



MITIGATION & RESILIENCE

Mitigating Today for a More Resilient Tomorrow

Tuesday, December 3rd, 2019

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MITIGATION & RESILIENCE



*“**Mitigation** is the effort to reduce loss of life and property by lessening the impact of disasters.”*

*“**Resilience** aims to build a culture of preparedness through insurance, mitigation, preparedness, continuity, and grant programs.”*

In order for mitigation to be effective we need to take action now before the next disaster to reduce human and financial consequences later (analyzing risk, reducing risk, and insuring against risk).

It is imperative to plan for Mitigation and Resilience!!

DECADE OF DISASTERS (2008-2018)

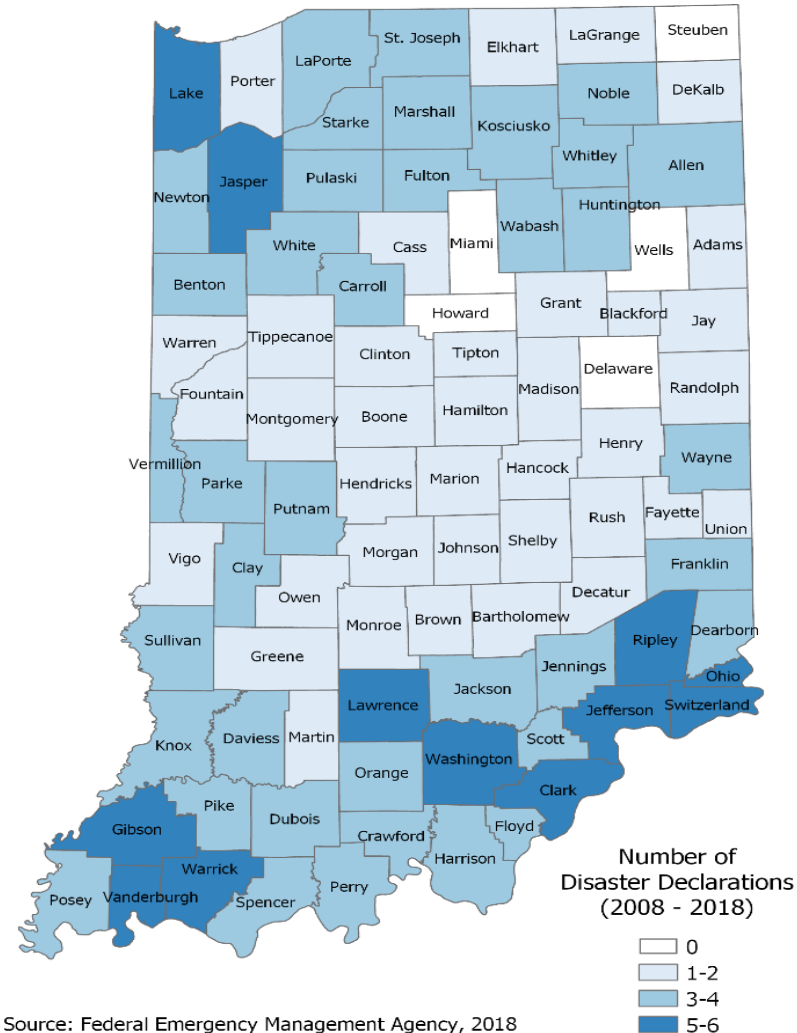


DR-4363: 2018 Severe storms and flooding causing extensive and record flooding along the Yellow, Kankakee and Iroquois Rivers.

DR-4173: 2014 Severe winter storm and snowstorm with the second highest calendar day snowfall for Indianapolis, 11.4", since records began.

DR-4058: 2012 Severe storms, straight-line winds, and tornadoes. 14 deaths due to tornadoes, including an EF4 tornado that destroyed a school.

DR-1997: 2011 Severe storms, tornadoes, straight-line winds, and flooding, including up to 2" hail, EF0 to EF2 tornadoes.



DR-1832: 2009 Severe storms, tornadoes and flooding, including an EF3 tornado.

DR-1828: 2008 Severe winter storm with both ice and snow accumulations up to 8".

