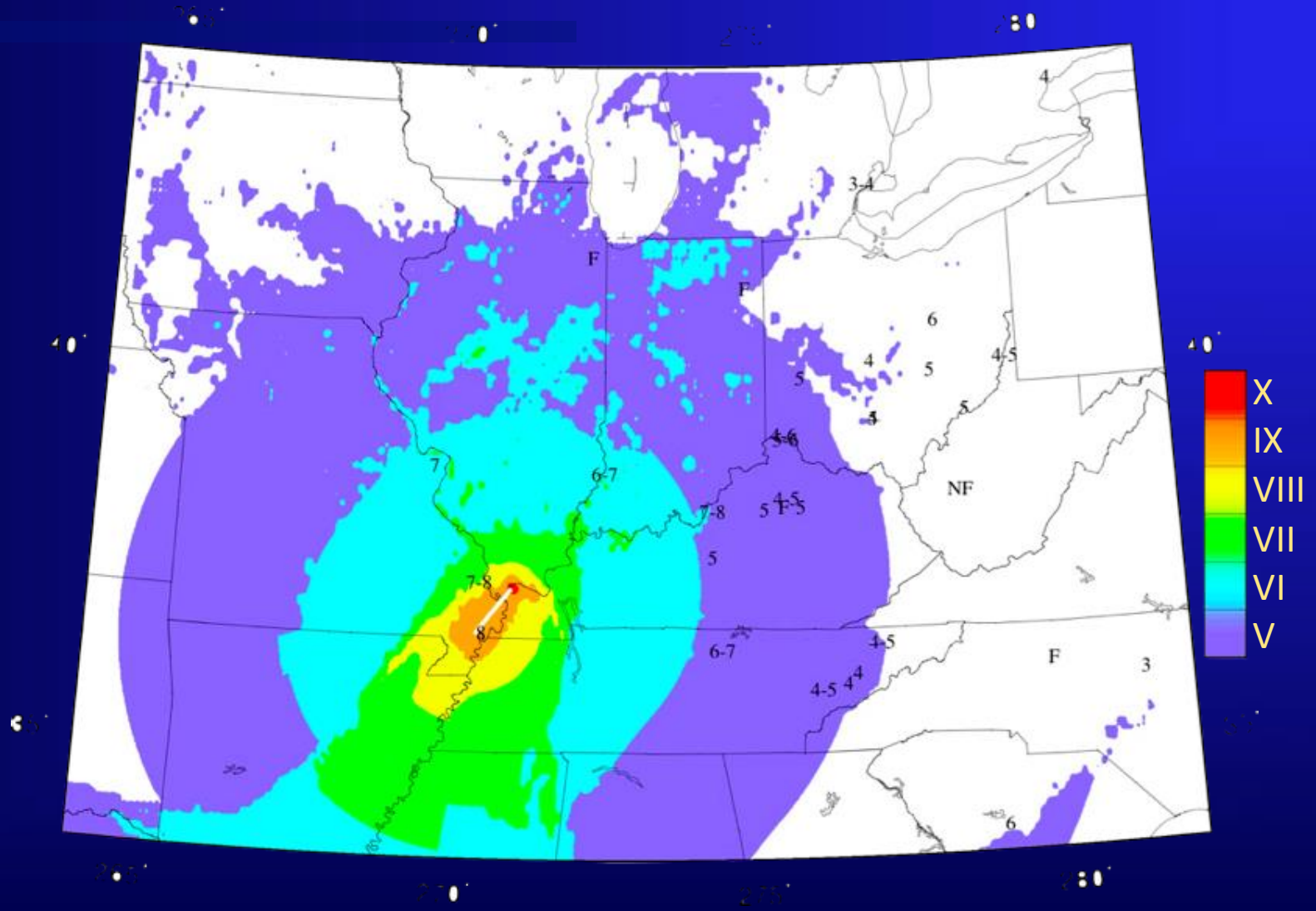
First Sequence

Number of events since DEC 16, 1811

Mw	No.
~7.7	1
>6.7	2
6-6.7	
5-6	1
4-5	
2.5-4	16

JANUARY 23, 1812

Second Principal Event



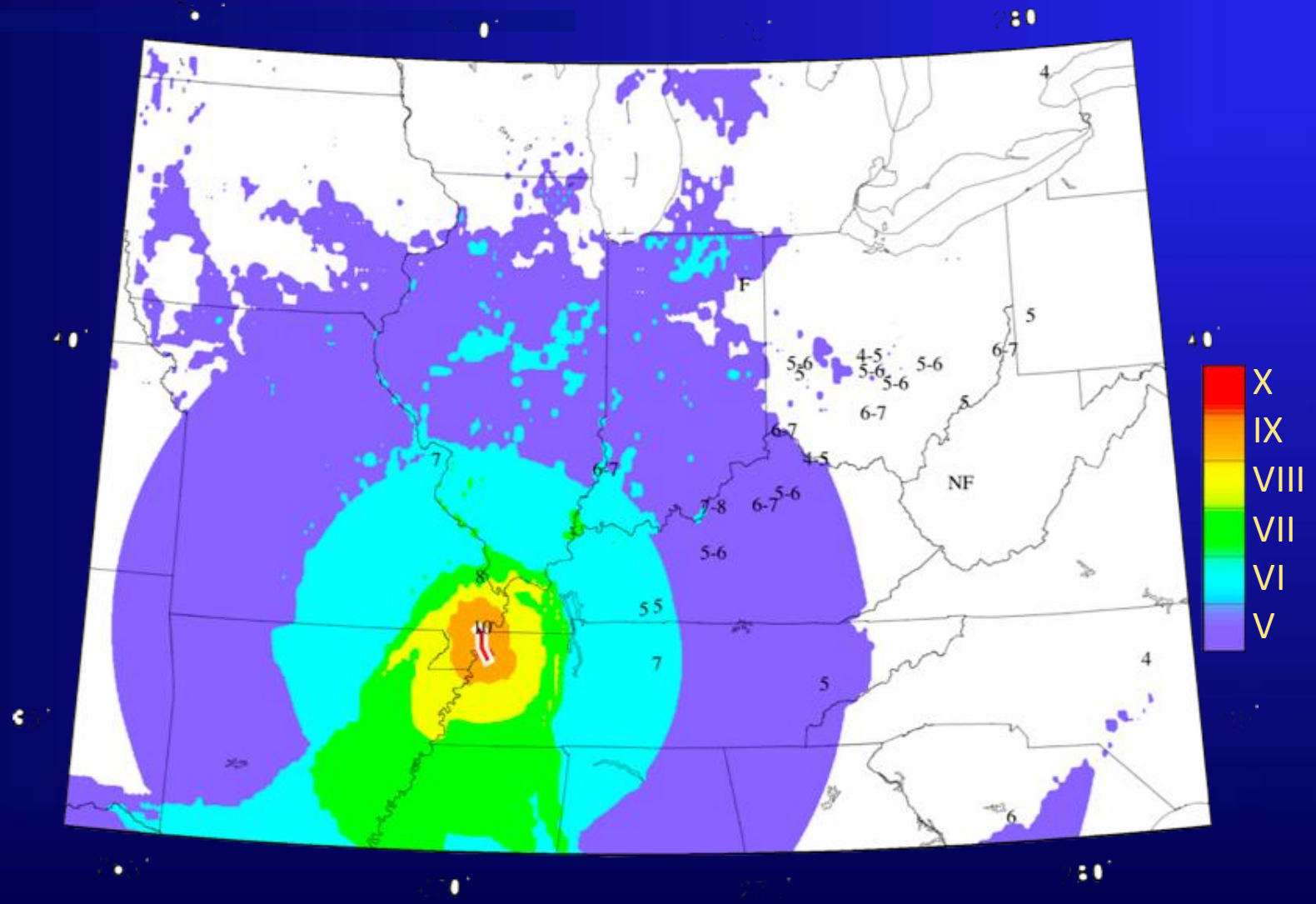
Second Sequence

Number of events since JAN 23, 1812

Mw	No.
~7.5	1
>6.7	
6-6.7	
5-6	4
4-5	
2.5-4	13

FEBRUARY 7, 1812

Largest & Third Principal Event



Third Sequence

Number of events since FEB 7, 1812

Mw	No.
~7.8	1
>6.7	1
6-6.7	4
5-6	4
4-5	3
2.5-4	90

MARCH 15, 1812

Aftershock of FEB 7, 1812 Event

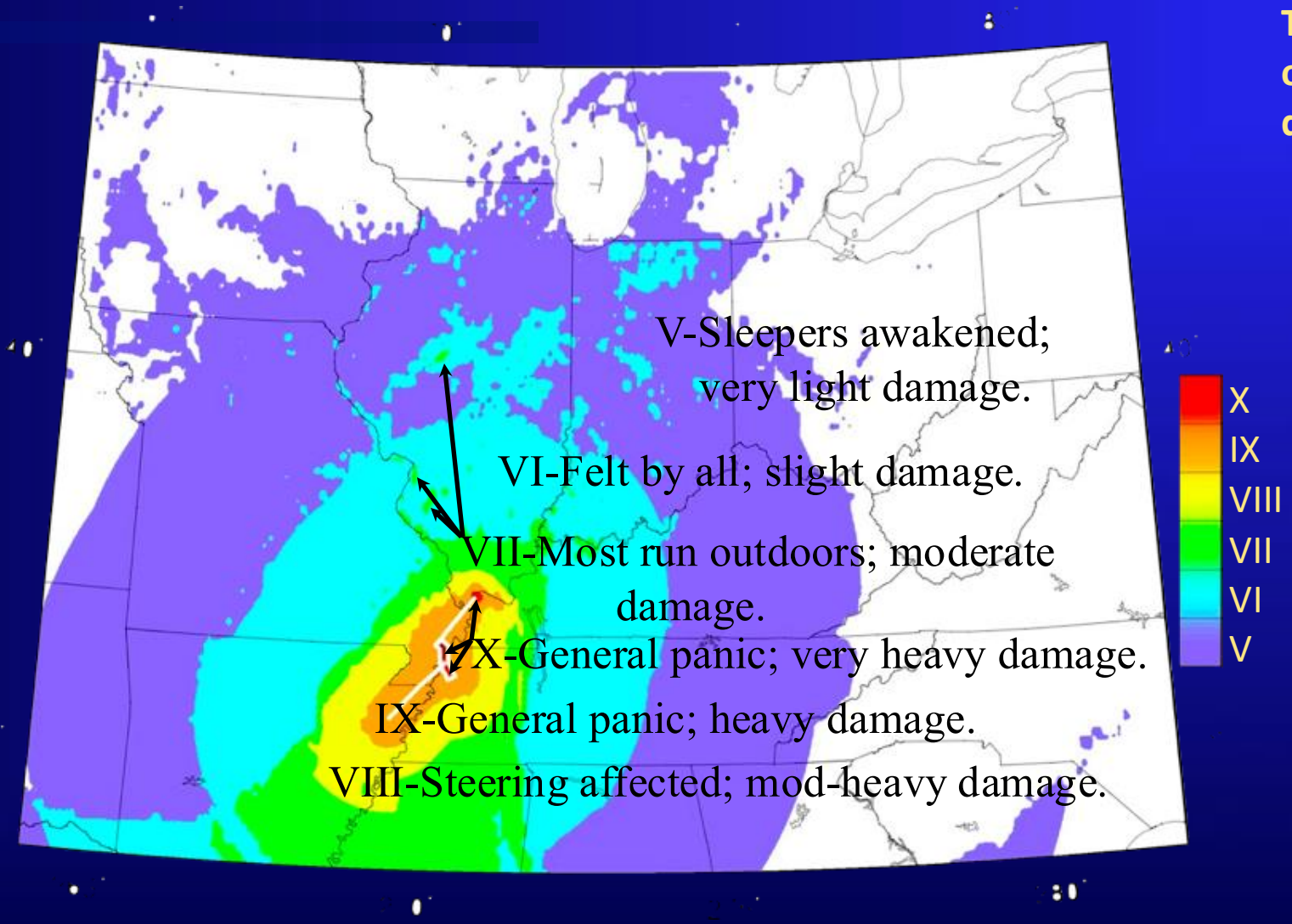
Third Sequence

Number of events since FEB 7, 1812

Mw	No.
~7.8	1
7	2
6.5	5
5.5	19
4.5	33
2.5-4	1102

1811-12 NM Series' Events

Cumulative Isoseimal for 1811-12 Events



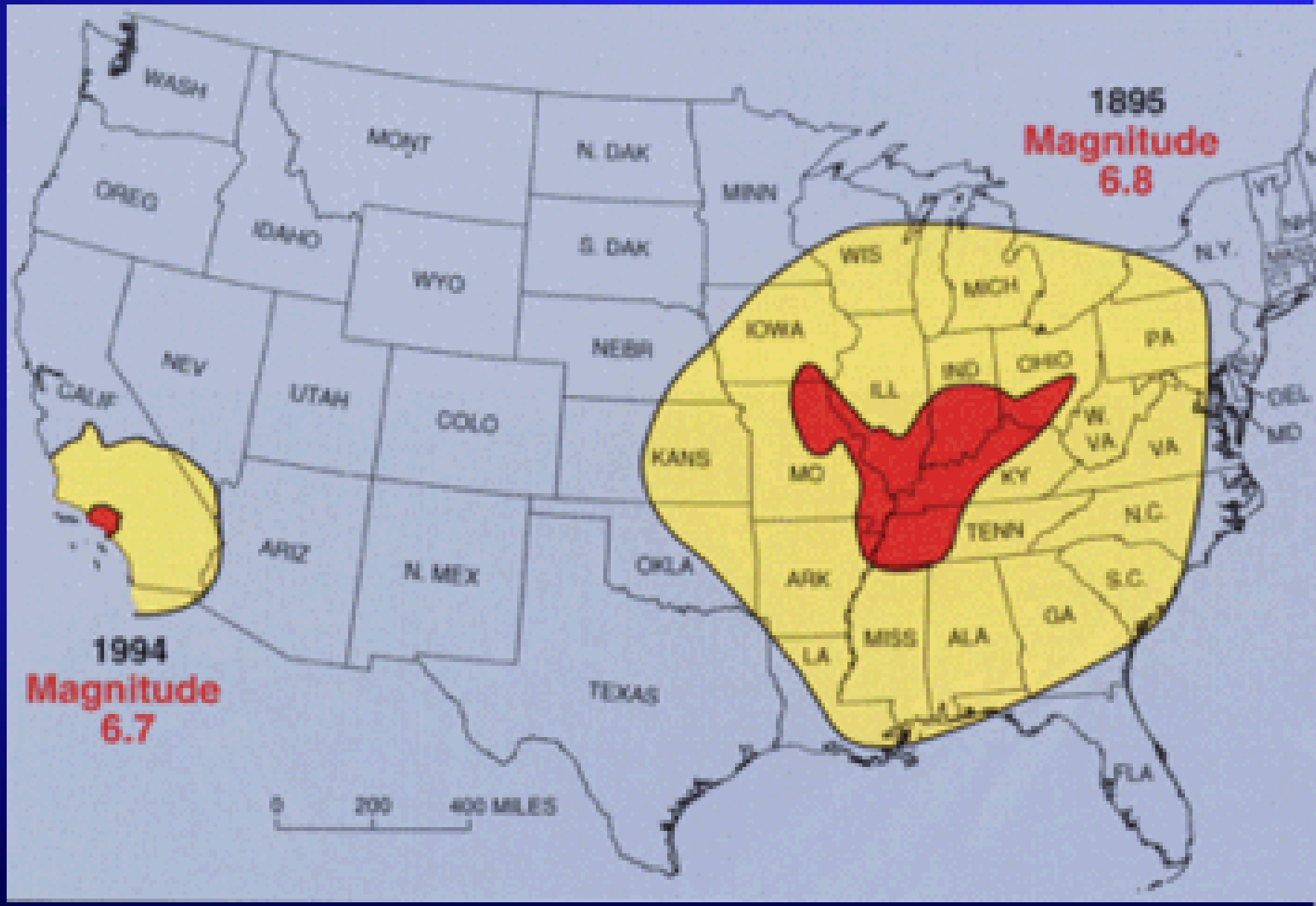
All Sequences

Total number of events over 90 days

Mw	No.
≥7.5	3
6.8-7.4	5
6-6.7	10
5-6	35
4-5	65
2.5-4	1,756
ALL	1,874

C & E US Seisms' Greater Damage Area

- Same magnitude earthquakes cause damage in 10 times greater area in the CE US as compared to the W US.



USGS, 2010

REGIONAL EARTHQUAKE RISK

- USGS Probability in 50 years.
  - Large earthquake, M = 6.0, 25% to 40% probability, which could be near St. Louis but not likely.
  - Great earthquake, M = 7.5, 10% probability, most likely within the NMSZ. [Great earthquake(s)=1811-12 New Madrid Eqk Series]

- Not the *50-year event*. Misunderstanding by many of the meaning of *X*-year event value.
  - 50-year earthquake means within any 50-year period there exists: about 1 in 3 chance of **no earthquake of that magnitude** would occur, and about 2 in 3 chance of **one or more earthquakes of that magnitude or greater** would occur.

NMSZ's LESSONS

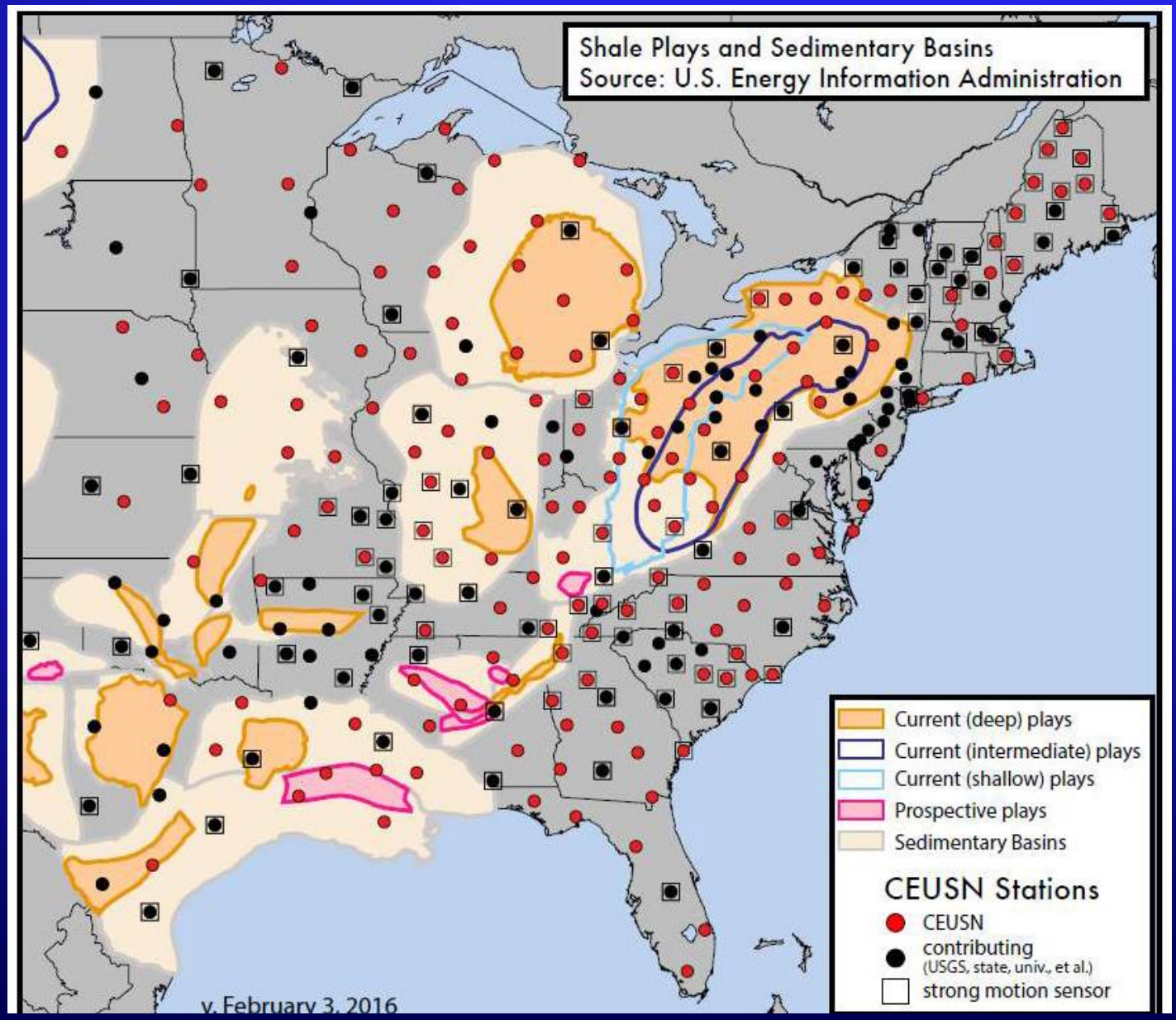
- The average return interval of the 7 cave accretion events is 1,050 years with a 360-year minimum & a standard deviat'n of 775 years.
- Major to great NMSZ events are likely to come as a series of three, principal earthquakes. Long aftershock sequences will follow the principal event for months.
- CEUS Attenuation models clearly depict hazards from similar magnitude events at 3 times greater distances than WUS seisms.
- The long, low-amplitude ground shaking from major earthquakes at great distances from their focus can cause resonance in tall structures and long bridges.
- Detailed data of soil type, soil depth, slope, & water surface depth are needed for effectively assessing scenarios.

SEISMOLOGIC & PRACTICE ADVANCES

- EarthScope Consortium
- USGS Tool Box
- IBC & ASCE 7
  - Geotechnical Engineering
  - Structural Engineering
- Earthquake Preparedness, Response & Recovery

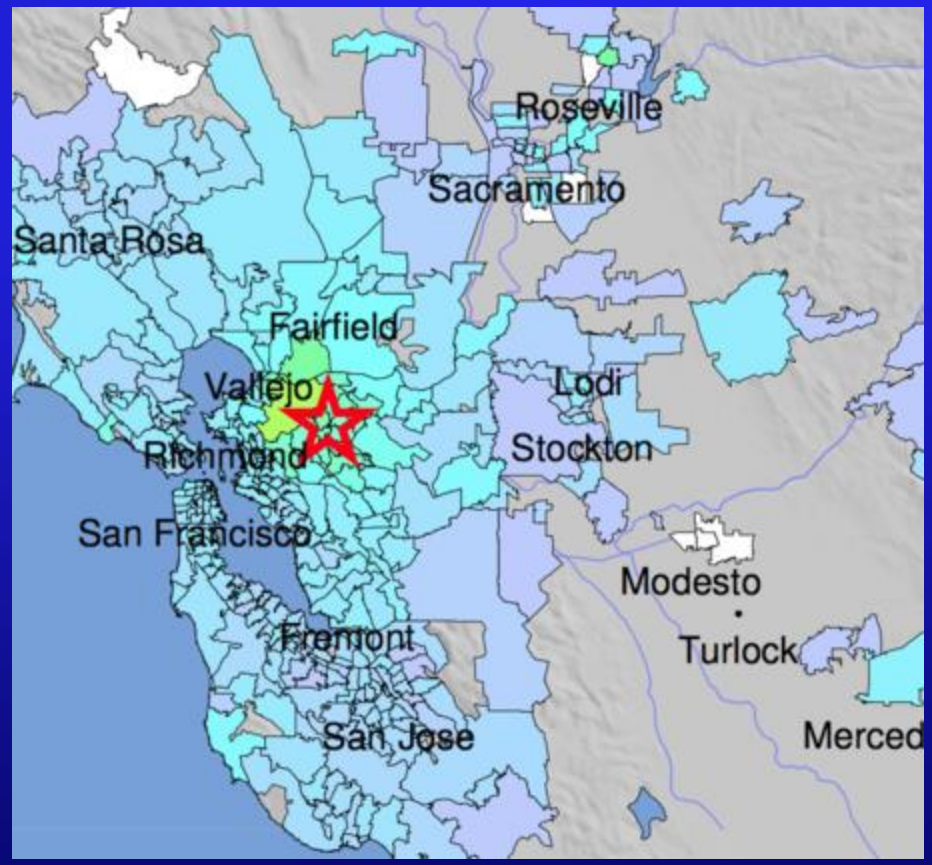
EARTHSCOPE CONSORTIUM

- A university consortium supporting global geophysical research & education.
- Engaging society to be resilient to geohazards, informed by geophys-ical discovery and global collaboration.



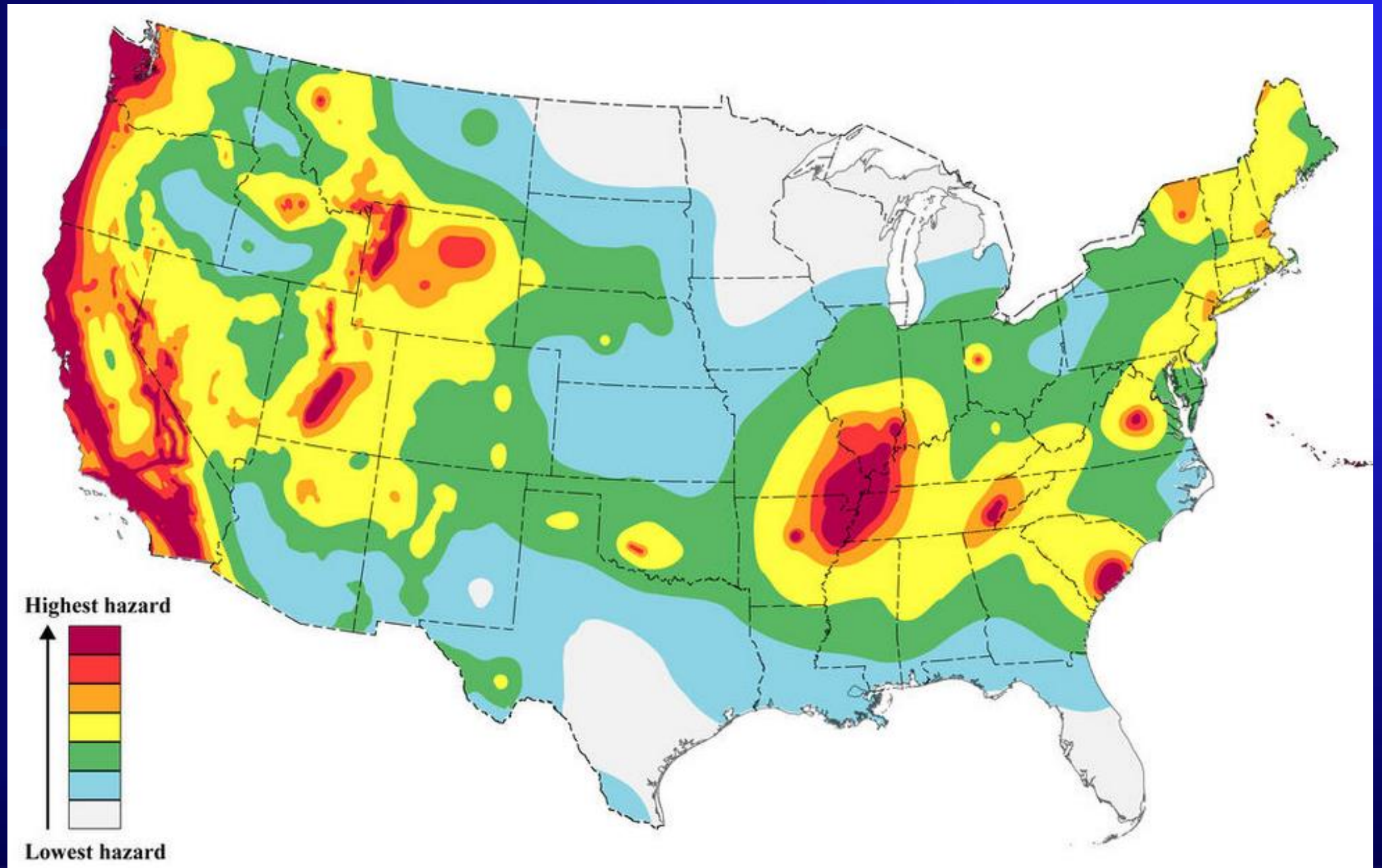
USGS's SEISMOLOGIC TOOL BOX

- Did You Feel It?
- ShakeMap
- PAGER
- Aftershock Forecasts
- Ground Failure
- Finite Faults
- Early Warning/ShakeAlert®



Aug 23, 2022 Eqk

2023 USGS Earthquake Hazard Map

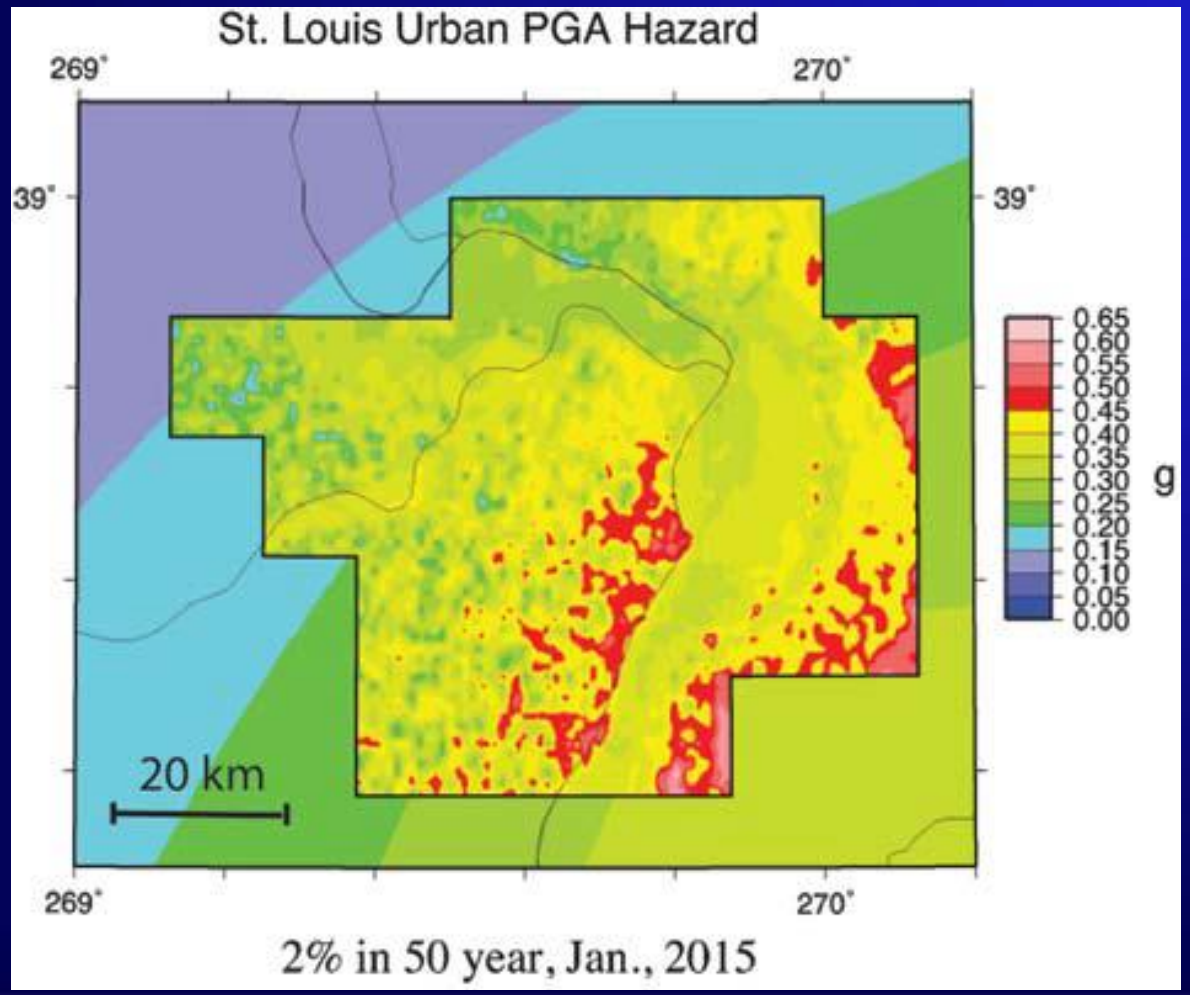


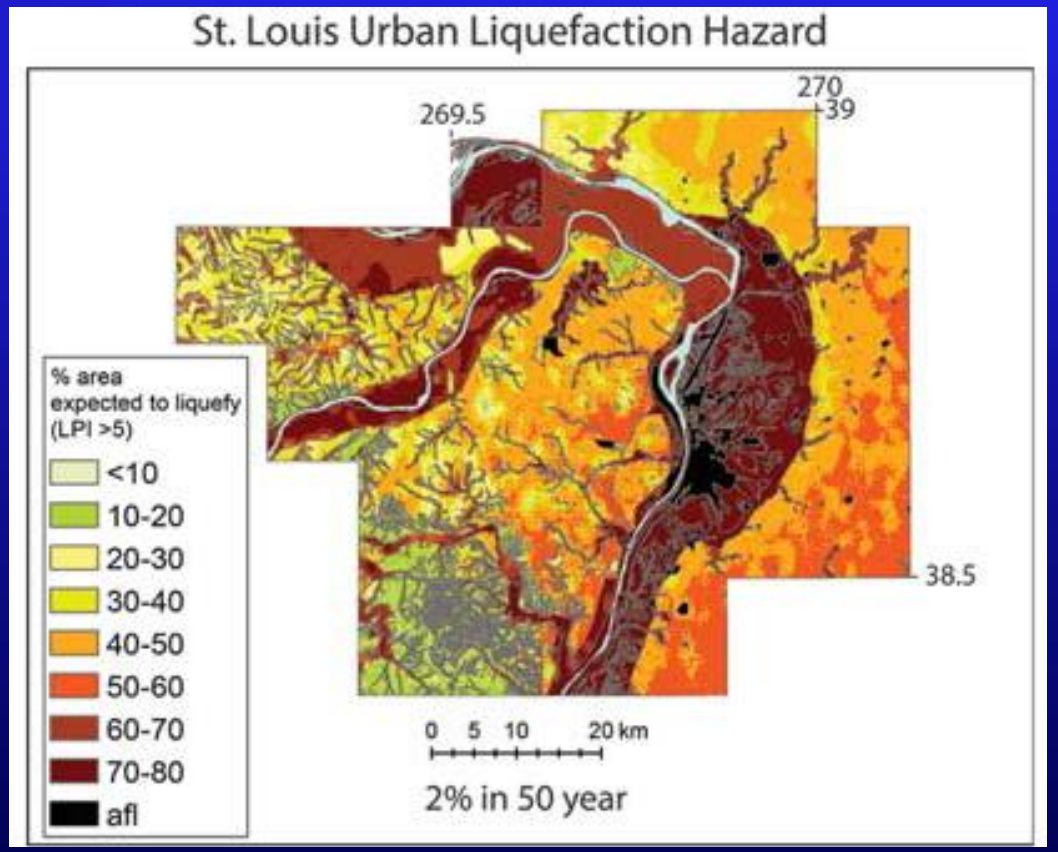
ADVANCES BENEFITING IBC & ASCE 7

- Next Generation Attenuation Relationships, CEUS.
- Greatly improved understanding of the seismic response of layered soil profiles.
- Improved methods to predict liquefaction triggering and post-liquefaction shear strength.
- Greatly improved understanding of methods to mitigate liquefaction.
- 2010-11 Christchurch, NZ Earthquakes' & other events' studies being funded & data exchanged.

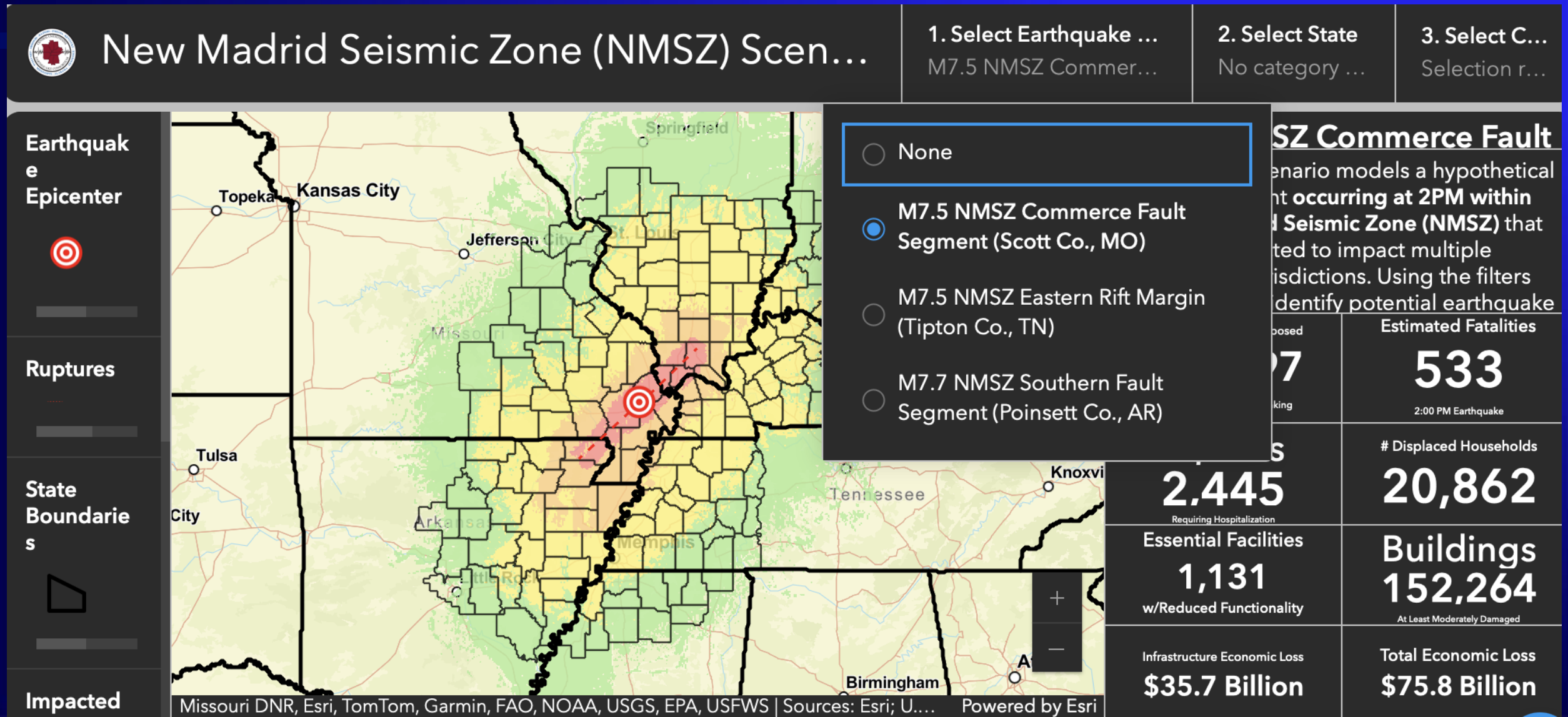
EARTHQUAKE RISK FOR ST. LOUIS

2% in 50 years, Cramer, et al., 2017





NMSZ Scenario Model
https://cusec.maps.arcgis.com



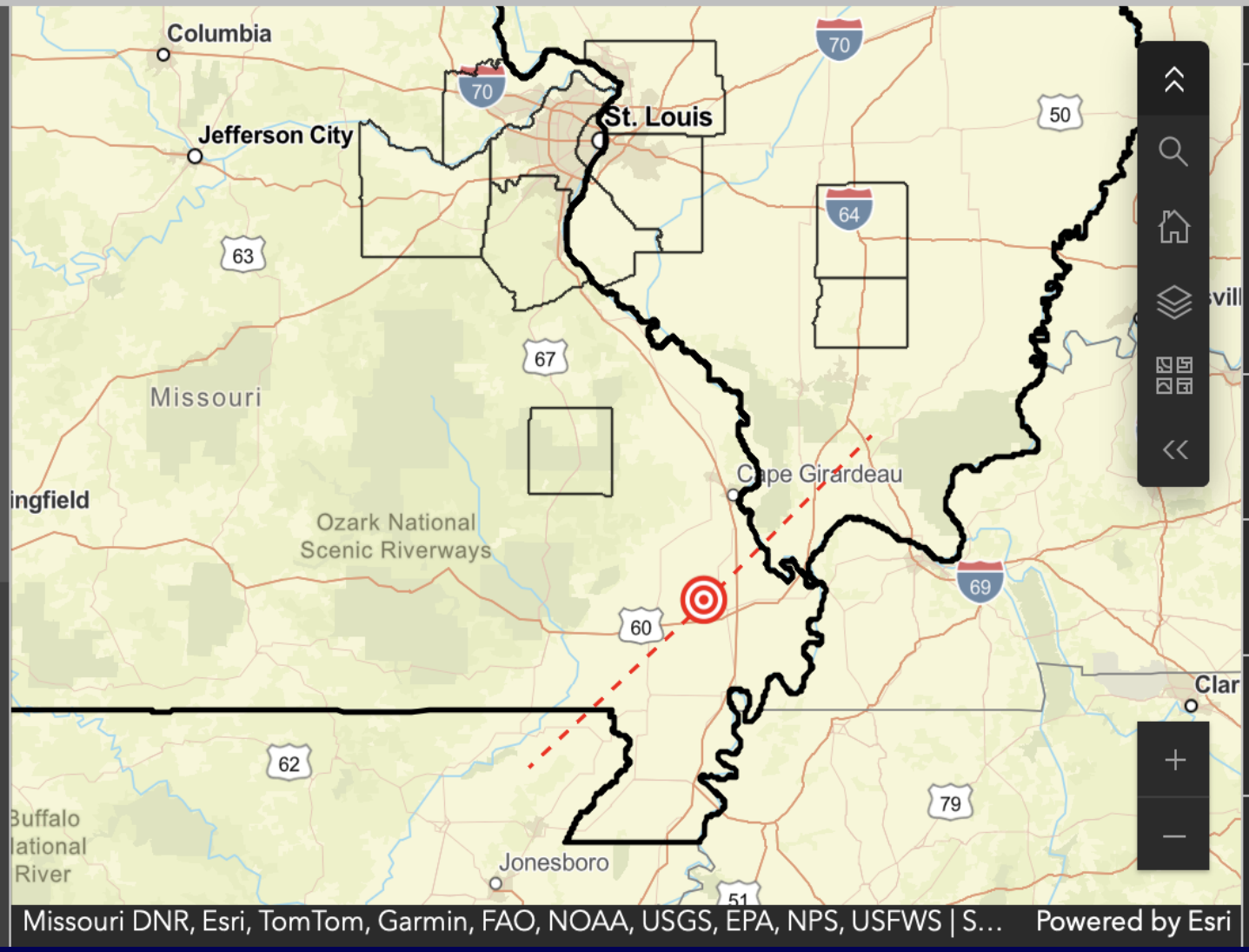
NE NMSZ Event

Earthquake Epicenter

Ruptures

State Boundaries

Impacted Counties



M7.5 NMSZ Commerce

The selected scenario models a hypothetical earthquake event **occurring at 2PM within the New Madrid Seismic Zone (NMSZ)** that would be expected to impact multiple counties and jurisdictions. Using the filters above, you can identify potential earthquake impacts at the state and county levels. You can click directly on a county to

Estimated Population Exposed **0** To At Least Very Strong Shaking	Estimated Fatalities **2** 2:00 PM Earthquake
Injuries **26** Requiring Hospitalization	# Displaced Households **161**
Essential Facilities **66** w/Reduced Functionality	Buildings **10,145** At Least Moderately Damaged
Infrastructure Economic Loss **$1.5 Billion**	Total Economic Loss **$3.9 Billion**

NE NMSZ Event

Earthquake Epicenter

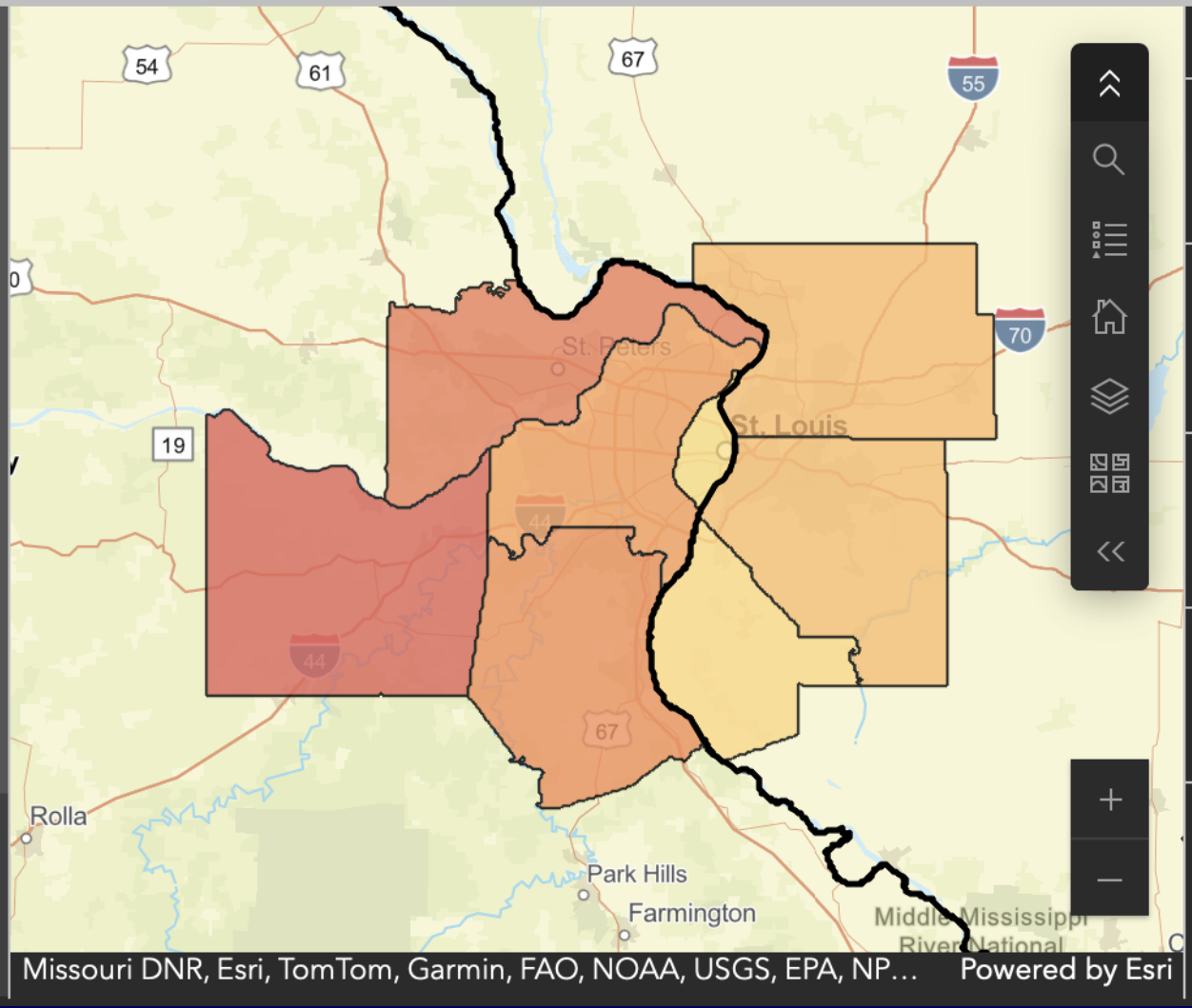
Ruptures

State Boundaries

Impacted Counties

Direct Economic Loss ($)

> 713,476,492



M7.5 NMSZ Commerce Fault

Due to their destructive nature, earthquakes can cause significant economic losses by damaging homes, buildings and infrastructure, which may be costly to repair or rebuild. For instance, the 1994

Total Economic Loss

$3.9 Billion

Residential Structural Damages
$112.3 Million

Other Residential Losses
$748.6 Million
(Nonstructural, contents, etc.)

Business Structural Damages
$214.4 Million

Other Business Losses
$1.3 Billion
(Inventory, Contents, Wages, etc.)

Transportation Economic Loss
$127.7 Million

Utility Economic Loss
$1.4 Billion

SW NMSZ Event

Earthquake Epicenter

Ruptures

State Boundaries

Impacted Counties

M7.7 NMSZ Southern Fault

The selected scenario models a hypothetical earthquake event **occurring at 2PM within the New Madrid Seismic Zone (NMSZ)** that would be expected to impact multiple counties and jurisdictions. Using the filters above, you can identify potential earthquake impacts at the state and county levels. You can click directly on a county to

Estimated Population Exposed **0** To At Least Very Strong Shaking	Estimated Fatalities **0** 2:00 PM Earthquake
Injuries **0** Requiring Hospitalization	# Displaced Households **1**
Essential Facilities **0** w/Reduced Functionality	Buildings **1,000** At Least Moderately Damaged
Infrastructure Economic Loss **$408.7 Million**	Total Economic Loss **$776 Million**

Near Memphis NMSZ Event

Earthquake Epicenter

Ruptures

State Boundaries

Impacted Counties

M7.5 NMSZ Eastern Rift

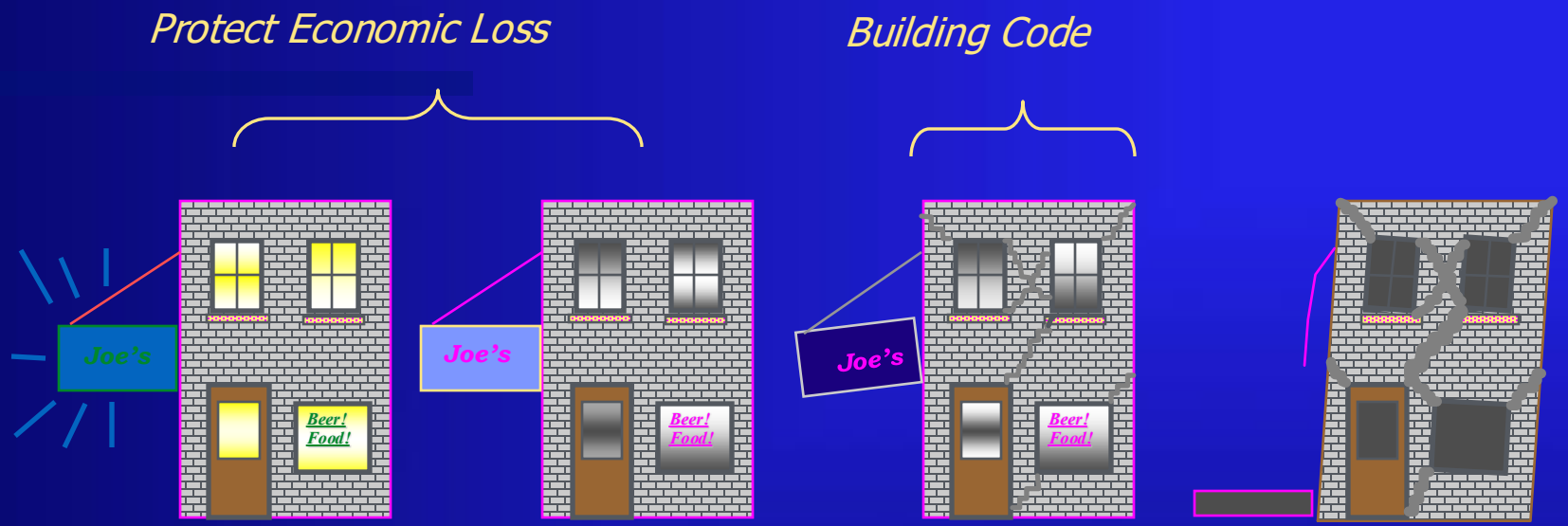
The selected scenario models a hypothetical earthquake event **occurring at 2PM within the New Madrid Seismic Zone (NMSZ)** that would be expected to impact multiple counties and jurisdictions. Using the filters above, you can identify potential earthquake impacts at the state and county levels. You can click directly on a county to

Estimated Population Exposed **0** To At Least Very Strong Shaking	Estimated Fatalities **0** 2:00 PM Earthquake
Injuries **0** Requiring Hospitalization	# Displaced Households **0**
Essential Facilities **0** w/Reduced Functionality	Buildings **543** At Least Moderately Damaged
Infrastructure Economic Loss **$201.9 Million**	Total Economic Loss **$414.5 Million**

IBC & ASCE 7

- 2024 International Building Code, 3 yr cycle
  - In MO IBC is adopted by counties [which edition & what exceptions] for the design of all new buildings, except detached residential & townhouses to 3 stories.
  - Inspection & enforcement are required for effective codes.
  - A properly enforced code protects life safety of occupants, not a structure's viability after the hazard.
- Minimum Design Loads and Associated Criteria for Buildings and Other Structures, ASCE/SEI 7-22, 6 yr cycle
  - The committee evaluates possible revisions and improvements for the IBC edition 2 years ahead of its approval.

Alternative Performance Levels



Operational

Immediate Occupancy

Life Safety

Near Collapse

Loss

0%

100%

N Gould, ABS Consulting, 2012

IMPROVED EARTHQUAKE PREPAREDNESS, RESPONSE & RECOVERY

- Preparedness actions: Performance-Based Design (PBD) being conducted; sustainable systems considered; critical facility inventories; structural and nonstructural improvements; annual ShakeOut drills at businesses & schools.
- Post-disaster response: MO SAVE Coalition's hazard responses & exercises; use of Unmanned aerial vehicles for disaster assessments.
- Recovery: Functional Recovery (FR) more of holistic approach relative to PBD.

UNACCOUNTED ISSUES - 1

- While the 1811-12 NMES' damage was not heavy in St. Louis, buildings are more complex of different sizes & frequencies today relative to the simple, small 1800's structures. There are a large percentage of older structures, yet proper seismic code design only began about 35 years ago.
- States should by law: require state-wide IBC conformity & quickly adopt the latest revision; &, assure funding of proper inspection & enforcement of new structures' IBC design.
- Earthquake [& other hazards] Residential Insurance Riders have become expensive &/or difficult to acquire.

UNACCOUNTED ISSUES - 2

- Structural engineering research and testing of existing structures before their removal should consider episodic, progressive failure from a repeated NMES due to three principal earthquakes and their aftershocks for months following the first event.
  - A relatively simple system should be assessed under ASCE-7 to incorporate how damage increases with the second, third, … tenth comparable ground shaking that is likely with a major NMES event.
  - Resolve the extent or order of further structural damage [fragility-fatigue-weakening; damaged subsystem(s); failed shear &/or load path system(s); failure of structural integrity – *the loss of Life Safety*; partial or total collapse] when a structure already impacted by an earthquake suffers from succeeding aftershocks.

UNACCOUNTED ISSUES - 3

- NMSZ's Exercises are extremely important, given the extent of damage even a large, ~M6.2 event will cause about the epicenter.
  - Damage will be felt over two to four FEMA regions. FEMA will not have the resources nor manpower to cover the damaged area.
  - Well prepared states will be overwhelmed by the extent of damage & the life issue needs of its residents.
  - Less prepared states will be sorely tested to help its citizenry.
  - Aftershocks will cause response chaos & induce more damage.
- NMSZ's Exercises must include an aftershock to be realistic.
  - Aftershocks could be considered by having an event larger than the primary seism, because of its progressive damage.

UNACCOUNTED ISSUES - 4

- Research should be conducted for large regional recovery and planning for simultaneous rebuilding of residential, office, commercial & manufacturing structures, while restoring lifelines to full service. The alternative is mass, regional resettlement.
- Anecdotes from the 2025, St. Louis Tornado for only several hundred, damaged structures wrt the hundreds of thousands regionally damaged from a major NMSZ earthquake.
  - Insurance claims are still being processed or denied.
  - Buildings still have not been repaired for lack of sufficient materials and labor force.
  - Some critical life-line items, e.g. large electrical transformers, have long lead times to acquire only a few pieces at a time.

Thank You

Greg Hempen
EcoBlast, LC
hempen69@gmail.com

Kentucky Sunset, M. Hannick

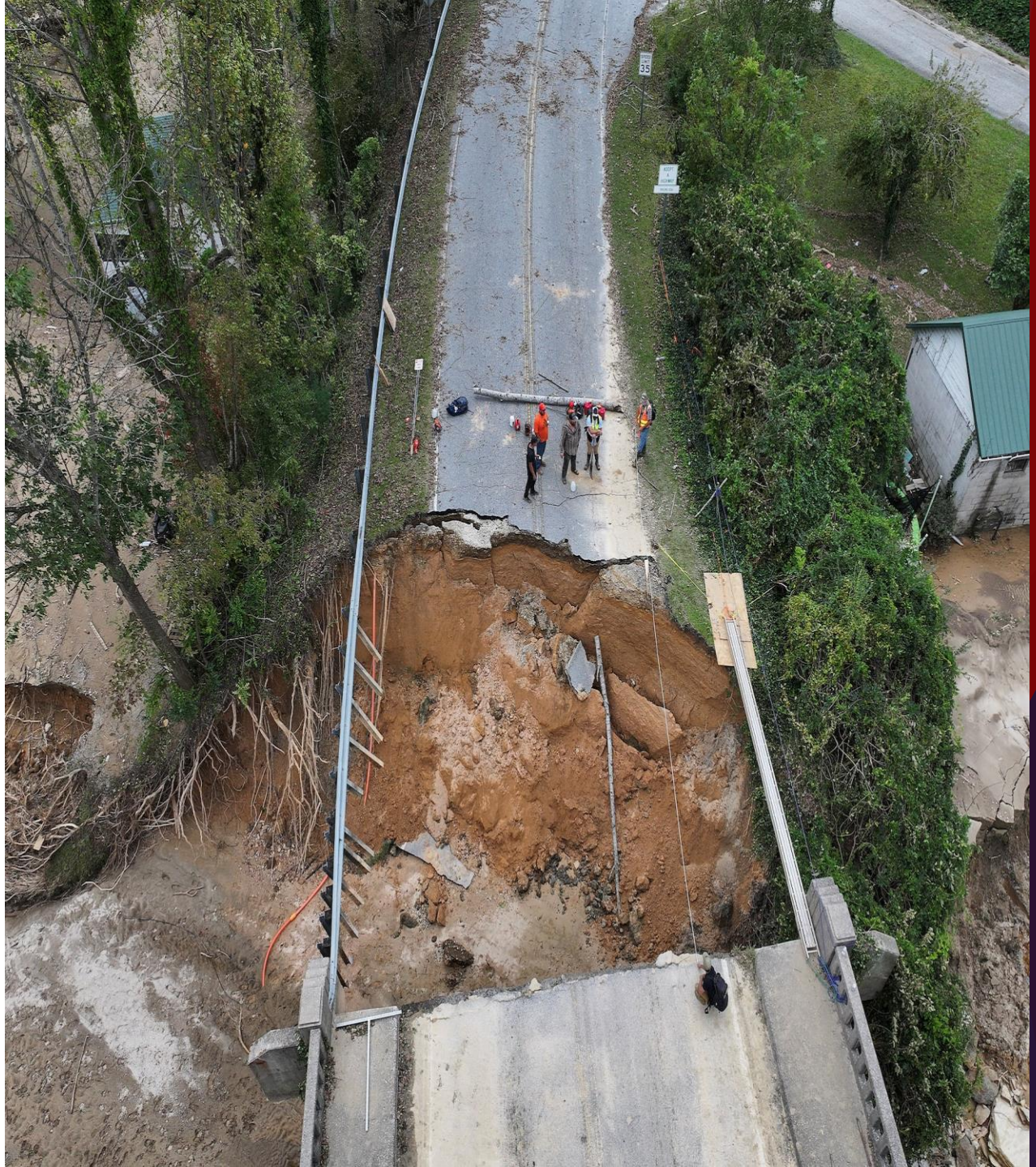

EARTHQUAKE
SUMMIT
2026
BUTLER COUNTY
EMERGENCY MANAGEMENT
HOMELAND SECURITY AGENCY
MISSOURI
DEPT OF PUBLIC SAFETY
EMERGENCY MANAGEMENT
CENTRAL UNITED STATES
EARTHQUAKE CONSORTIUM
MISSOURI - ILLINOIS - INDIANA - KENTUCKY
ARKANSAS - MISSISSIPPI - ALABAMA - TENNESSEE

100 Hour Life Sustaining Mission Presentation

Presenter:

- Melissa Friel, SEMA Preparedness Division Manager

Hurricane Helene September 27, 2024



Hurricane Helene

Hurricane Helene caused unprecedented and catastrophic damage in western North Carolina becoming the state's deadliest and costliest natural disaster. The remnants of the storm funneled record-breaking rainfall into the Appalachian Mountains, triggering devastating flash floods and more than 2,000 landslides.

Fatalities: Helene was the deadliest hurricane to hit the U.S. mainland since Katrina in 2005. At least 107 people were killed in North Carolina, with most of the deaths caused by rainfall flooding and landslides in the mountains.

Property damage: The storm destroyed thousands of homes and damaged tens of thousands more, leaving many residents displaced. In Buncombe County alone, 140 housing units were condemned, and many families remained in temporary housing or campers a year later. In the Rollins neighborhood of Madison County, 25 of 27 homes were either destroyed or heavily damaged.

Hurricane Helene Continued

- **Roads and bridges:** Thousands of miles of roads and hundreds of bridges and culverts were destroyed or damaged by floods and landslides, cutting off entire communities. The storm caused the collapse of parts of Interstate 40 in the Pigeon River Gorge and shut down the entire North Carolina segment of the Blue Ridge Parkway.

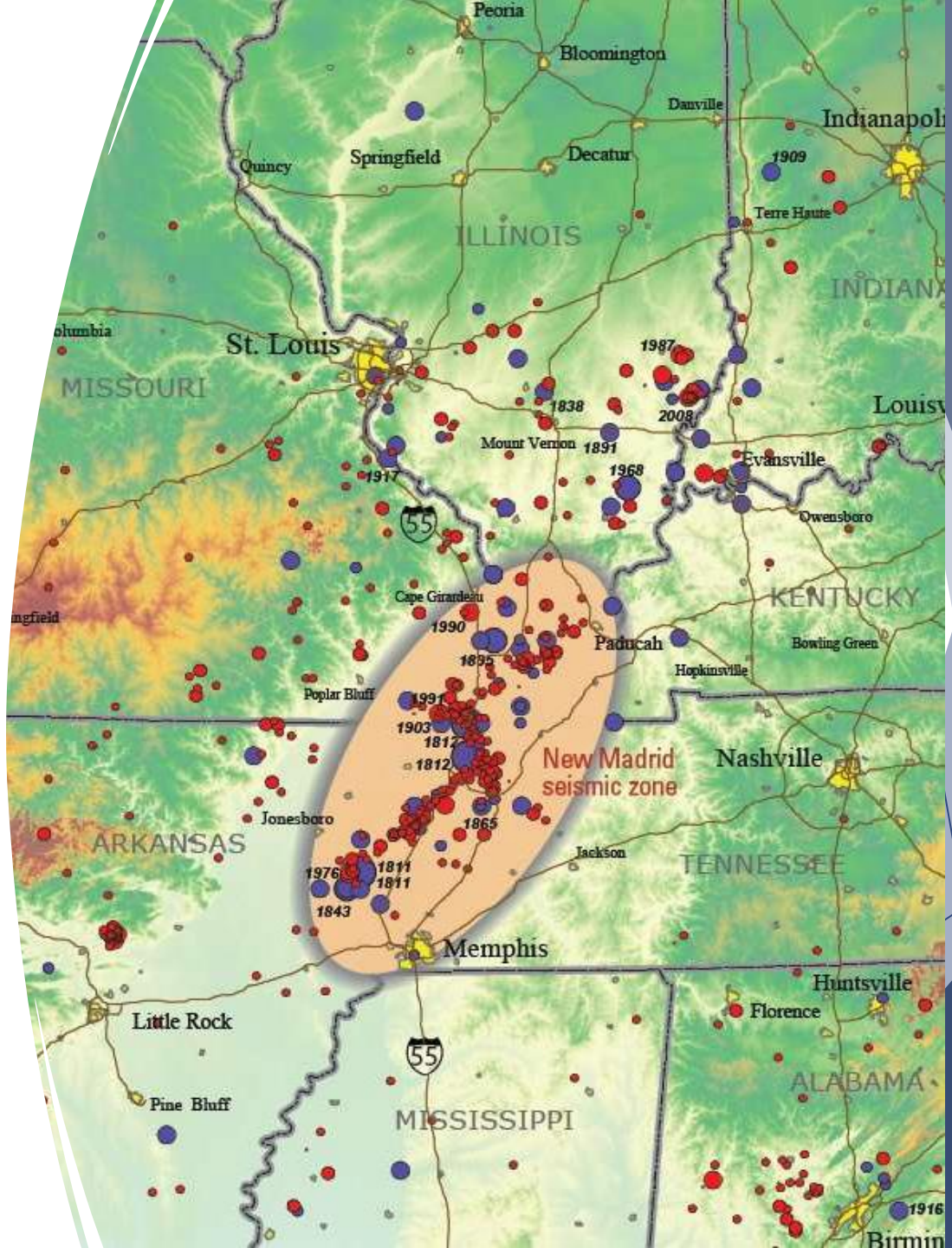
- **Utility outages:** Millions of people in the Southeast lost power during and after the storm. More than 100,000 people in Buncombe County alone experienced outages, with damage to hundreds of electrical substations across western North Carolina. Telecommunications and water and sewer services also experienced significant outages.

Madrid Seismic Zone Catastrophic Earthquake, Missouri's Hurricane Helene

- Severely impacted counties will be cut off from services and outside assistance due to road and bridge damage.
- Counties will need to be prepared to take care of their own for an extended period of time.
- Food, water and medical supplies will be limited to what is currently available on grocery store and pharmacy shelves.
- Initial outside help will be deployed through air assets only.
- The state will be utilizing all of its assets to get resources into the impacted counties.
- Help will come, but it not be within hours, but it will take days.

New Madrid Seismic Zone

About 200 earthquakes per year

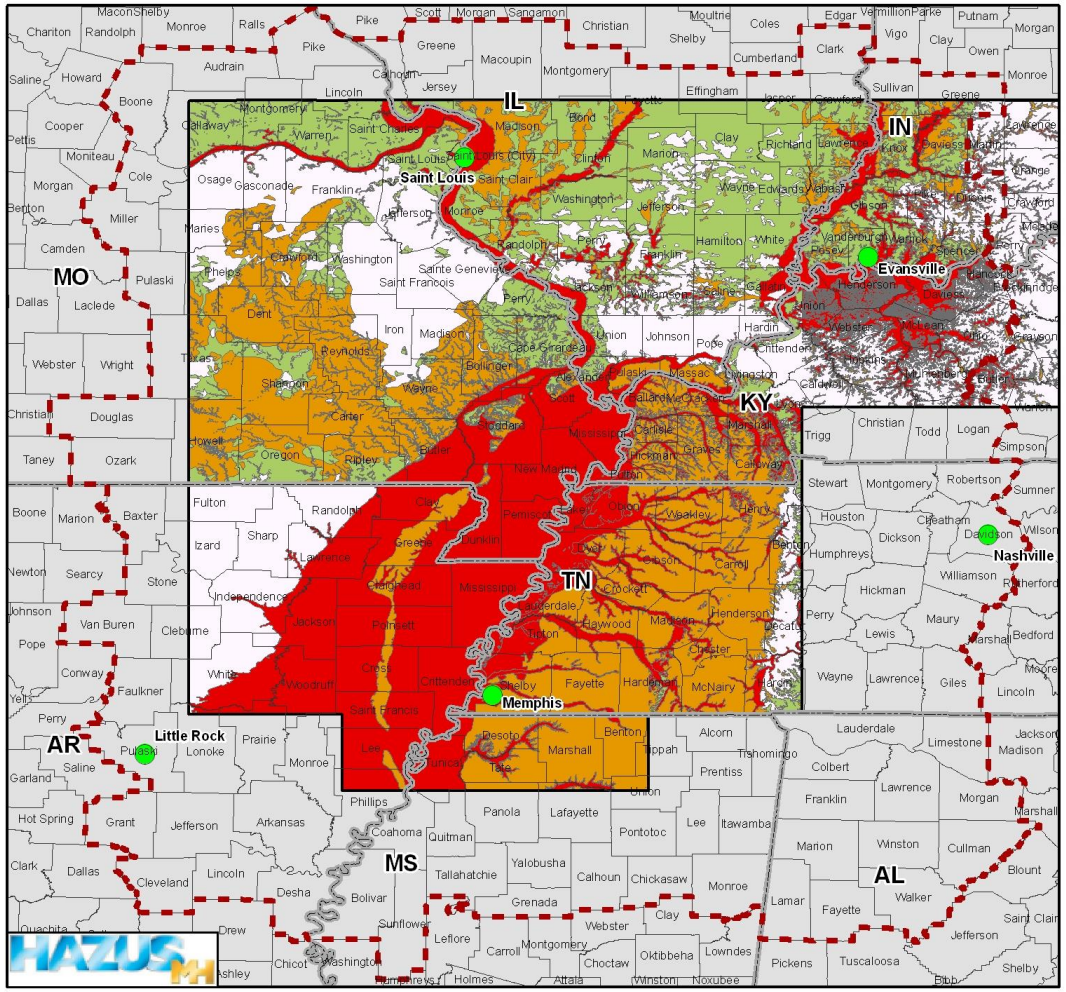


1811 – 1812 New Madrid Fault Earthquake Timeline

- ***December 16,1811*** **Magnitude 7.5** on the fault in Northeast Arkansas
- ***December 16 & 17,1811*** Three **Magnitude 6.0 – 6.5** Earthquakes Occurred
- ***January 23, 1812*** **Magnitude 7.3** Missouri
- ***February 7, 1812*** **Magnitude 7.5** along the Reelfoot fault in Missouri and Tennessee
- ***Between December 16,1811 and March 15, 1812***
  - **200 moderate to large aftershocks** in the New Madrid region. Ten of those greater than **6.0.**
  - **100 aftershocks Magnitude 5.0 – 5.9**
  - **89** in the **Magnitude 4 range**
  - **1800 aftershocks Magnitude 3.0 – 4.0**

* USGS Earthquake Hazards Program Webpage

Liquefaction Susceptibility - Earthquake Scenario: New Madrid Region



New Madrid Scenario Magnitude 7.7

Liquefaction Susceptibility

- None
- Very Low
- High
- Very High
- Major Cities
- Study Region Boundary
- County Boundaries
- State Boundaries

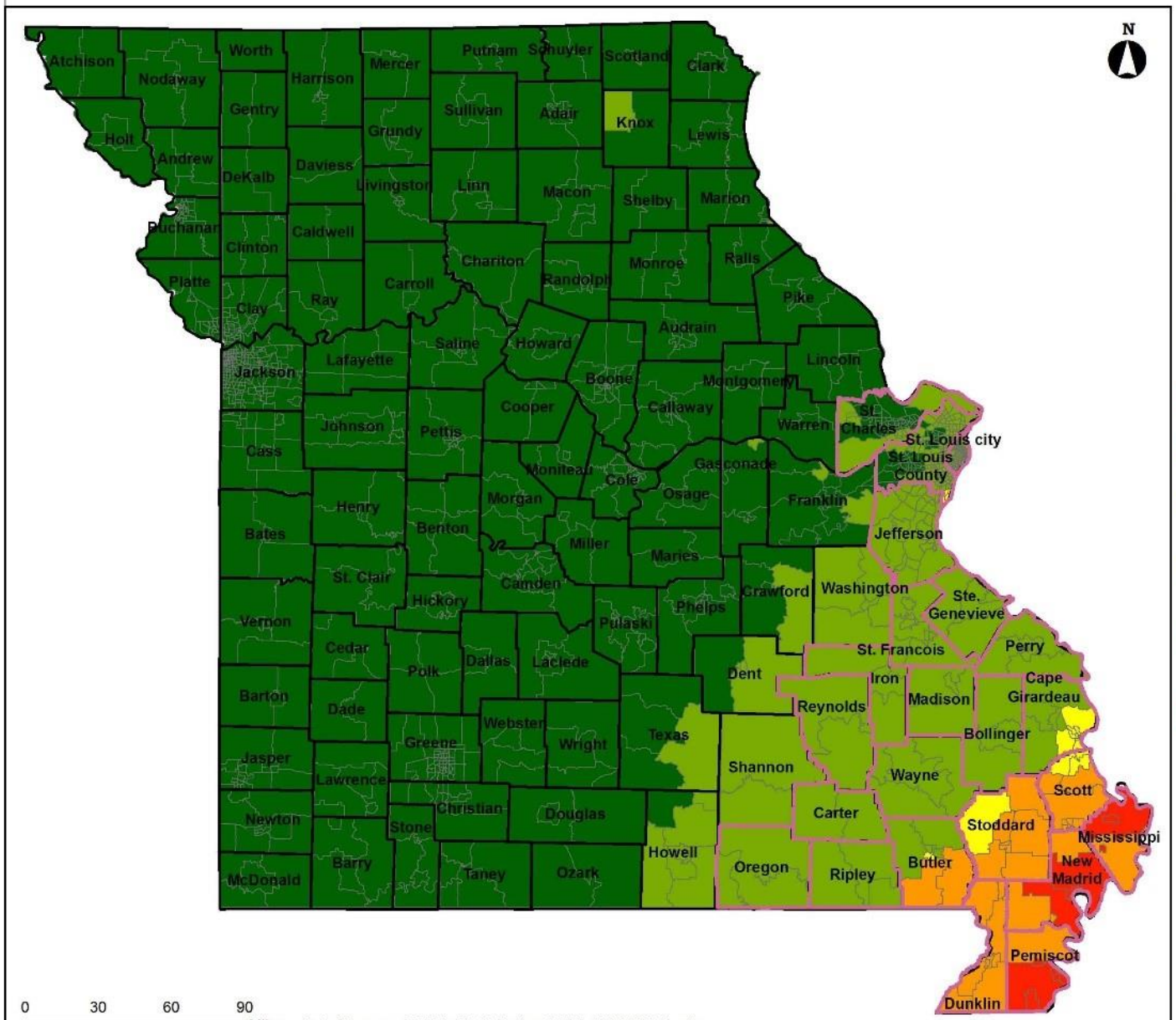
N

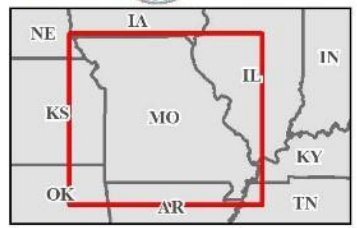
0 25 50 100 Miles

Location Map

Missouri Expected Shaking Intensity

SEMA FEMA





Data Layer / Map Description:
Overview of the area affected by the event.

Legend

- X - Extreme
- IX - Violent
- VIII - Severe
- VII - Very Strong
- VI - Strong
- Impacted Area

Based on a M7.7 quake centered in the Missouri Bootheel. Produced by FEMA in 2018 based on MAE Center 2009 data.

Estimated Missouri Impact

- 1,100 hospital beds in SEMO, only 80 available
- 200 schools in SEMO, most unusable for school or shelter
- 1,000 bridges damaged, inc. 500 impassable
- 310,000 households without power
- 124,000 households without water
- 14,000 injuries
- 700 fatalities

Source: MAE Center Report Volume II part 2, Oct. 2009

An Earthquake Occurs on the New Madrid Fault

- Bottom Line
  - Critical infrastructure damaged or destroyed
  - Residents **will not be able access "normal" day to day resources** including:
    - Food
    - Drinking Water
    - Prescription medications
    - Healthcare Resources
    - Electricity
    - Natural Gas
    - Etc.

WHAT WILL “WE” DO TO MEET THE EMERGENCY NEEDS OF THOSE IMPACTED BY CATASTROPHIC EARTHQUAKES ALONG THE NEW MADRID SEISMIC ZONE?

The 100 Hour Life Sustaining Mission Playbook DRAFT

Purpose

- Activate THE 100 HOUR LIFE SUSTAINING MISSION providing the delivery of food, water, medications and medical supplies to the counties most impacted as a result of a significant earthquake along the New Madrid Seismic Zone (NMSZ).

- Missouri State Emergency Management Agency (SEMA) will lead efforts to deliver food, including, shelf stable meals, Meals Ready to Eat (MREs) and other non-perishable food, bottled water, medication and medical supplies to be delivered by rotary wing or fixed wing assets to the impacted counties, while the over the road trucking traditional method of delivering supplies is being inspected and repaired.

State Partners

- State Agencies
  - MO SEMA
  - Missouri Department of Social Services (DSS)
  - Missouri Department of Health and Senior Services (DHSS)
  - Missouri National Guard (MONG)
  - Missouri Department of Transportation (MODOT)
  - Missouri State Highway Patrol (MSHP)
  - Missouri Division of Fire Safety (DFS)
  - Missouri Department of Corrections (DOC)
  - Missouri Office of Administration (OA)
  - Missouri Veterans Commission (MVC)

NGO and Faith-Based Partners

- American Red Cross (ARC)
- The Salvation Army (TSA)
- Missouri Baptist Disaster Relief (MBDR)
- Convoy of Hope
- Feeding Missouri (Representing all Food Banks)
- Civil Air Patrol (CAP)
- Missouri Hospital Association (MHA)
- Health Care Coalitions (HCCs)
- Etc.

Business Partners

- Walmart
- Dollar General
- Target
- Members of the Business Emergency Operations Center (BEOC)
- Etc.

Local Partners

- County and City Emergency Management Directors in the Impacted Counties
- Hospitals in the Impacted Counties
- Long Term Care Facilities (LTCF) in the Impacted Counties
- Local Public Health Agencies in the Impacted Counties

THE PLAN

- A task force made up of state agencies, NGOs and the business community will be stood up to complete this mission.
- Within the first 100 hours post earthquake, a warehouse will be stood up at the Rolla/Vichy airport that will provide/deploy life sustaining assets to the counties impacted by an earthquake that disrupts normal supply chain deliveries
  - Assets include: Bottled water, shelf stable meals, life sustaining medications, and medical supplies, etc.
- Air assets that will deliver are identified and prepared to deliver the life-sustaining assets from the warehouse to the counties.
- NGOs, State Agencies and Business Partners will be requested to identify the resources they have on hand for this mission.

The Plan Continued

- The entities that will be able to provide the assets will be given route instructions and police escort if needed.
- While the warehouse is being set up, the National Guard will be establishing the air assets that will be used, while also setting up air traffic control for the site.
- SEMA will be setting up the warehouse and acquiring all the assets needed to manage the warehouse.
- Regional Coordinators will establish communication with local/county Emergency Managers to determine the amount of resources needed and where they will be delivered.

Local Responsibilities

- Determine where the resources/assets will be delivered/air lifted in their county.
- Let the state know the amount of assets/resources needed for their county.
- Determine how the resources/assets will be delivered from the drop off location to their communities, along with arranging the equipment needed to deliver the items, i.e., fork lifts, trucks, etc.
- The distribution process on the local level.

Next Steps

- Move the plan from “DRAFT” status to complete
- Conduct a meeting with the Partners who will provide the assets that will be delivered and outline the plan.
- Socialize the plan with the Local Emergency Managers to ensure they are aware of what the state and the Partners will be doing to assist them following a catastrophic earthquake along the New Madrid Seismic Zone.

Questions and Presenter Contact Information

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- Cell: 573-301-9908


EARTHQUAKE
SUMMIT
2026
BUTLER COUNTY
EMERGENCY MANAGEMENT
HOMELAND SECURITY AGENCY
MISSOURI
DEPT OF PUBLIC SAFETY
EMERGENCY MANAGEMENT
CENTRAL UNITED STATES
EARTHQUAKE CONSORTIUM
MISSOURI - ILLINOIS - INDIANA - KENTUCKY
ARKANSAS - MISSISSIPPI - ALABAMA - TENNESSEE

Missouri Route Establishment Strike Team Mission

David Hooker SEMA

EARTHQUAKE POST INCIDENT BRIDGE INSPECTION

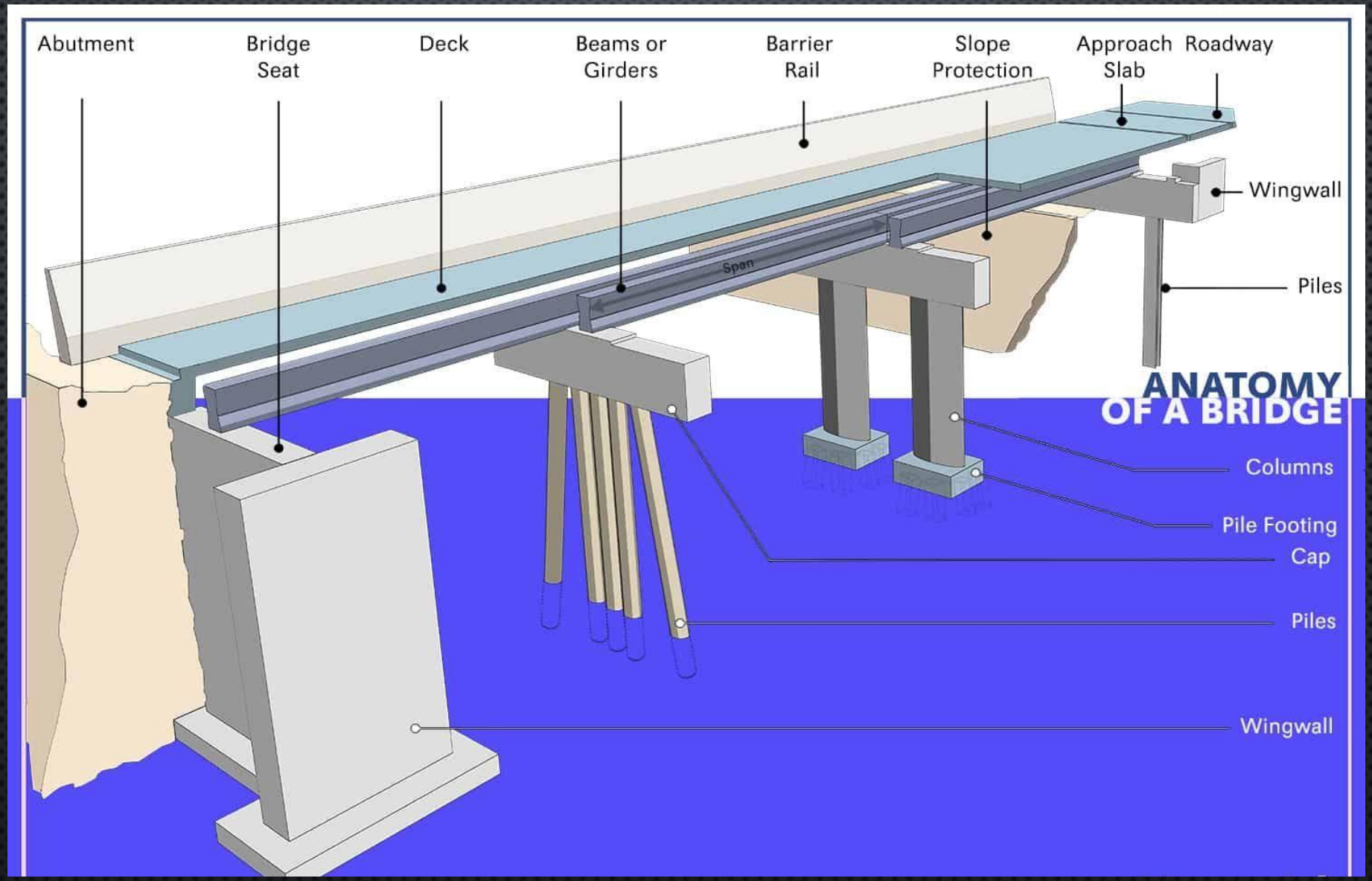
August 2024

Course Number MoDOT_24510

BRIDGES OF MISSOURI

Bridge definition:

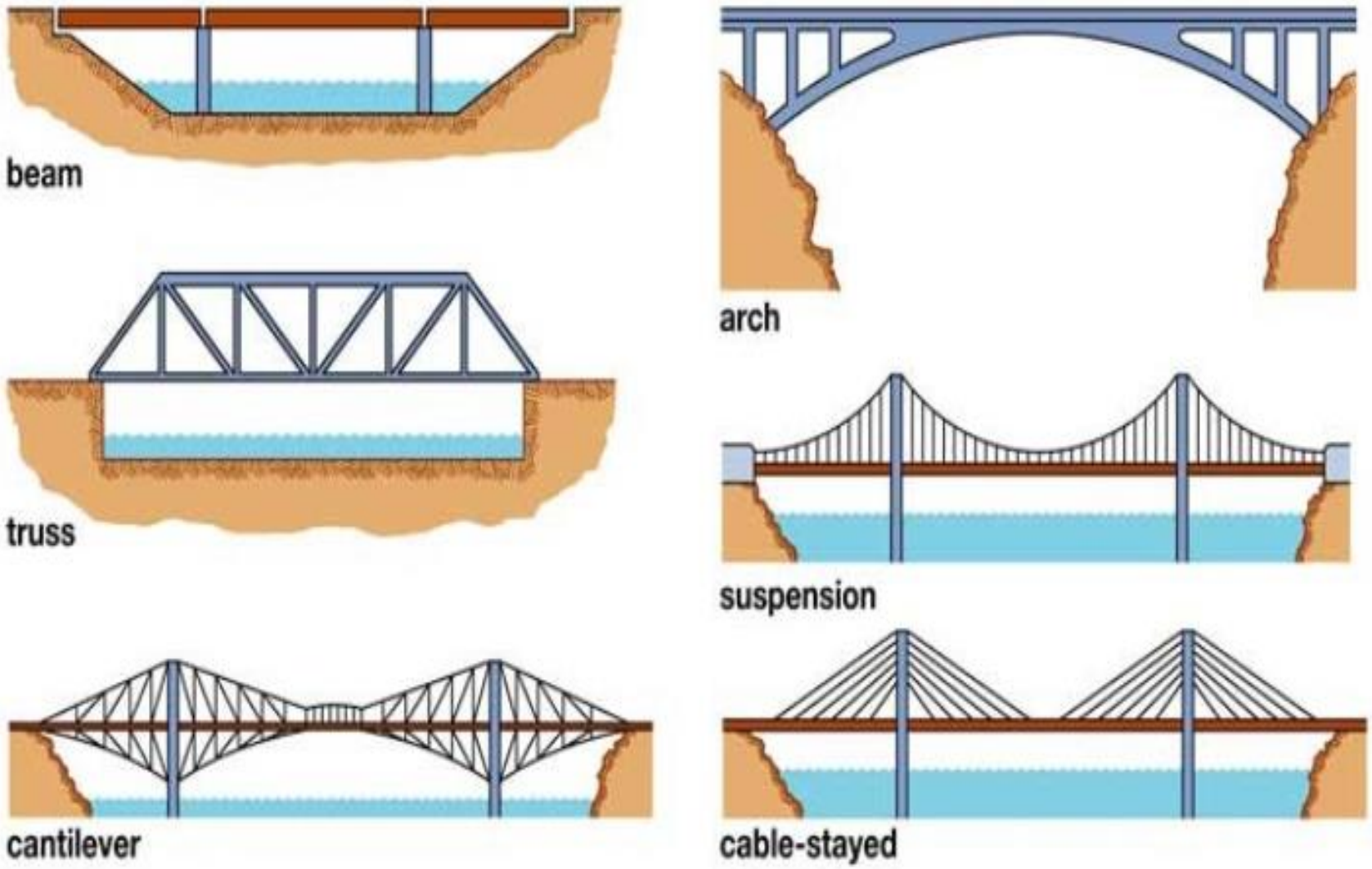
Any structure that carries a highway load and has a total length of twenty (20) feet



THE BASIC BRIDGE DESIGN

MISSOURI BRIDGES ARE MADE OF:

- Steel
- Concrete
- Wood
- Or combination of all the materials

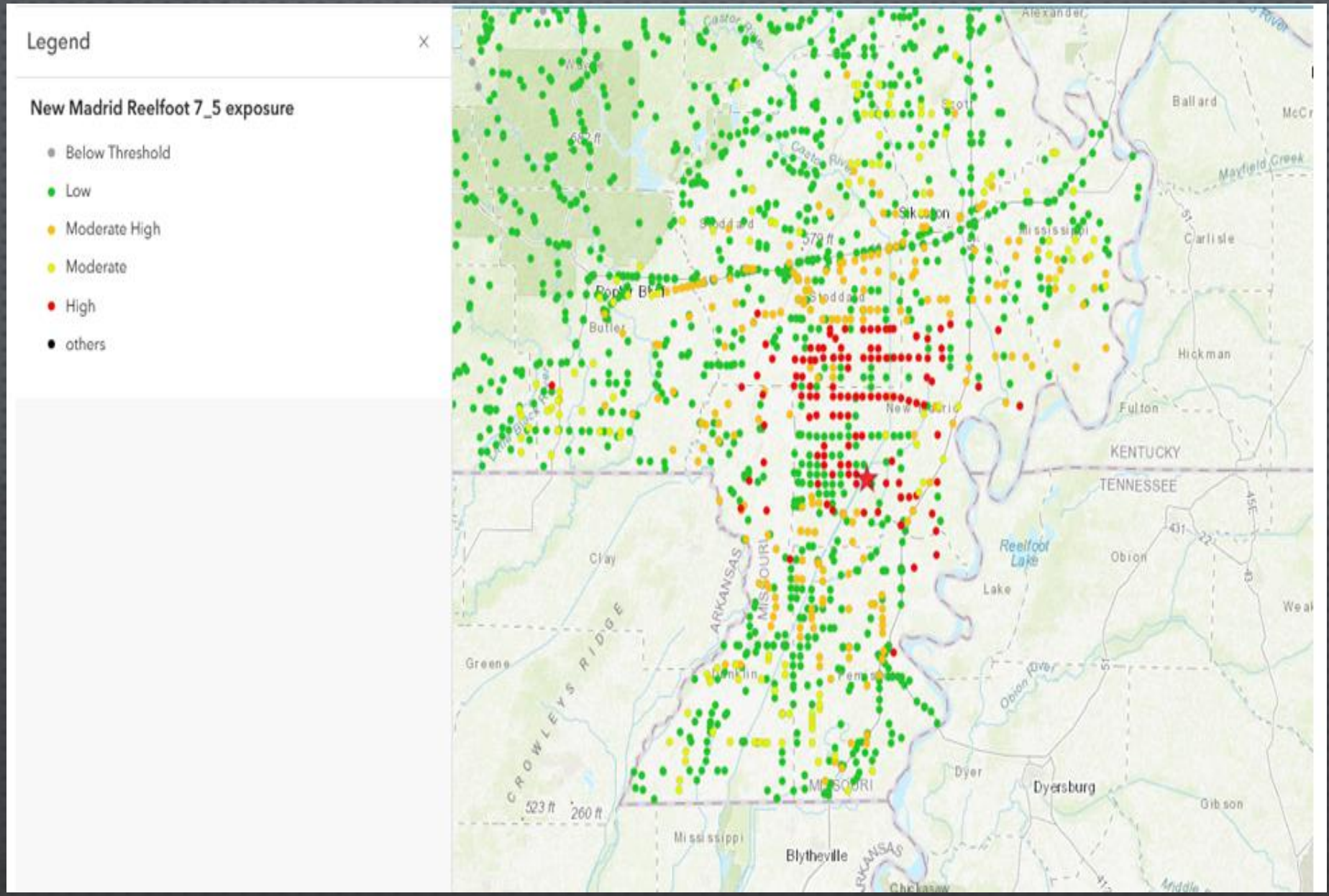


BRIDGE TYPES

CONCRETE STRUCTURES

CON'T.

TIMBER SUBSTRUCTURE



[Annex G Appendix D – Earthquake Response Plan – Bridge Inspection Process]

INSPECTION KIT

What's needed for the Inspection:

- Bridge damage report forms
- 10-Point cheat sheets
- County maps
- Red and green duct tape
- Yellow caution flagging
- Writing utensils
- Water (where applicable)

OPTIONAL ITEMS FOR INSPECTION KIT:

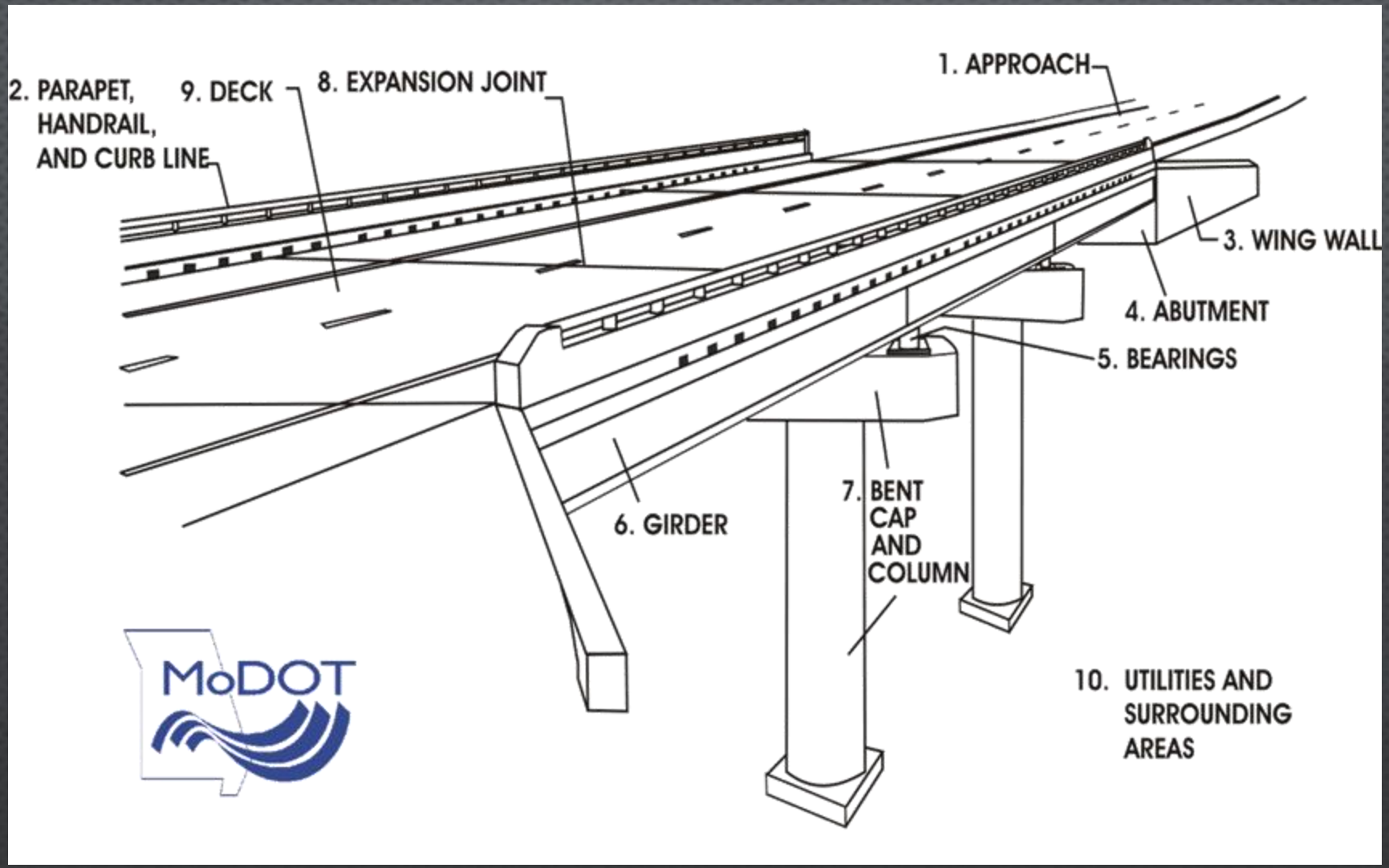
- Flashlights
- Batteries
- Flashlight bulbs
- Clipboard
- 3 ring binder
- Food *(where applicable)*

10-POINT INSPECTION

If damage is found, close the bridge

- Be aware of existing damage/deterioration not associated with the current incident
- Report closure and damage to supervisor
- Move on to the next bridge

10-POINT INSPECTION CHEAT SHEET



Bridge Damage Report Form

☐ Open
☐ Closed
☐ Collapsed

District: _____ Inspector's Name: _____ Time: ___:___ AM PM

Date: ____/____/____

Bridge Number: _____ Route: _____ County: _____

Location: _____

Remarks: (Specific Problems) _____

_____

_____

Emergency Bridge Inspection

Check box that corresponds with any problems below:
Note: *Only check a box if you're going to* ***close*** *the bridge*

		Items:	Check for:
☐	1.	Bridge Approaches	Raised or lowered, cracks, or buckling
☐	2.	Hand Rail, Parapet, and Curb Line	Misalignment, bowing, dips, or separations
☐	3.	Wing Walls	Cracks or spalling
☐	4.	Bridge Abutments	Cracks or movement at the ground level
☐	5.	Bearings	Unseated, misalignment, sheared, or bent bolts
☐	6.	Beams or Girders	Misalignment, bending or buckling, spalling, or missing bolts or rivets
☐	7.	Bent Caps, and Columns	Exposed rebar, bearing movement, missing keeper, chipped concrete, or movement at the ground level
☐	8.	Hinge or Expansion Joints	Misalignment, cracks, spalling, exposed rebar, or torn expansion materials
☐	9.	Bridge Deck (top and underside)	Cracks, missing pieces of concrete, or exposed rebar
☐	10.	Utilities and Surrounding Areas	Disturbed soil, soil liquefaction, damaged utilities, sand blows, and surrounding structure damage

How to properly tag a bridge:

Five pieces of red tape: one on each corner and one at or near the bridge number with date, time, inspector's initials, and the 10-point inspection number(s) that corresponds with the problem(s).

Two pieces of green tape: one on each right-hand side-approaching corner with date, time, and the inspector's initials.

J:\buersj\safety\Bridge inspection training\Bridge Damage Report Form 1.doc

BRIDGE DAMAGE REPORT

BRIDGE / ROADWAY CLOSURES

- If you find damage:
  - Close by any means necessary
  - Notify supervisor of the closure
  - Use red tape – CLOSED
  - Use green tape – OPEN

RED TAGS

- Used to identify bridges that have been inspected and closed
- Placed on all four corners of the bridge's handrail or parapet and underneath at or near the Bridge I.D. number

RED TAG CON'T.

Information on the tag should include:

- Date
- Time
- Inspector's name
- The number on the 10-point inspection corresponding with the specific problem(s)

GREEN TAGS

- Identifies bridges that have been inspected and are open to traffic
- Information on a Green Tag should include date, time, and the inspector's name
- Once the inspection is completed, move on to the next bridge

BENT CAPS AND COLUMNS

MULTIPLE COLUMNS CON'T.

SHEARED COLUMN

Spalling and Cracking

Fresh Debris

4. Bridge Abutments
   - Cracks
   - Spalling
   - Movement at the ground level

3. Wing Walls
   - Cracks
   - Spalling
   - Movement at the ground level

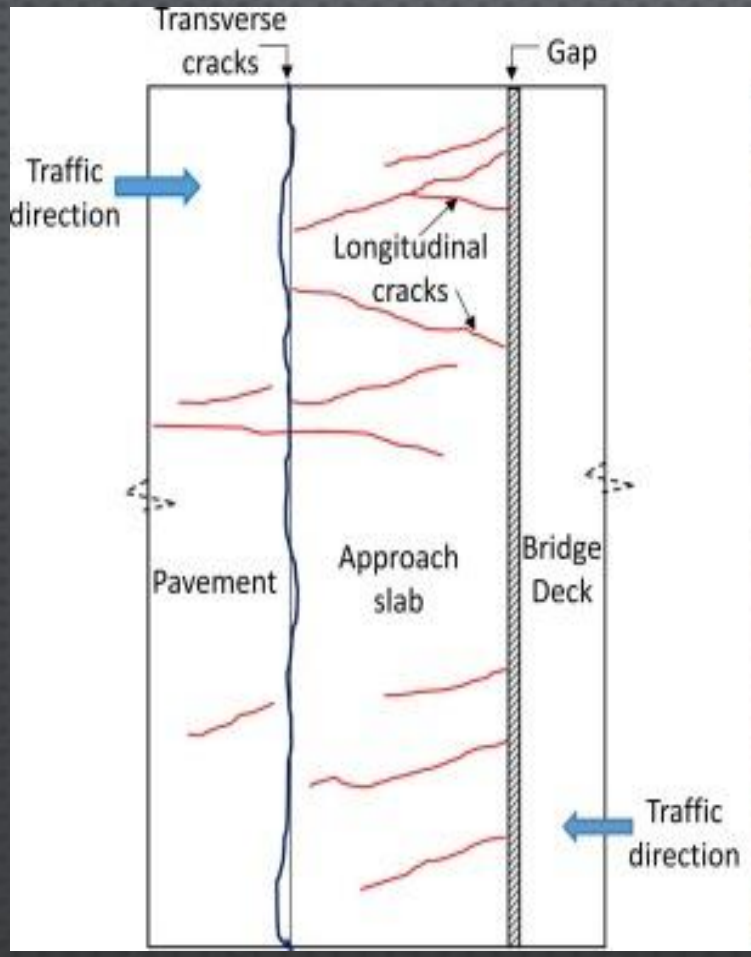
WING WALL DAMAGE

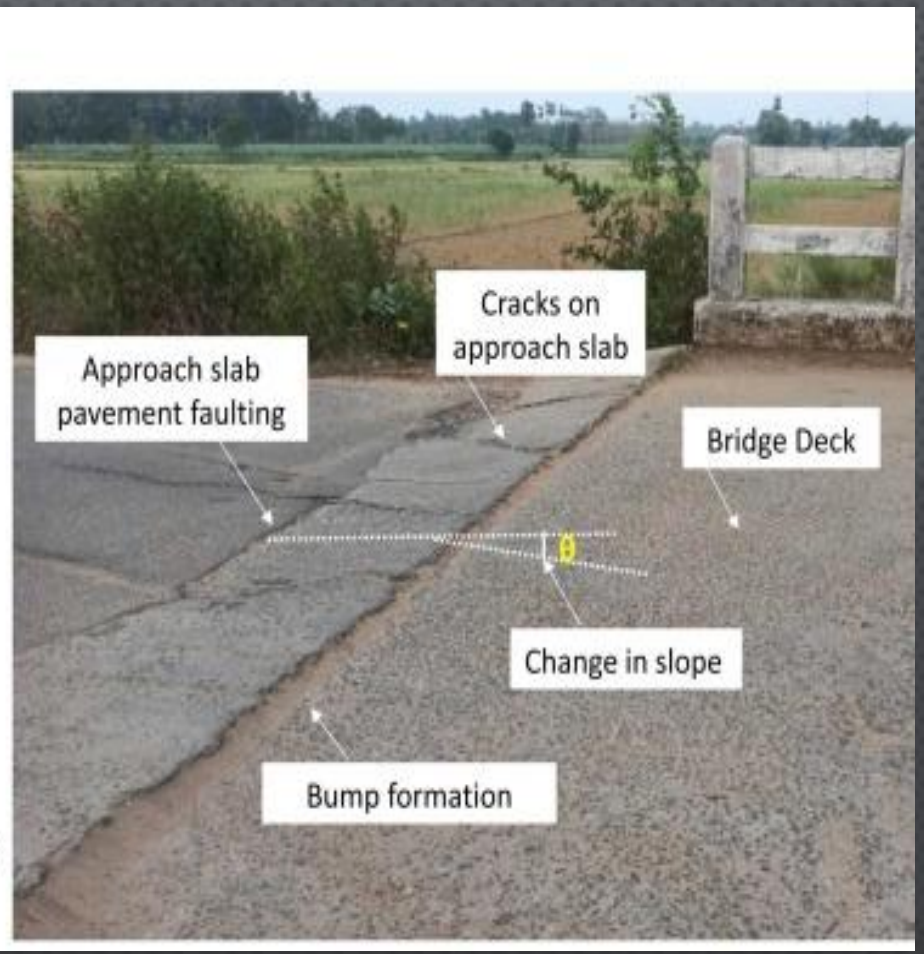
5. Bearings
   - Unseated
   - Misaligned
   - Sheared or bent bolts

ROCKER BEARING FAILURE

1. Bridge Approaches
   - Raised or lowered
   - Cracks
   - Buckling

APPROACH DAMAGE





2. Bridge Parapet, Handrail and Curb-line
   - Misalignment
   - Bowing
   - Dips
   - Separations

BOWING OF PARAPET AND HANDRAIL

OPEN or CLOSED

Open or Closed

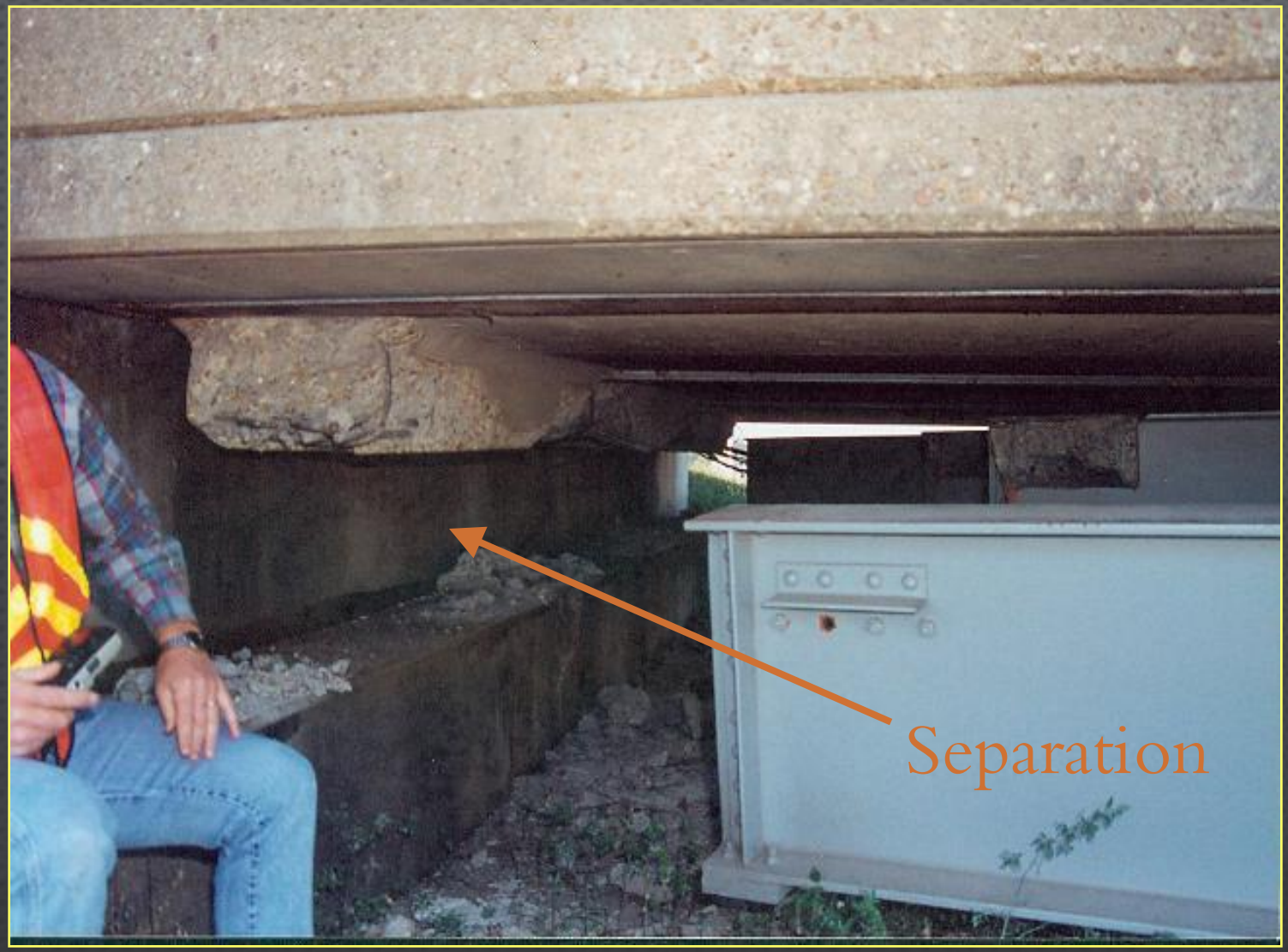
Open or Closed

OPEN or CLOSED

OPEN or CLOSED

OPEN or CLOSED

Open or Closed

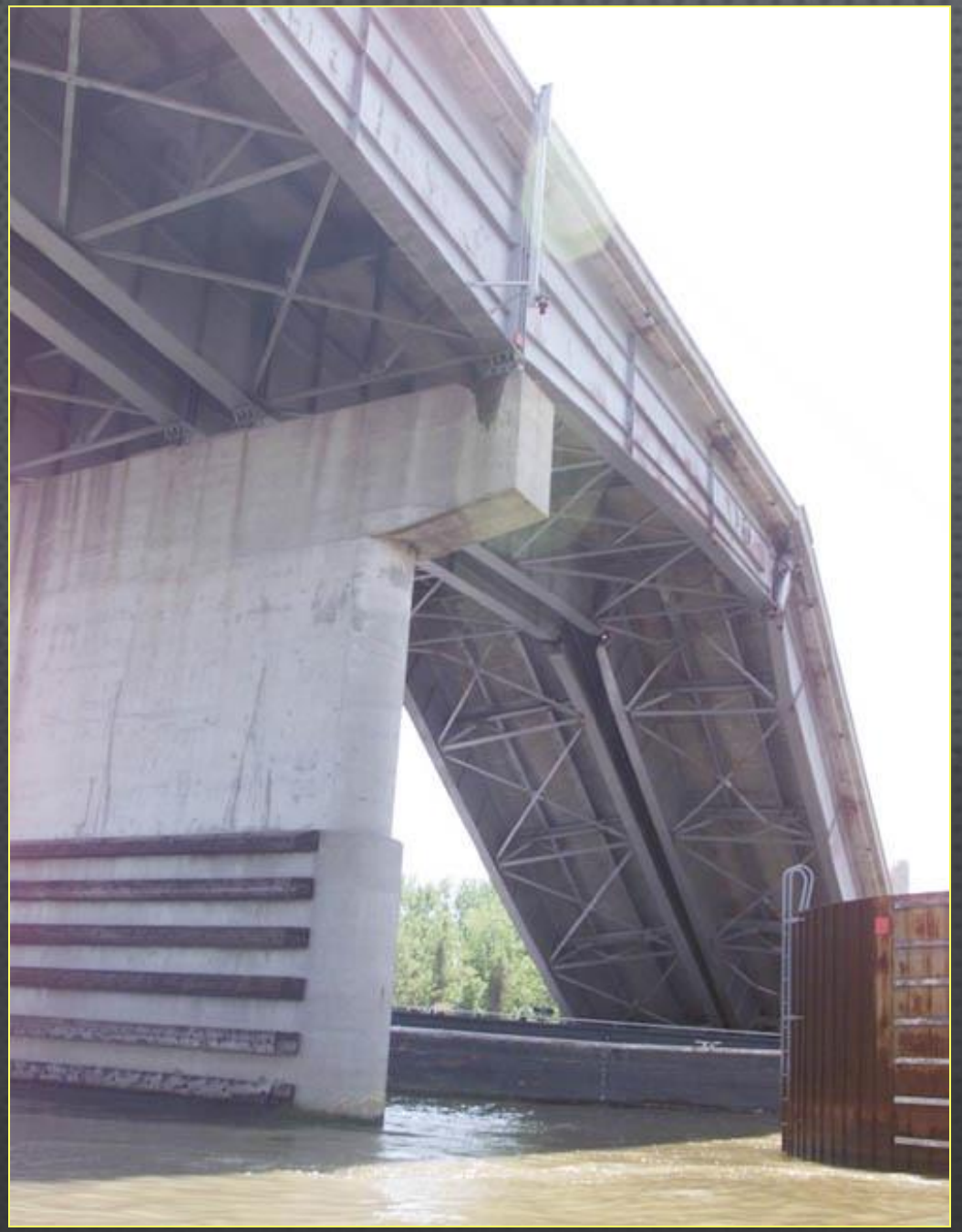


Open or Closed

OPEN or CLOSED

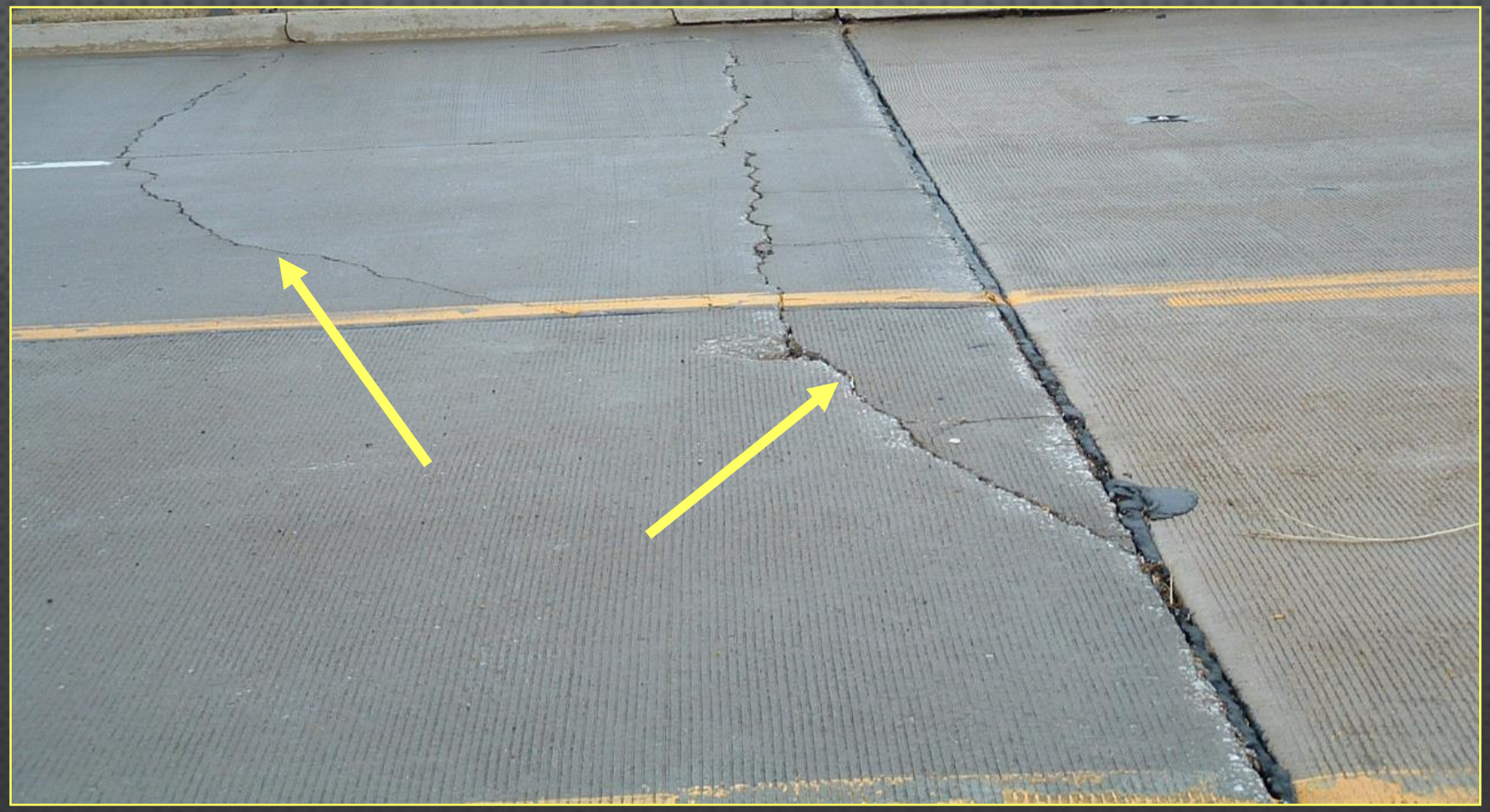
OPEN or CLOSED

Open or Closed



OPEN or CLOSED

CRACKS IN THE BRIDGE DECK



Questions?


EARTHQUAKE
SUMMIT
2026
BUTLER COUNTY
EMERGENCY MANAGEMENT
HOMELAND SECURITY AGENCY
MISSOURI
DEPT OF PUBLIC SAFETY
EMERGENCY MANAGEMENT
CENTRAL UNITED STATES
EARTHQUAKE CONSORTIUM
MISSOURI - ILLINOIS - INDIANA - KENTUCKY
ARKANSAS - MISSISSIPPI - ALABAMA - TENNESSEE

Family Reunification After Catastrophic Natural Disasters

COORDINATING THE MULTI-AGENCY EMERGENCY RESPONSE EFFORTS TO ENSURE FAMILIES ARE CONNECTED WITH THEIR LOVED ONES

a presentation by Andrea Spillars

Multi-Agency Reunification Task Force

Two Events – Same Challenges

Joplin Tornado 2011

Hurricane Helene 2024

Agenda

- Introduction
- Family Reunification Planning / Three-Prong Approach
- Two Models – A study in contrast
- Centralized Coordination
- Multi-Agency Reunification Task Force

FAMILY REUNIFICATION AFTER CATASTROPHIC NATURAL DISASTERS: A UNIQUE MISSION

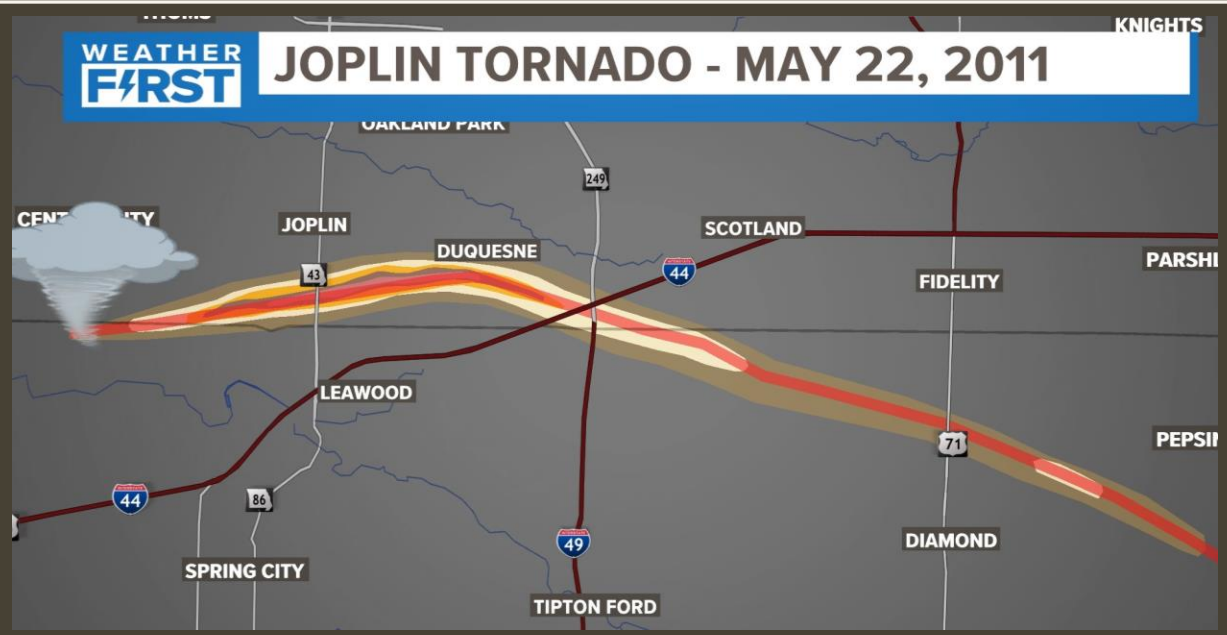
- Infrastructure damage impairs or limits communications with family and friends to confirm well-being
- Widespread damage, large geographic search areas
- Structures completely destroyed/gone
- Multi-Agency Response significantly larger, extensive coordination needs

Joplin Missouri 2011

The Before

- **Population: 50,000+**
- **12th most populous city in Missouri**
- **Economic Hub – Metro Area (Four-state) 210,000+**
- **Missouri Southern State University**
- **Public Schools**
  - **10 elementary**
  - **3 middle**
  - **1 high school (455 graduating seniors, 2011)**

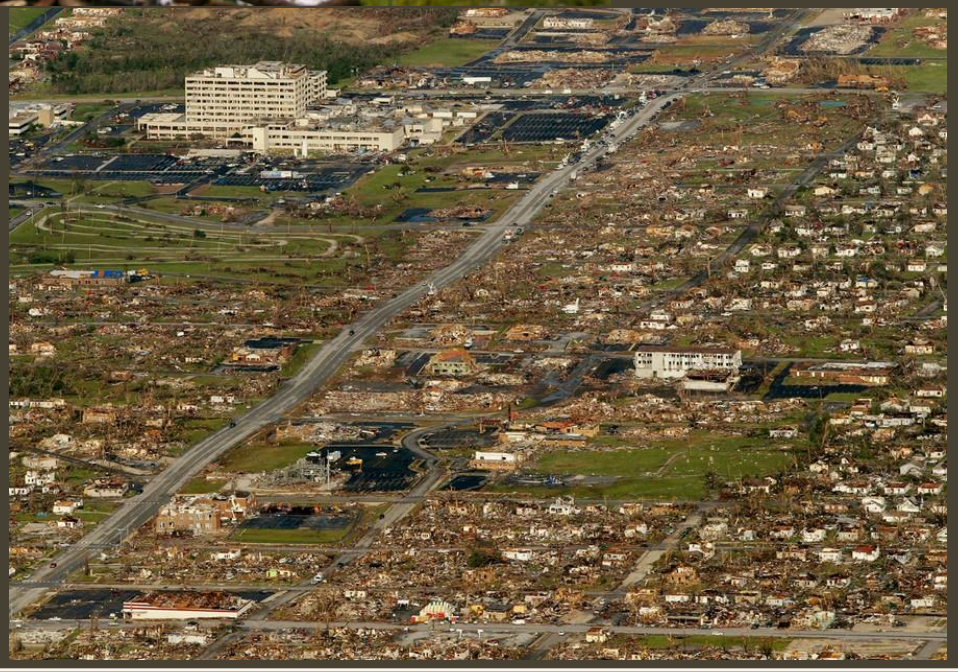
Joplin Missouri 2011



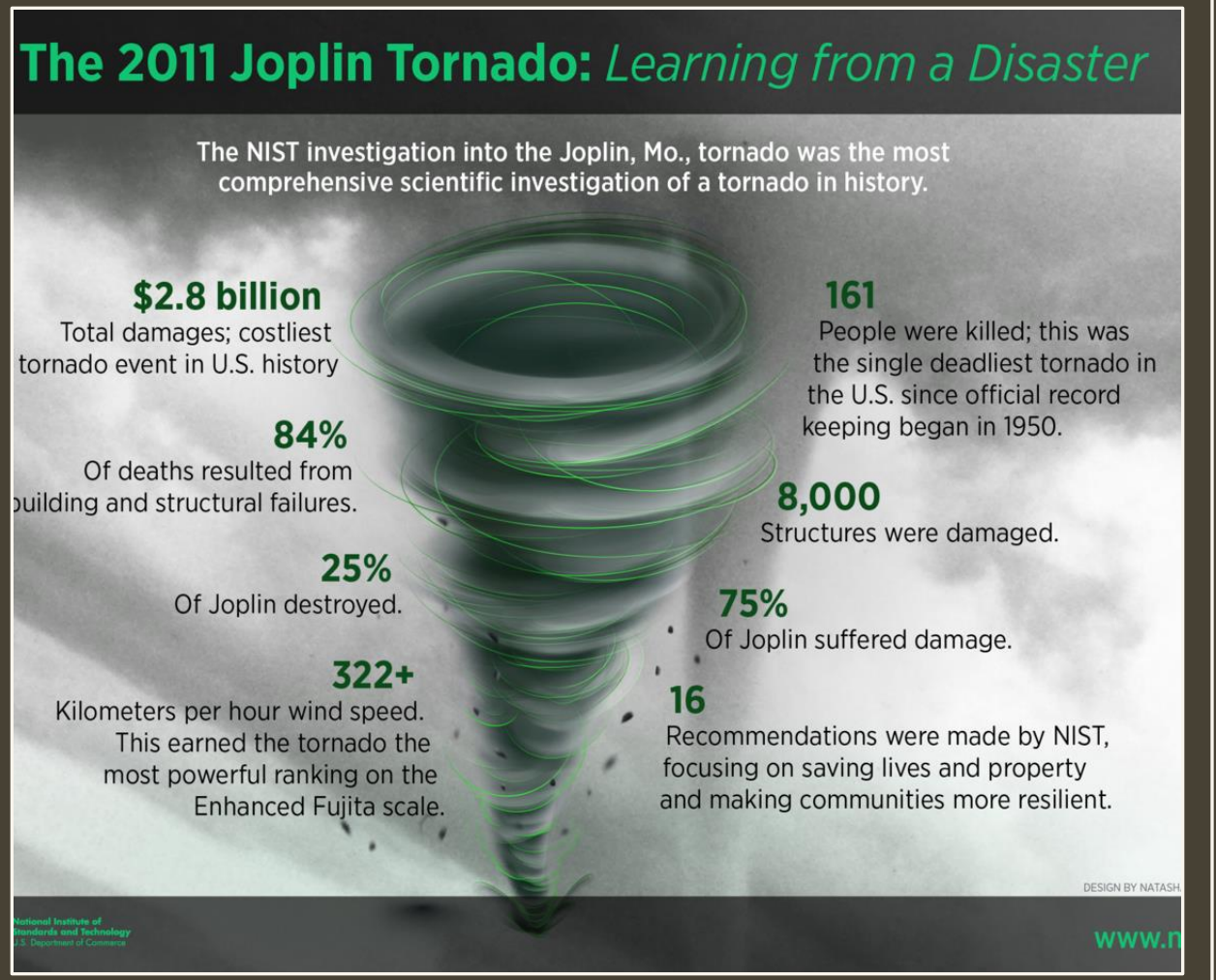
The Event

- **EF5, > 200 MPH**
- **22.1 Mile Damage Path**
- **0.75 to 1 Mile Wide**
- **On The Ground: 38 Min. (5:34 – 6:12 PM)**

The Damage



Joplin Missouri 2011



The Aftermath

- Costliest Tornado In US History – 2.8 Billion Dollars
- 7th Deadliest Tornado in US History 161 Killed
- 84% of deaths resulted from structural failures
- 25% of Joplin was destroyed
- 75% of Joplin suffered damage
- 8,000 Structures were damaged

Joplin Missouri 2011

Updated at 7:09 p.m. ET

Missouri's government announced Thursday that more than 230 people are still unaccounted for after a powerful tornado hit the southwestern city of Joplin Sunday.

More from CBS News

Andrea Spillars, deputy director of the state's Department of Public Safety, told reporters in a morning news conference that 232 people are missing. She urged survivors to check in.

List of missing individuals after Joplin tornado

The State Journal-Register

Staff Writer State Journal-Register

Updated May 26, 2011, 9:51 a.m. CT

Joplin Officials Release List of 232 Missing After Tornado

PBS NEWS

World May 26, 2011 12:16 PM EDT

The Missing

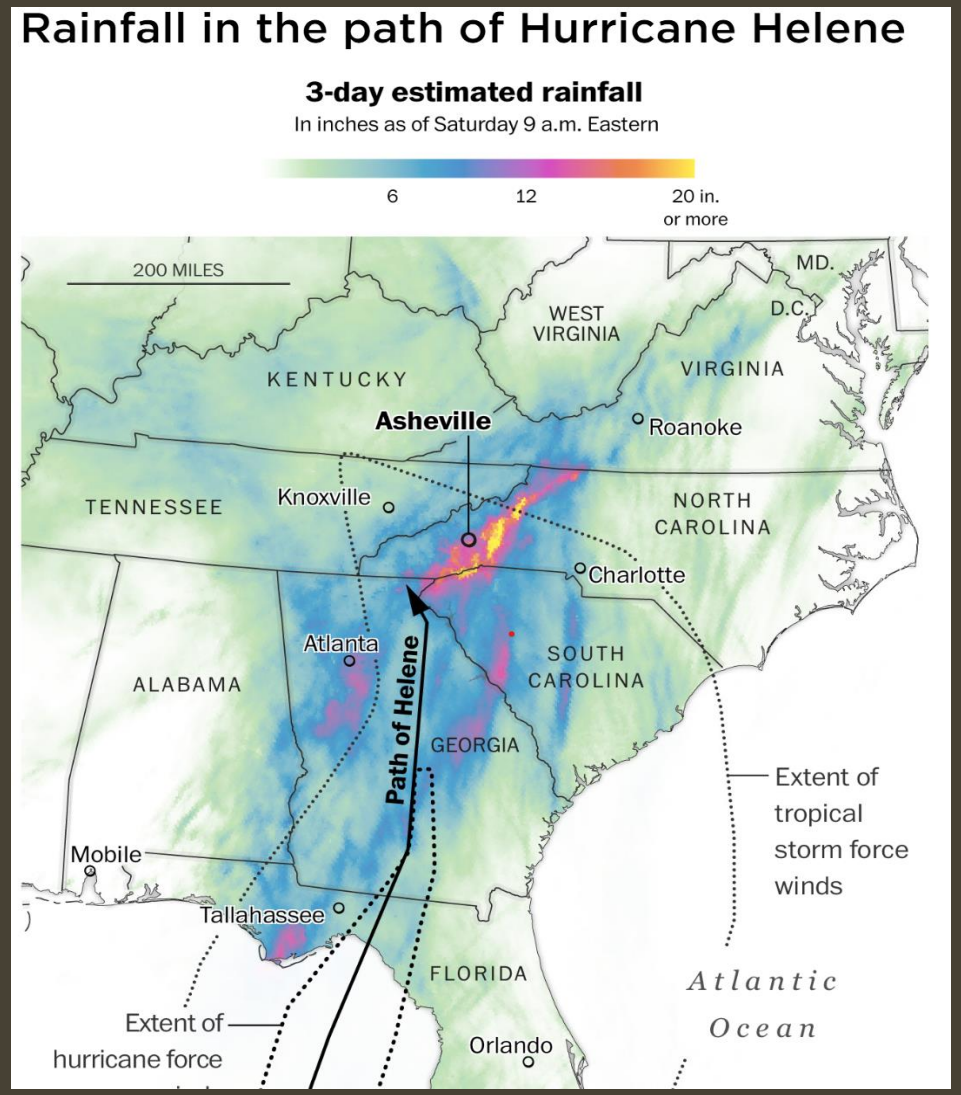
- Communication infrastructure destroyed, limiting cell phone use
- In the days following the tornado, thousands were reported "missing" through a centralized call-in number.
- No mechanism in place to effectively screen those names reported "missing"
- Agencies with tools and resources to help account for people were operating independently
- Families unable to contact their loved ones feared the worst

Hurricane Helene 2024 North Carolina

The Event

- Sept 25-27: Historic rainfall in the mountains of Western North Carolina
- Over 18-20 inches of rainfall across 10 counties
- 20-30 inches of rainfall across several of those counties
- Yancey County hardest hit, with record 30.78 inches of rain in Busick, N.C. (breaking record set in 1957 by 8.7 feet)

Hurricane Helene 2024 North Carolina



The Aftermath

- Catastrophic Flooding over hundreds of miles in western N.C.
- 32 flash flood emergencies across the southern Appalachian mountains in N.C.
- The South Toe River in Yancey County broke the record level set in 1957 by 8.7 feet.
- USGS documented over 2,000 landslides, primarily in western N.C.
- 125,000 housing units damaged or destroyed

The Damage

Hurricane Helene 2024 North Carolina

NATIONAL

Loved ones search for the hundreds of people still missing after Helene

OCTOBER 1, 2024 · 4:58 PM ET

By Jaclyn Diaz, Liz Baker

Tony J. Daniel hands out bottled water in the aftermath of Hurricane Helene on Sunday in Old Fort, North Carolina.

Melissa Sue Gerrits/Getty Images

The Missing

- 2,000 reported missing - Blue Ridge Public Radio
- Communication infrastructure destroyed, limiting cell phone use
- In the days following the event, thousands reported "missing" through a centralized website.
- No mechanism in place to effectively screen those names reported "missing"
- Agencies with tools and resources to help account for people were operating independently
- Families unable to contact their loved ones feared the worst

FAMILY REUNIFICATION:

COORDINATING THE MULTI-AGENCY EMERGENCY RESPONSE EFFORTS TO ENSURE FAMILIES ARE CONNECTED WITH THEIR LOVED ONES

Multi-Agency Family Reunification Coordination

Purpose:

The MAFRC ensures a common operating picture for relevant stakeholders and synchronizes operations between State, Local, Federal, Non-Governmental Organizations (NGO), and Private Sector partners supporting family reunification activities.

End State:

The MAFRC ensures a common operating picture and synchronized support for impacted families across relevant stakeholders for successful family reunification.

Key Tasks:

Ensure unity of effort, ongoing communication, and mission synchronization across all involved agencies

Key Tasks:

Identify shortfalls and develop recommendations for support

Key Tasks:

Validate the number of unaccounted-for individuals and incident fatalities

Key Tasks:

Ensure families and relevant agencies are supported with accurate information

FAMILY REUNIFICATION:

A Three-Prong Approach In Mass Casualty/Fatality Events During Natural Disasters

▪ Information Collection	▪ Information Collection Functions (ESF 13) ▪ State Highway Patrol or State Police ▪ Local Law Enforcement, State Associations of Sheriffs and Police Chiefs ▪ FBI
▪ Fatality Management	▪ Fatality Management (ESF 8) ▪ Medical Examiner or Coroner ▪ Disaster Mortuary ▪ Search and Rescue ▪ Local/State Law Enforcement ▪ Local Funeral Directors ▪ State Vital Records Agency
▪ Family Assistance	▪ Family Assistance ▪ NGOs (American Red Cross, United Way) ▪ Chaplains Association (including Police Chaplains) ▪ United States Coast Guard / Local/State Law Enforcement ▪ Funeral Directors Association ▪ National Transportation Safety Board / State Emergency Management Agency

FAMILY REUNIFICATION: The Models

COORDINATING THE MULTI-AGENCY EMERGENCY RESPONSE EFFORTS TO ENSURE FAMILIES ARE CONNECTED WITH THEIR LOVED ONES

Centralized Coordinating Agency

COORDINATING THE MULTI-AGENCY EMERGENCY RESPONSE EFFORTS TO ENSURE FAMILIES ARE CONNECTED WITH THEIR LOVED ONES

Centralized Coordinating Agency

State public safety officials take charge of process of locating unaccounted-for individuals

State officials ask Missourians to help locate friends, loved ones

JOPLIN, Mo. –At the direction of **Gov. Jay Nixon**, the **Missouri Department of Public Safety** has assumed control of the process of locating unaccounted-for individuals as a result of Sunday's devastating tornado in Joplin. At a morning news conference, the department released a list of 232 individuals for whom an official missing persons report had been filed. More than 60 law-enforcement and emergency-management personnel, including Missouri State Highway Patrol troopers; State Emergency Management Agency staff; federal partners; and local detectives are working under the department's direction on this top priority.
"Under Gov. Nixon's direction, the Department of Public Safety has immediately taken charge of the process of locating individuals who are unaccounted for following Sunday's devastating tornado," said **DPS Deputy Director Andrea Spillars**. "Following the Governor's orders, we have assigned additional investigators to take and investigate official reports, to field calls, and to help locate each and every one of these individuals. Just as all necessary resources were devoted to search and rescue efforts in the tornado's immediate aftermath, this critical mission will have all the personnel necessary to get information to anxious families, friends and loved ones. Locating these unaccounted-for individuals is a critical priority for our department."
Under the department's direction, a team of more than 60 law-enforcement officers, State Emergency Management Agency personnel, Red Cross volunteers, and local and federal partners are working 24 hours a day on accounting for these individuals. State employees that are part of the effort include investigators from the Missouri State Highway Patrol, the State Emergency Management Agency and the Missouri Department of Health and Senior Services. Joplin Police Department investigators and federal employees are also part of the effort.
The names of these unaccounted-for individuals are being cross-referenced with all hospitals that admitted or treated patients injured during the tornado, shelters housing tornado survivors, applicants for disaster assistance and the Red Cross Safe and Well program. Additionally, the Department of Public Safety is working with cell phone service providers to check whether cell phones have been used by individuals who have been unaccounted-for list since their names were added to the list.
Deputy Director Spillars also urged member of the public to help reduce the list and speed the process of reuniting tornado survivors with loved one by calling the Missouri State Highway Patrol Found-Persons Hotline: 417-895-6868.
To get direction on filing a report about an unaccounted-for individual, families and loved ones may call 417-659-5464 or file a report with the Highway Patrol in person at the Billingsley Student Center on the campus of Missouri Southern State University.
The list will be made available and kept updated on the Missouri Department of Public Safety's website, **www.dps.mo.gov**.

JOPLIN TORNADO 2011

DPS served as the coordinating agency for all three prongs of the reunification effort, which included MSHP, SEMA, DHS, local law enforcement, and NGOs. Lines of Effort (LOE):

JOPLIN TORNADO 2011 – Information Collection

- DPS coordinated a 24-hour multi-agency effort to locate individuals
  - State and Local Law enforcement – cell phone data, witness/victim interviews (MSHP, Joplin PD, Jasper County Sheriff)
  - DHS – Hospital admissions, ambulance transports (3-state area), nursing homes
  - SEMA/NGOs – Shelter admission, Red Cross Safe and Well, applications for federal disaster aid
- DPS held daily meetings with families in Joplin
  - Assigned an MSHP trooper to each family to support families through ongoing communication
  - Coordinate the exchange of information learned from family meetings with the identification efforts
- Engage the public through daily press conferences
  - Release initial list of unaccounted for based on best available information
  - Establish check-in number directly to MSHP
  - "Missing Persons" Reports filed and investigated by MSHP and local LE

JOPLIN TORNADO 2011 – Family Assistance

- **Mission**: Ensure families and loved ones of victims and survivors receive needed assistance, including information and resources by supporting family reunification activities due to the impacts of TC Helene.
- **Implementation:** DPS held daily meetings with families in Joplin
  - Assigned an MSHP trooper (liaison) to each family to support families through ongoing communication
  - Coordinated the exchange of information learned through family meetings with the identification efforts
    - The FA liaison served as the single point of contact for information about investigative efforts to locate their loved one and to help families navigate support services, as appropriate.
- **Key Tasks**:
  - Ensure unity of effort and mission synchronization to support impacted families
  - Ensure a common operating picture for families and the multi-agency reunification effort
  - Validate information regarding unaccounted-for individuals to allow for successful reunification
- **End State**: The FA mission and liaisons ensured a common operating picture and synchronized support for impacted families across relevant stakeholders for successful family reunification.

JOPLIN TORNADO 2011 – Fatality Management

- Federal DMORT Team
- DHS
- MSHP
  - Transport Dental Records
  - Liaison Officers
  - Death Notifications

JOPLIN TORNADO 2011 – Family Reunification End State

FOR IMMEDIATE RELEASE
June 01, 2011

Missouri State Highway Patrol accounts for all unaccounted-for individuals following the Joplin tornado

Unaccounted-for individuals count down to 0; next-of-kin of 134 deceased individuals have been notified

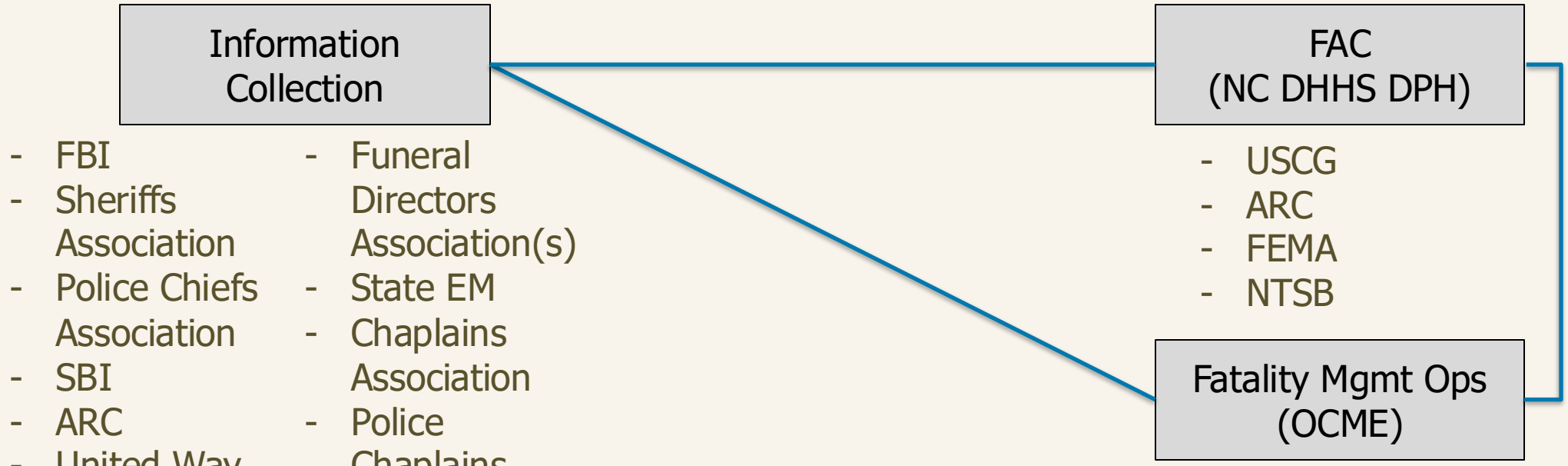
The **Missouri Department of Public Safety** announced today that all persons who had previously been reported as unaccounted-for have either been located or confirmed deceased and their next-of-kin notified. "In the wake of this devastating tornado, Missouri State Highway Patrol Troopers have demonstrated outstanding professionalism and dedication in carrying out the vital mission of locating every individual who was unaccounted for after the storm," **Gov. Nixon** said. "Our Troopers worked 24/7 to locate these individuals and to bring relief to the families of the living, and closure to the families of those who died. This was a critical mission that our Missouri State Highway Patrol performed exceptionally well."…

Multi-Agency Reunification Task Force

Helene (DR-4827-NC)

October, 2024

MARTF Organization



Information Coordination

- Primary: NC DHHS Division of Public Health
- Supporting: FEMA, FBI, Sheriffs Association, Police Chiefs Association, NC State Bureau of Investigation (SBI), American Red Cross, United Way, DMORT, USAR, NC State PIO, Office of the Chief Medical Examiner, Funeral Directors Association(s), North Carolina Emergency Management, Chaplains Association, Police Chaplains, ESF8 (HHS)
- Proposed Endstate: Reunification activities are complete and all impacted families know the status of their loved ones.

Family Assistance

- Primary: State DHHS Division of Public Health
- Supporting: Local EM, State/Local Law Enforcement FEMA, NTSB, American Red Cross, Police Chaplains, US Coast Guard
- Proposed Endstate: Friends and Relatives Center (FRC)/Family Assistance Centers (FAC) or similar capabilities established across the impacted area to serve as single points of contact for all family reunification support to impacted friends and relatives.
- Physical Address

Family Assistance Center

- **Mission**: The FAC ensures families and loved ones of victims receive needed assistance, including information and resources by supporting family reunification activities due to the impacts of TC Helene.
- **Purpose**: The FAC serves as a venue for authorities to coordinate access to support services such as disaster mental health and spiritual services and disseminate information such as available financial resources, as appropriate.
- **Agency Partners**:
  - United States Coast Guard
  - NC SEMA, FEMA
  - Red Cross
  - NTSB
- **End State**: The FAC ensured a common operating picture and synchronized support for impacted families across relevant stakeholders for successful family reunification.

Proposed Lines of Effort (3 of 3)

Fatality Management

- Primary: NC Office of the Chief Medical Examiner
- Supporting: DMORT, USAR, Local Law Enforcement, Local Medical Examiners, Local Funeral Directors
- Proposed Endstate: Partners ensured the proper recovery, handling, identification, transportation, tracking, storage, and disposal of human remains and personal effects; certified cause of death; and facilitated access to mental/behavioral health services to the family members, responders, and survivors of an incident.

Critical Steps for MARTF

- Develop objectives for each Line of Effort with relevant stakeholders
- Identify Critical Information Requirements for situational awareness reporting
- Identify stakeholder coordination requirements
  - Liaison Officers
  - Subject Matter Experts
- Establish MARTF meeting/coordination cadence

Hurricane Helene Family Reunification - Ongoing

After 6 months, 5 people still missing in North Carolina following Hurricane Helene

There have been 107 Helene-related deaths in North Carolina, officials said.

Six months after Hurricane Helene destroyed communities across the Southeast, five people remain missing in North Carolina due to the storm, according to officials.

The missing include one person from Avery County, one from Mitchell County and three from Yancey County -- all of whom have not been in contact since the Category 4 hurricane hit North Carolina in September, officials confirmed to ABC News.

Hurricane Helene Family Reunification - Ongoing

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There have been 107 Helene-related deaths in North Carolina, officials said.

Hurricane Helene made landfall in Florida's Big Bend region on Sept. 26 as a Category 4 hurricane. Days later, in Asheville, North Carolina, the storm caused historic flooding that devastated roads, bridges and structures.

The storm also ravaged through Georgia, South Carolina, Virginia and Tennessee.

More than 230 people have died from the storm, which has become the deadliest mainland hurricane since Katrina in 2005.

THANK YOU

Andrea Spillars


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MISSOURI STATE PLANNING INITIATIVE MISSING AND UNACCOUNTED FOR FOLLOWING A DISASTER

Melissa Friel, MO
SEMA Preparedness Division Manager

THE PROBLEM? HOW DO WE CAPTURE THE MISSING AND UNACCOUNTED FOR FOLLOWING A CATASTROPHIC DISASTER OR EVENT?

THE MISSOURI PLANNING INITIATIVE

- There are four legs to a Mass Fatality Incident “Stool”
  - The Missing and Unaccounted
  - Identifying the Fatalities
    - Postmortem Data
  - Assisting the Families whose loved ones are missing
    - Antemortem Data Collection
  - Reunification

MISSOURI'S MASS FATALITY ASSETS

- MO 1 DMORT
  - Completes the Postmortem process
  - Working with the local coroner to identify and reunite those who have died as a result of the event with their loved ones so death rituals can be observed.
- Victim Information Center (VIC)
  - The facility where family members come to provide antemortem information on their loved ones, to include:
    - Dental Records
    - DNA
    - Fingerprints, etc.
  - A facility that includes
    - Mental Health professionals
    - Agencies that can assist the family with their needs
    - Etc.

THE "MISSING" PIECE OF MISSOURI'S PLAN MASS FATALITY PLAN

- Missing and Unaccounted For Planning Initiative
  - Will begin in the fall of 2026
  - Will include the following disciplines
    - Sheriff's Association
    - Police Chief's Association
    - Missouri State Highway Patrol
    - Missouri Hospital Association
    - Missouri Health Care Coalitions
    - Missouri Department of Health and Senior Services

INITIATIVE FOCUS - THE MISSING LINK TO MISSOURI'S MASS FATALITY PLAN

- Develop a core planning team to develop the plan
- Core Planning Team Will Include
  - Missouri Sheriff's Association
  - Missouri Police Chief's Association
  - Missouri State Highway Patrol
  - Missouri Hospital Association
  - Missouri Dept of Health and Senior Services
  - Missouri Department of Public Safety

TIME LINE FOR THE PLANNING INITIATIVE

- First meeting in early September
- Conduct monthly Core Planning Team Meetings
- MO SEMA Planners will put pen to paper and write the plan
- Plan completed by end of December
- In 2027 a table top exercise will be completed

QUESTIONS OR COMMENTS OR IF YOU WOULD LIKE TO SERVE ON THE CORE PLANNING TEAM CONTACT MELISSA FRIEL @ MELISSA.FRIEL@SEMA.DPS.MO.GOV


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Missouri's S.A.V.E. Coalition

Rapid Building Evaluations After St. Louis Tornado, May, 2025

March 24, 202

Joe Leahy, PE
Chairman, SAVE Coalition

AGENDA

- Missouri S.A.V.E Coalition Overview
- ST Louis Tornado Response 2025

Missouri S.A.V.E. Coalition

SAVE Coalition Implemented by RSMo 44.023 (1991)

SEMA Authorized to Establish Volunteer Inspection Program

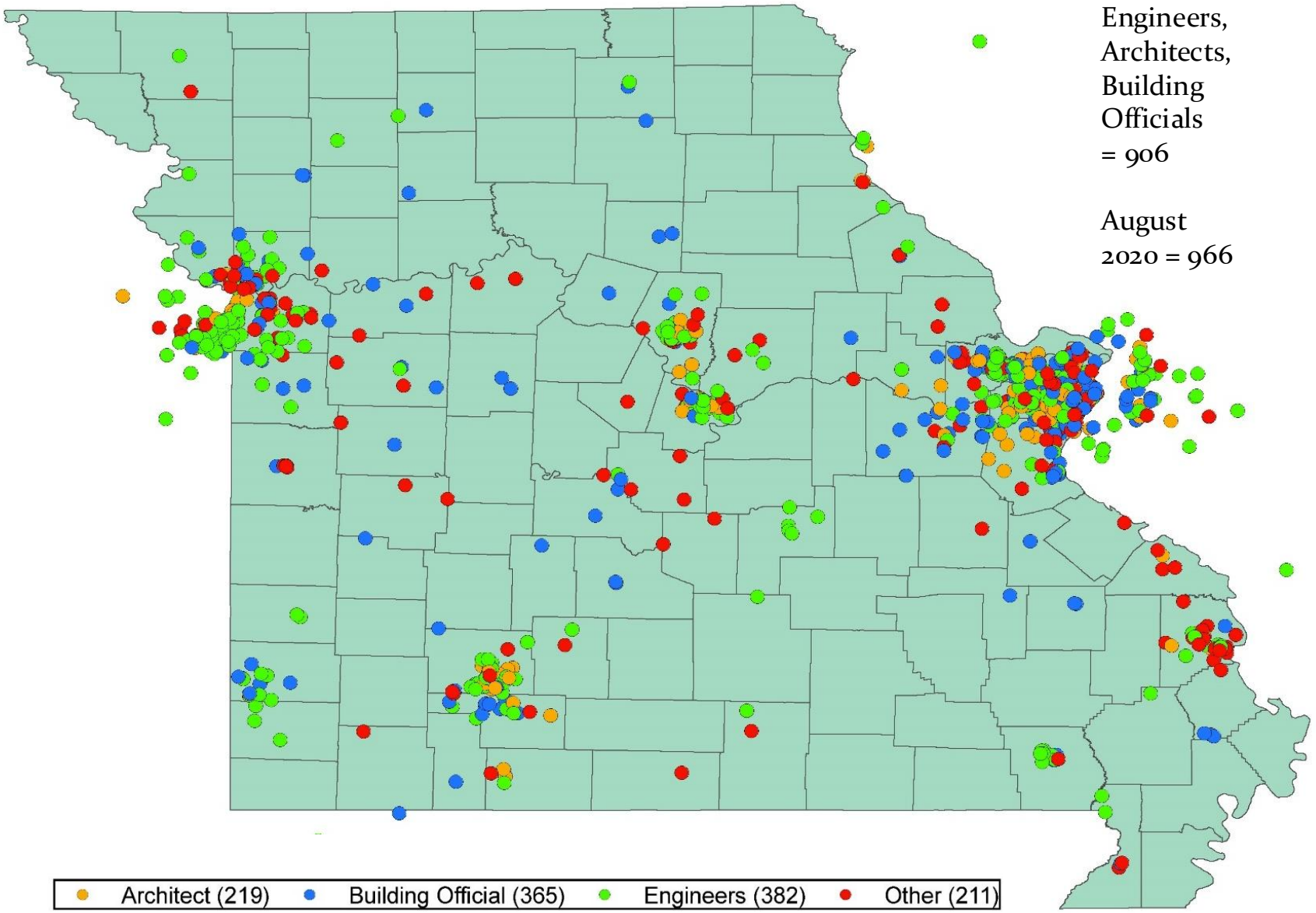
Missouri SAVE Coalition

Around1,900 Current Members

It Starts With ATC-20/45 Based Training

Source: SEMA

Missouri SAVE Coalition Members by Occupation



9/26/2018
Engineers, Architects, Building Officials = 906

August 2020 = 966

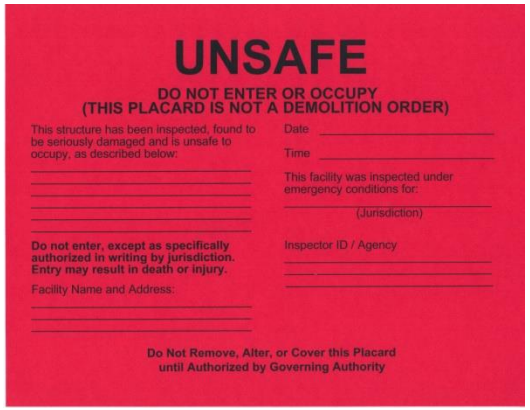
Missouri S.A.V.E. Coalition

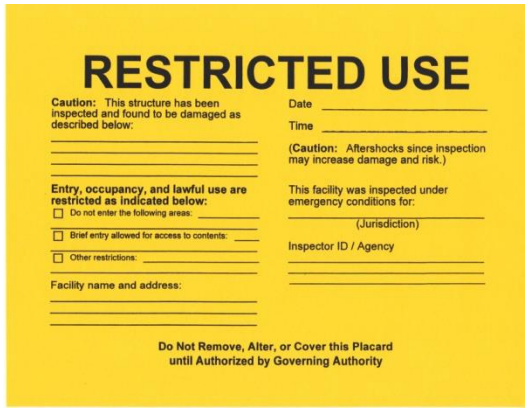
The S.A.V.E. Board of Directors Come From the Coalition's Participating Professional Organizations:

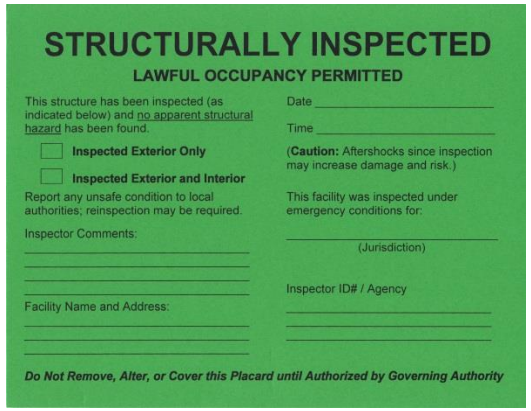
- American Council of Engineering Companies/Missouri (ACEC/MO)
- American Institute of Architects/Missouri - (AIA/MO)
- American Society of Civil Engineers - (ASCE)
- Missouri Society of Professional Engineers - (MSPE)
  Dennis Kidwell, PE & Joe Leahy, PE
- Structural Engineers Association of Kansas & Missouri - (SEAKM)
- Earthquake Engineering Research Institute - (EERI)
- Society of American Military Engineers/St. Louis - (SAME)
- Missouri Seismic Safety Commission - (MSSC)
- Missouri Association of Code Enforcement - (MACE)

What S.A.V.E. Does

- Mostly Rapid Visual Inspections per ATC-20 and ATC-45
- Exterior Only, Structural Life Safety
- Public Information and Warning - Post Placards:







- Provides GIS based data to the local government (Survey 123)

Missouri S.A.V.E. Coalition

S.A.V.E. Volunteer Service, In MO

Duration = 5 days

Liability = Willful & Gross Negligence Only

Duty With = Local Jurisdiction

Expenses = Local Jurisdiction Reimbursement

Workers Compensation = State

S.A.V.E volunteers are now authorized to respond to Emergency Management Assistance Compact (EMAC) requests from other states

How S.A.V.E. Activates

EVENT OCCURS
(Local Agencies Overwhelmed)

↓

Governor
Declares Emergency

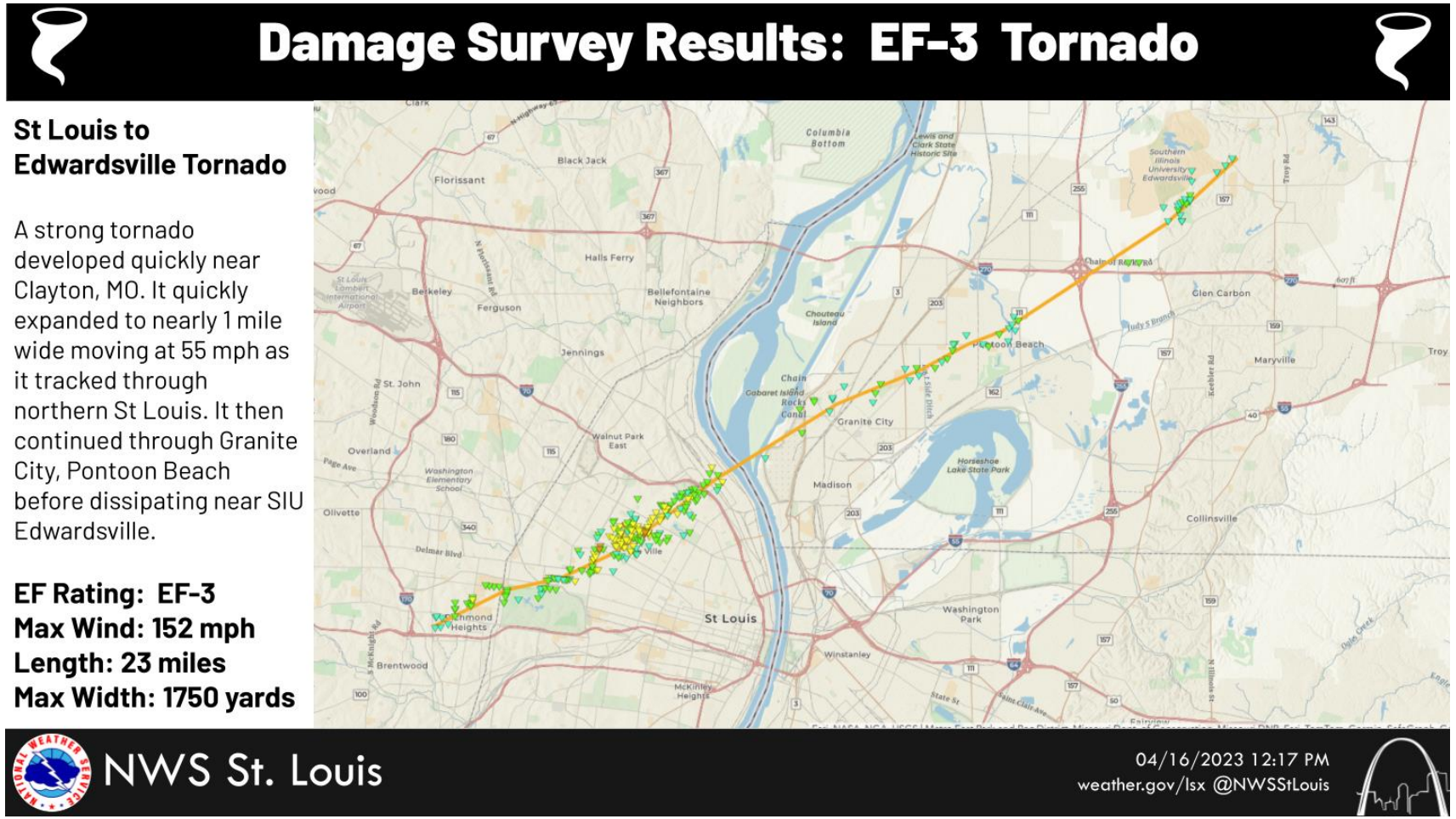
↓

Local Government Requests Building Inspection Help from SEMA

↓

S.A.V.E. Teams Begin Deployment
(After Search and Rescue Operations)

Event Occurs



National Weather Service

Event Occurs

Estimated 10,000 Buildings Damaged

National Weather Service

Predeployement Planning

- SAVE Trained St. Louis Officials Inquire About SAVE Assistance May 17
- Planning Meeting on May 19
  - Initial request for volunteers from the STL region through Show Me Response
  - Logistical coordination for operations center, placards, and maps with STL
  - **SAVE Requests SURVEY 123 assistance from CUSEC**
- Leader Deployment scheduled for May 20

Deployment May 21-24

- 60+ SAVE Trained Volunteers arrive in St. Louis May 21 – May 24
- Average 40+ teams incorporating STL officials
  - CUSEC team with Brian Blake On-Site
  - Daily briefing to teams for situational update and daily assignments
  - Refresher training for volunteers and STL officials
- Each of the teams averaged 40 evaluations per day
- CUSEC, SAVE, and STL GIS teams utilized SURVEY 123 for tracking

Deployment May 21-24

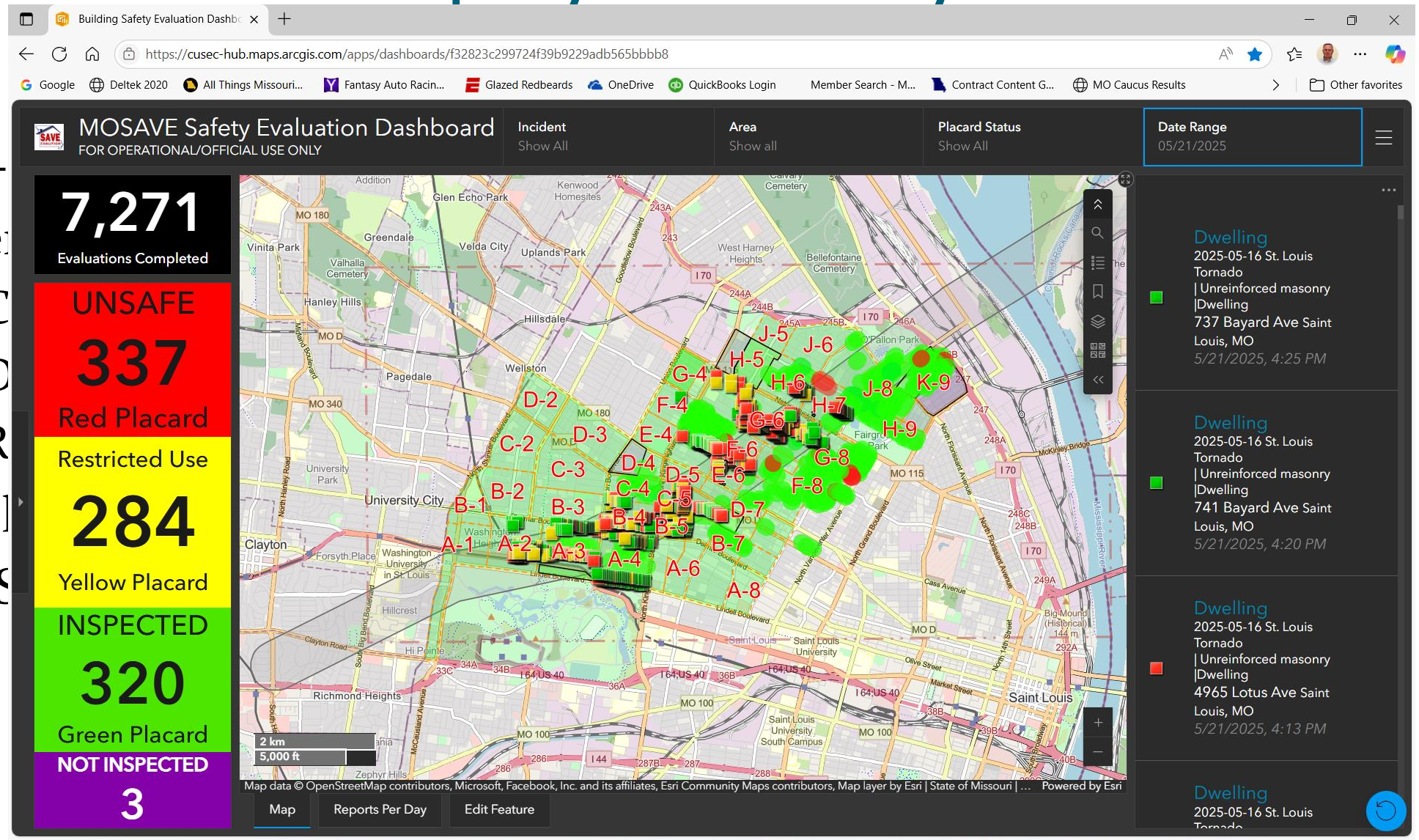
Deputizing SAVE Volunteers

Daily Briefs and Assignments

SAVE Operations and GIS

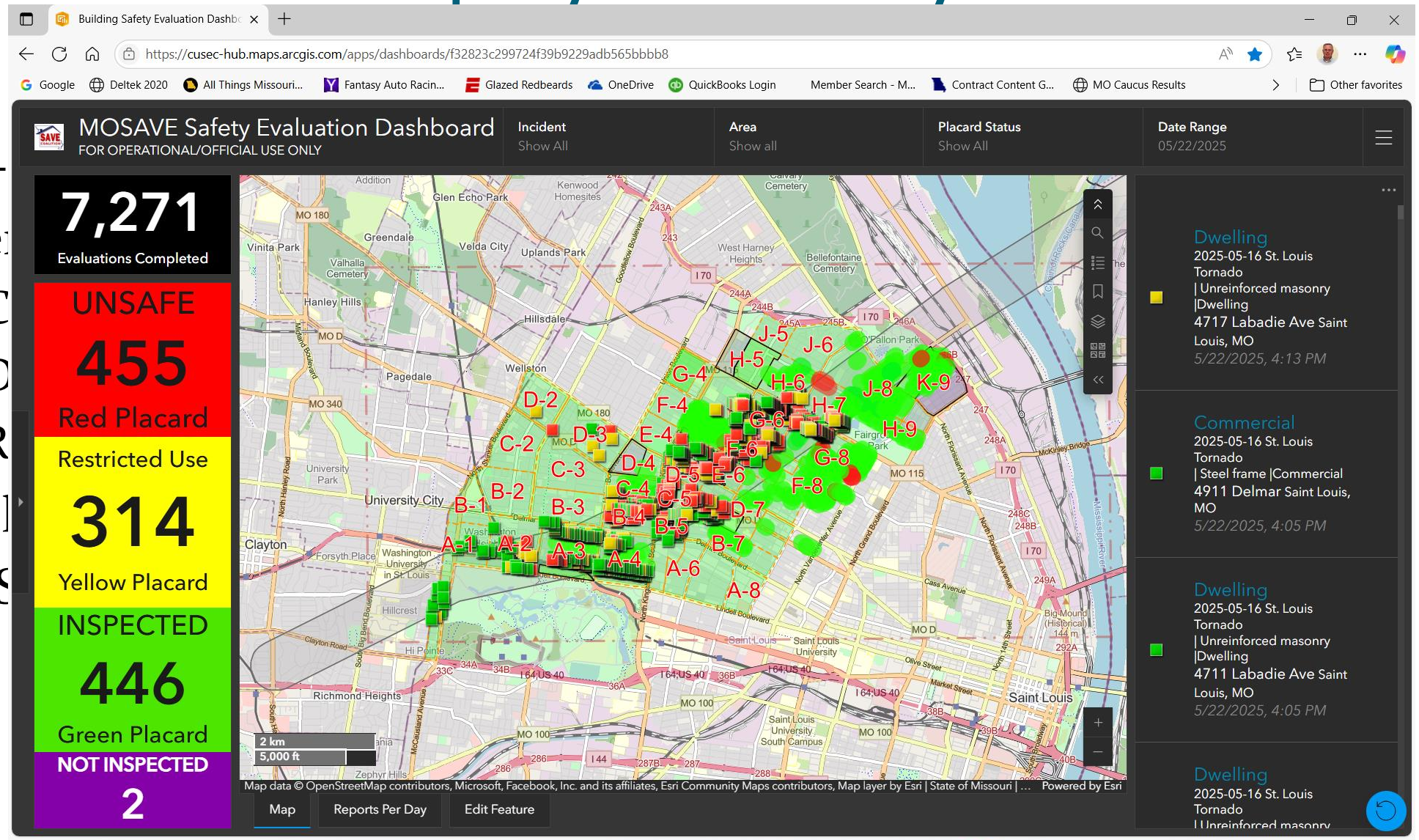
Deployment May 21

- 60+
- Ave
  - C
  - D
  - R
- Eac
- CUS



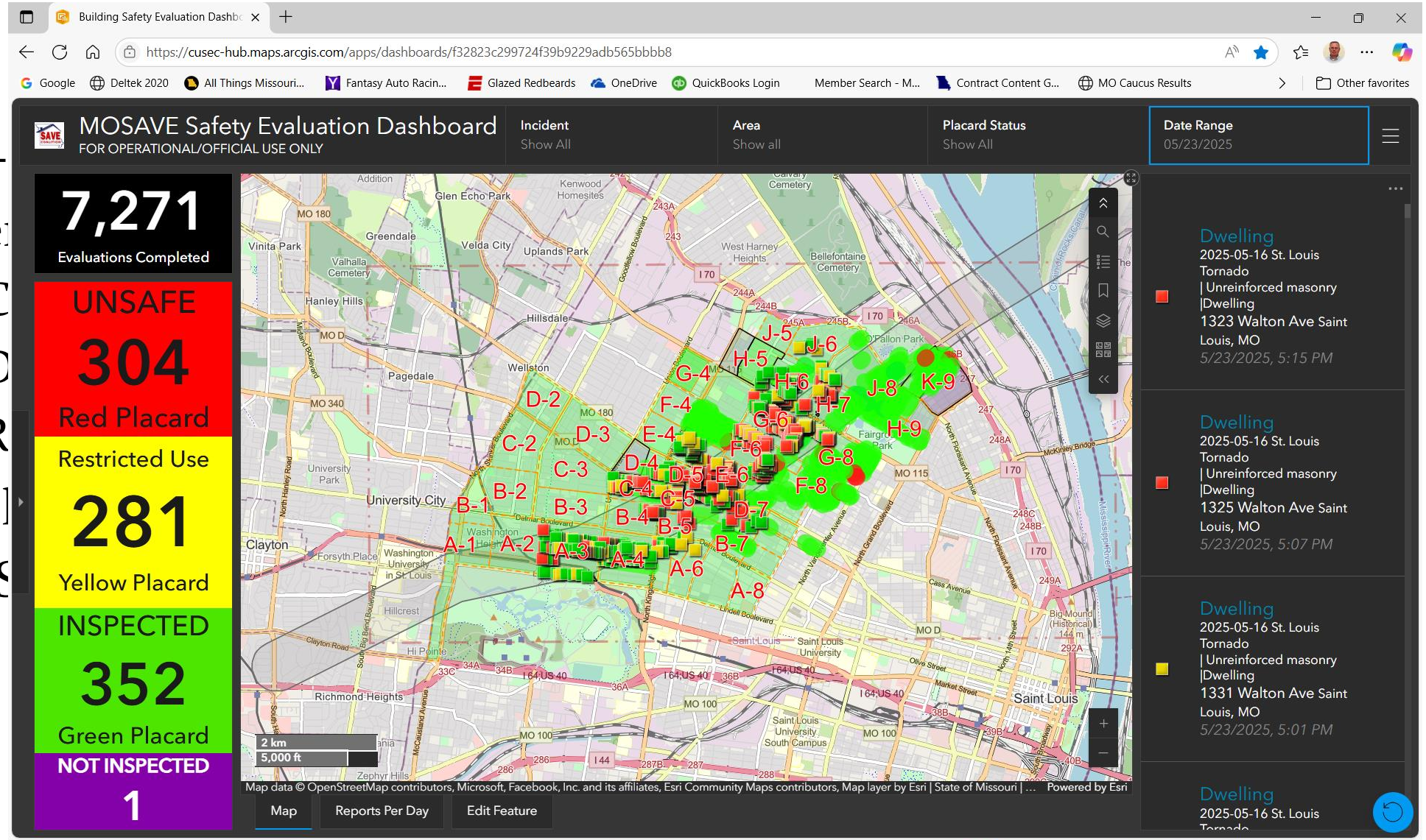
Deployment May 22

- 60+
- Ave
  - C
  - D
  - R
- Eac
- CUS



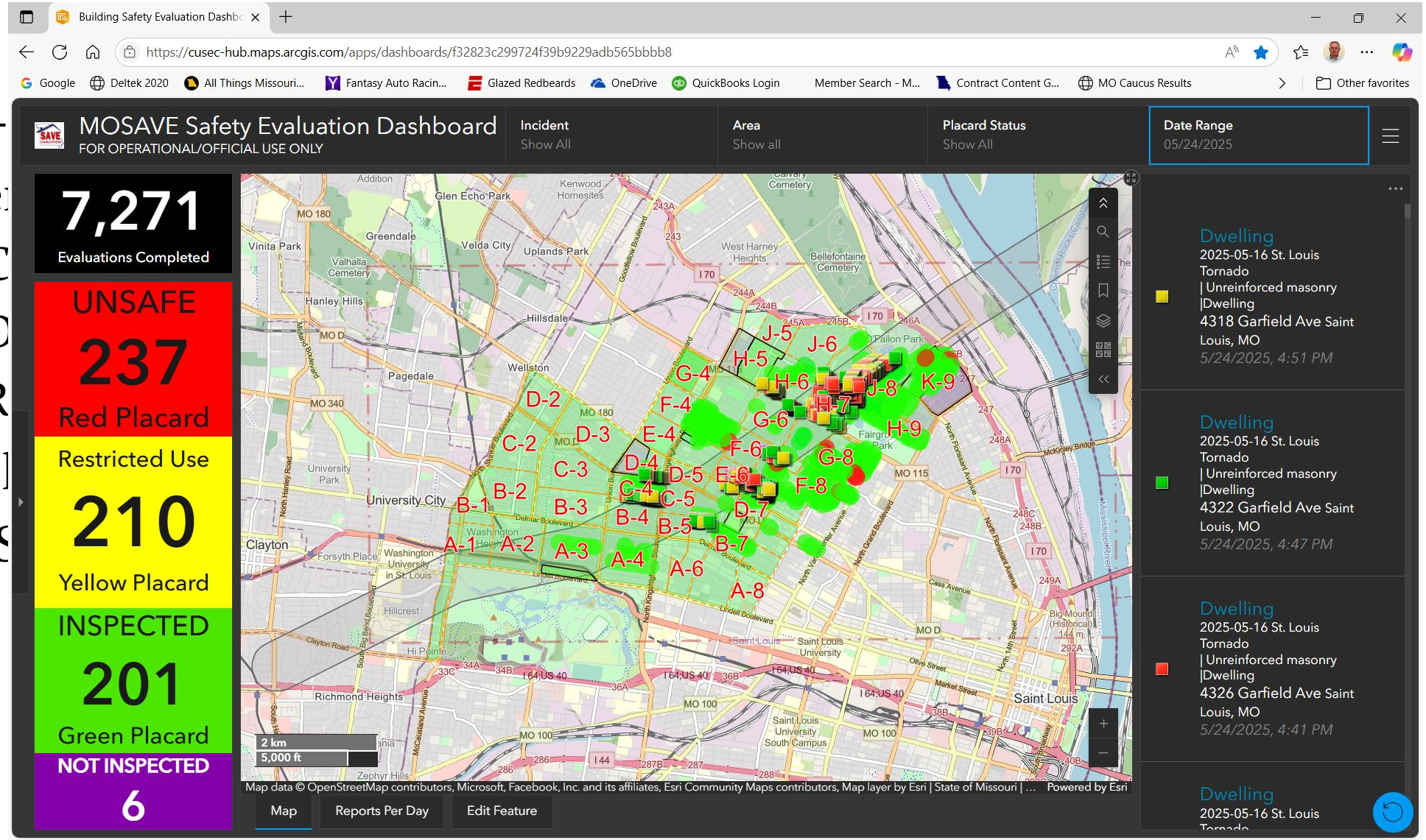
Deployment May 23

- 60+
- Ave
  - C
  - D
  - R
- Eac
- CUS



Deployment May 24

- 60+
- Ave
  - C
  - D
  - R
- Eac
- CUS



Deployment May 21-24

- 60+ S
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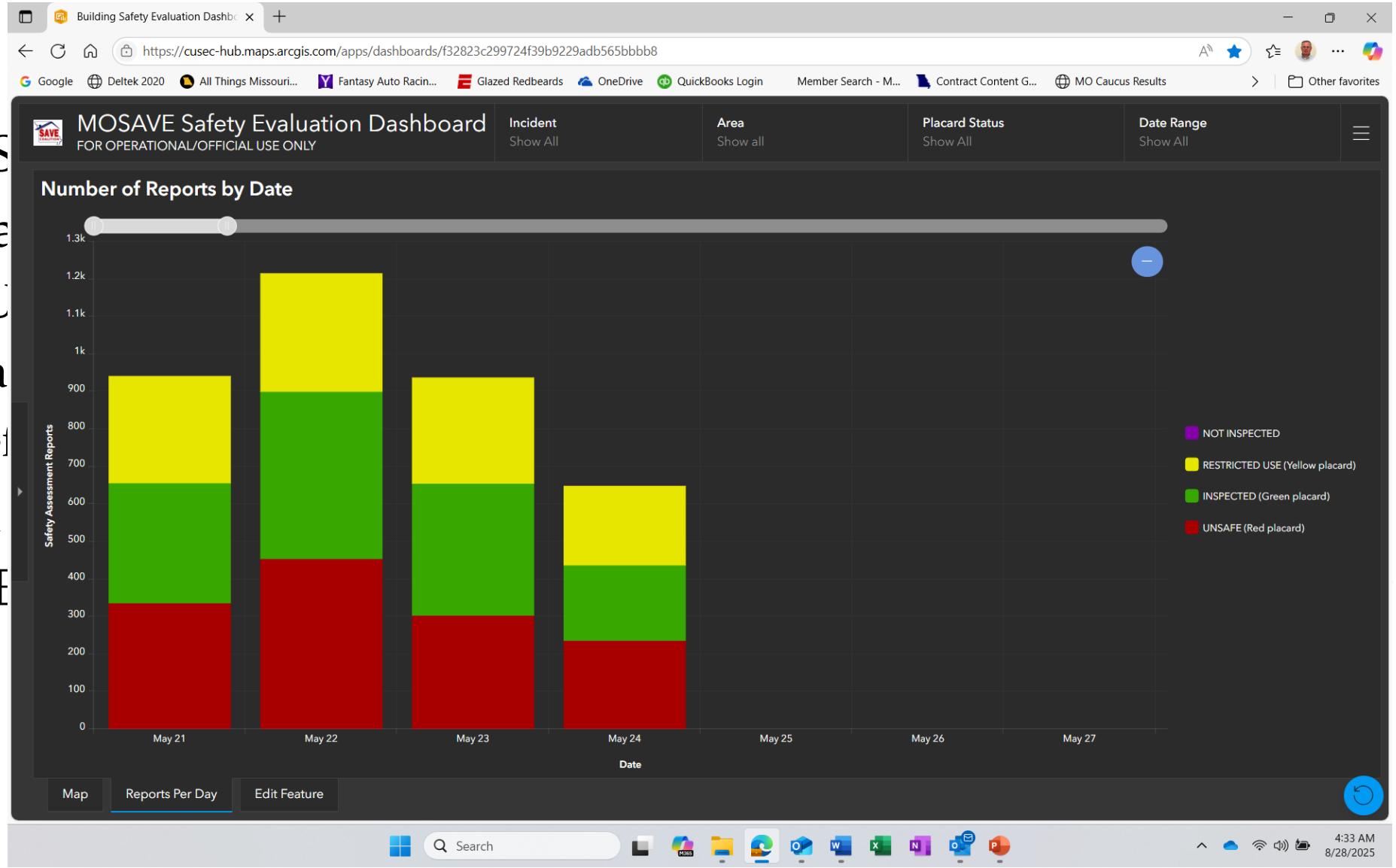


Deployment May 21-24 Results

- 3,741 Buildings evaluated
- STL building and elected officials assisted with city damage estimates
- Citizens appreciated the in-person inspection
- Approximately 6,000 estimated damaged buildings uninspected

Deployment June 7-10

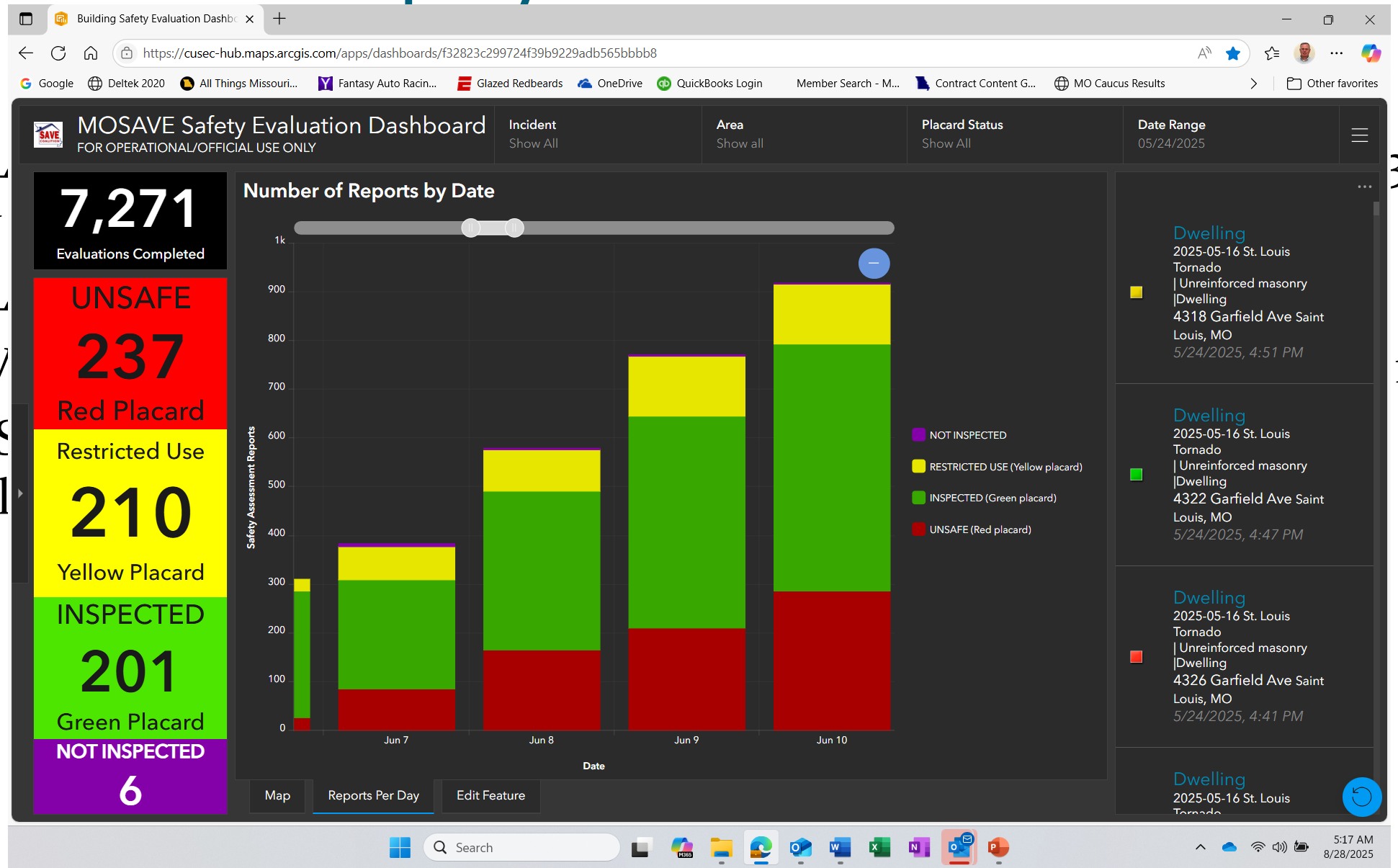
- STL officials continued evaluations from May 25 to June 6 averaging 30 per day
- STL requested 2nd SAVE deployment – 1st time in SAVE history
- SAVE Coalition provided 40 volunteers for evaluations from June 7 – 10
- CUSEC integrated recent aerial imaging to data platform to improve evaluations and situational awareness

Deployment June 7-10

- STL
- STL
- SAV
- CUS
eval

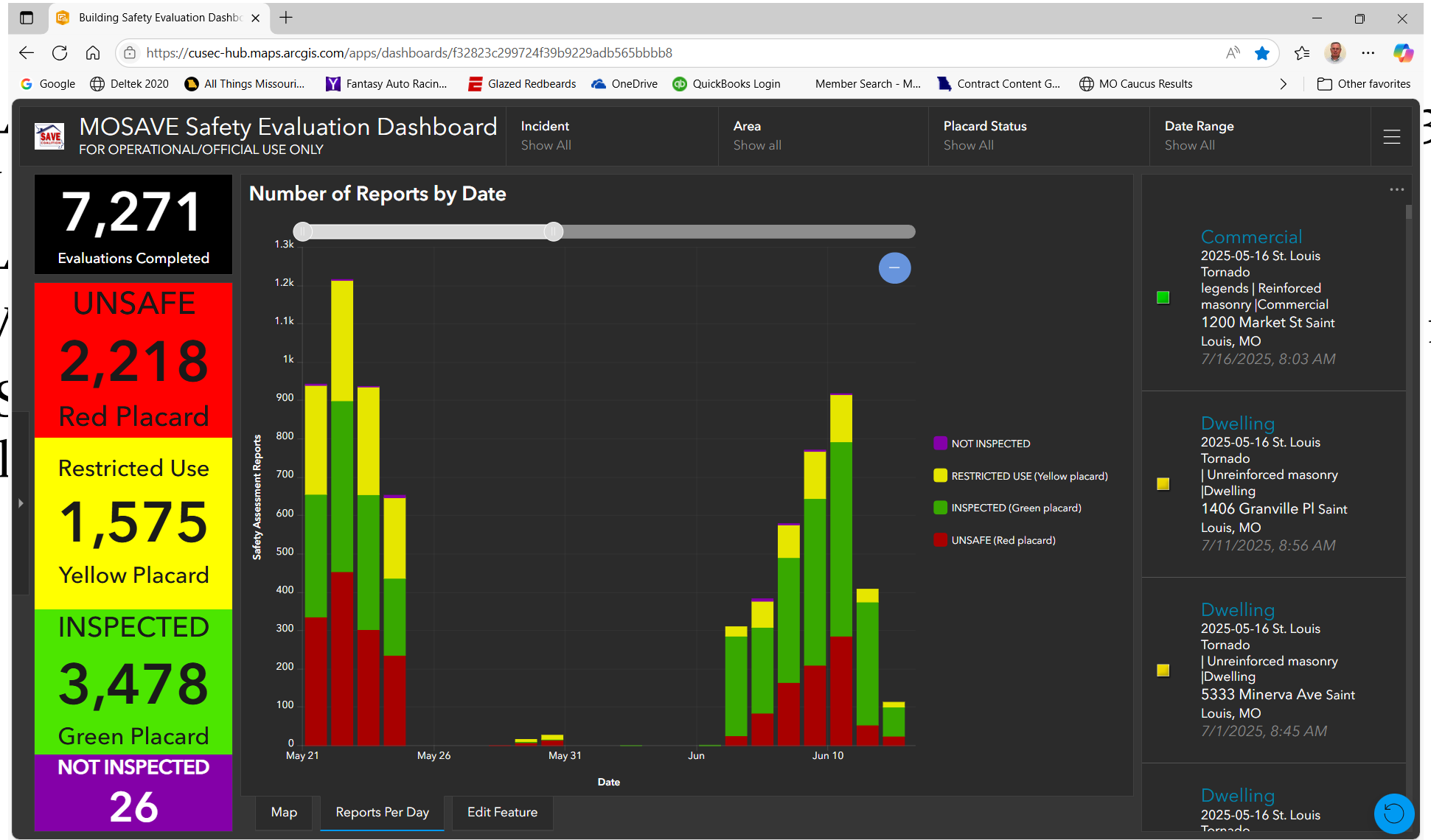
30 per day

10



Deployments in May & June

- STL… 30 per day
- STL…
- SAV… 10
- CUS… eval…

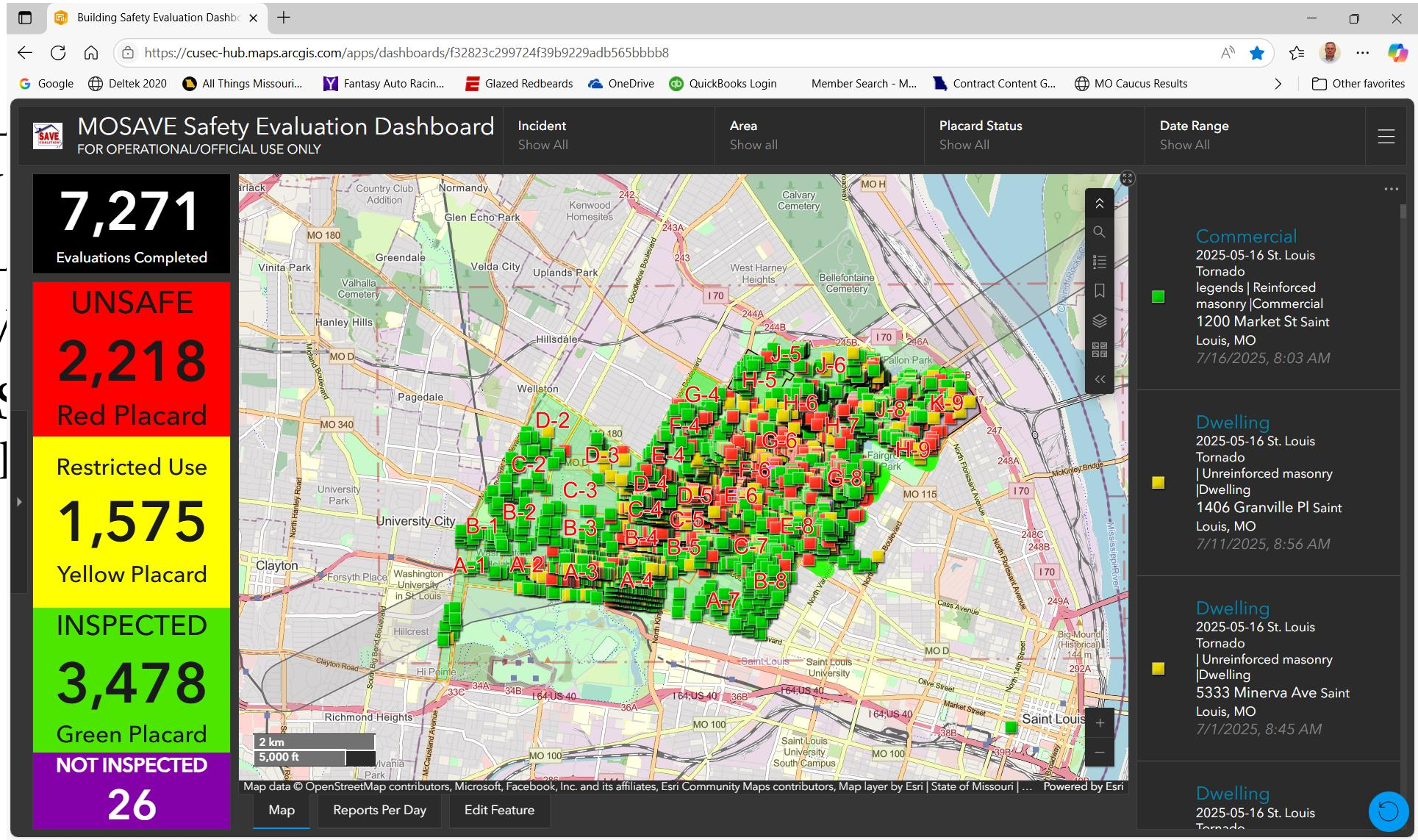


Deployments in May & June

- STL
- STL
- SAV
- CUS
eval

30 per day

10

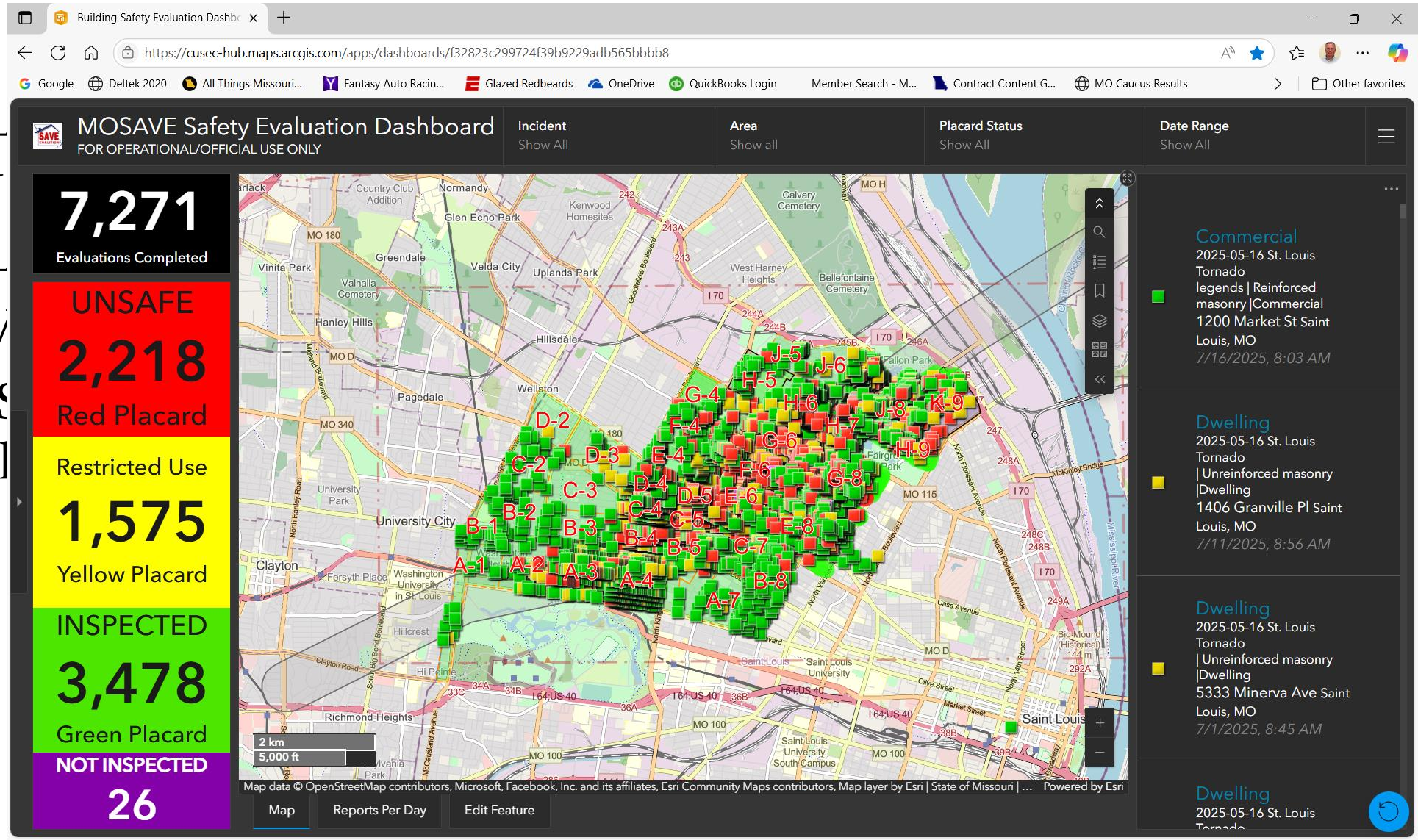


Deployments in May & June

- STL
- STL
- SAV
- CUS
eval

30 per day

10



Lessons Learned/Learning

- Pre-Deployment Coordination – City, State, and CUSEC
- Logistical Support
- GIS Support (City, State, Federal, CUSEC)
- FEMA Urban Search and Rescue Data
- Public Official and Law Enforcement Support
- S.A.V.E. Training Integrating SURVEY 123 Validated

Lessons Learned/Learning

- S.A.V.E. Leader Training Validated
- S.A.V.E. Program Worked Well
- Previous Training Exercises at Jefferson Barracks and Downtown St. Louis established relationships with City and County officials
- Integrate Recent Drone and Aerial Imagery with SURVEY 123 As Soon As Possible

Missouri SAVE Coalition

The Missouri Structural Assessment and Visual Evaluation (SAVE) Coalition is a group of volunteer engineers, architects, building inspectors and other trained professionals that assists the Missouri State Emergency Management Agency with

Questions?

St. Louis Tornado, 2025, Photo Credit Ben Ross– S.A.V.E.

Joe Leahy, PE
Missouri SAVE Coalition, Board Chairman
Information Provided by Ben Ross, PE & Jeff Briggs, MO SEMA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New Madrid Seismic Zone Surrounding State's Planning Efforts