DR-1795: 2008 Severe storms and flooding with wind gusts up to 70mph.

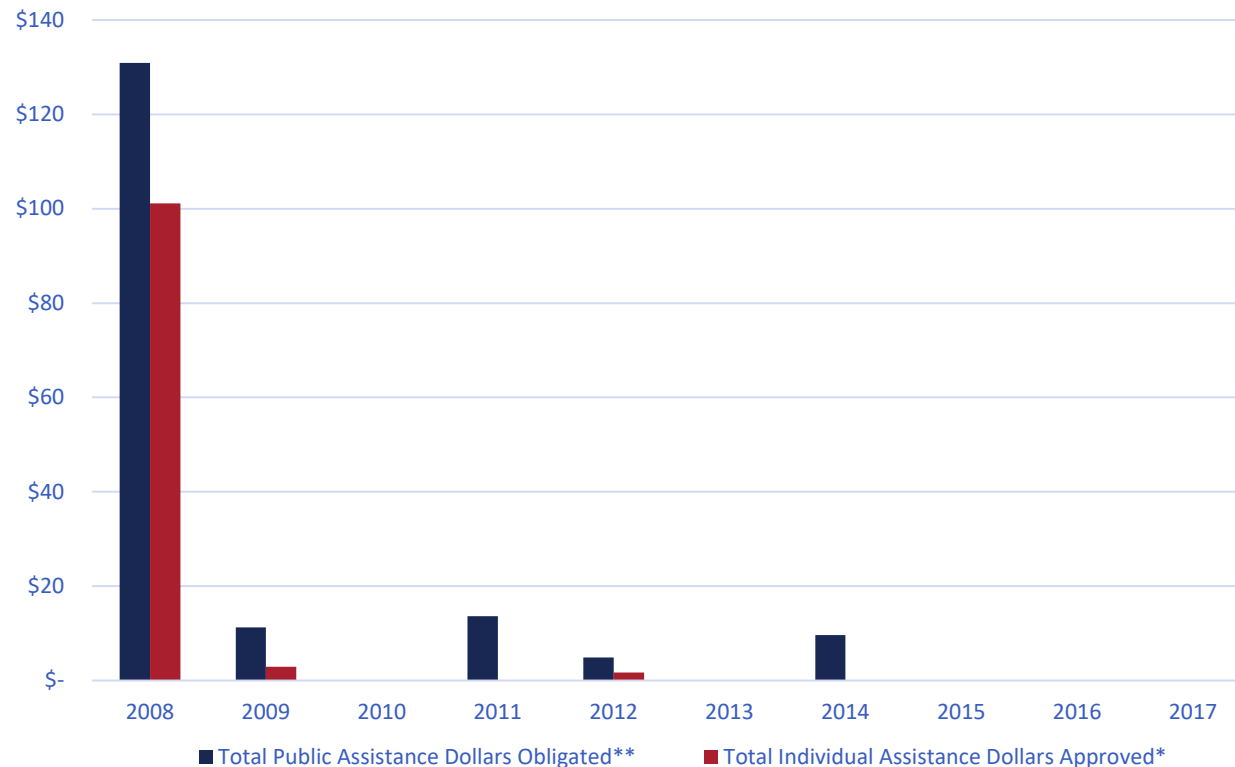
DR-1766: 2008 Devastating flood with over \$150 million dollars in disaster dollars.

DR-1740: 2008 Significant flooding in Northern Indiana with record flowing along the Tippecanoe River.

FEDERAL DISASTER ASSISTANCE



- Federal Disaster Assistance by Type for Indiana Disasters (2008-2017)



INDIANA SPECIFIC NATURAL HAZARDS



- Natural Hazards Addressed in the State Hazard Mitigation Plan
 - Flood
 - Severe Storms/Tornadoes
 - Earthquake
 - Extreme Temperatures
 - Drought
 - Winter Storm
 - Ground Failure
 - Wildfire
 - Dam/Levee Failure



2019 State of Indiana Standard Multi-Hazard Mitigation Plan

Indiana Department of Homeland Security

302 W. Washington Street. Room E208

Indianapolis, IN 46204

<https://www.in.gov/dhs>

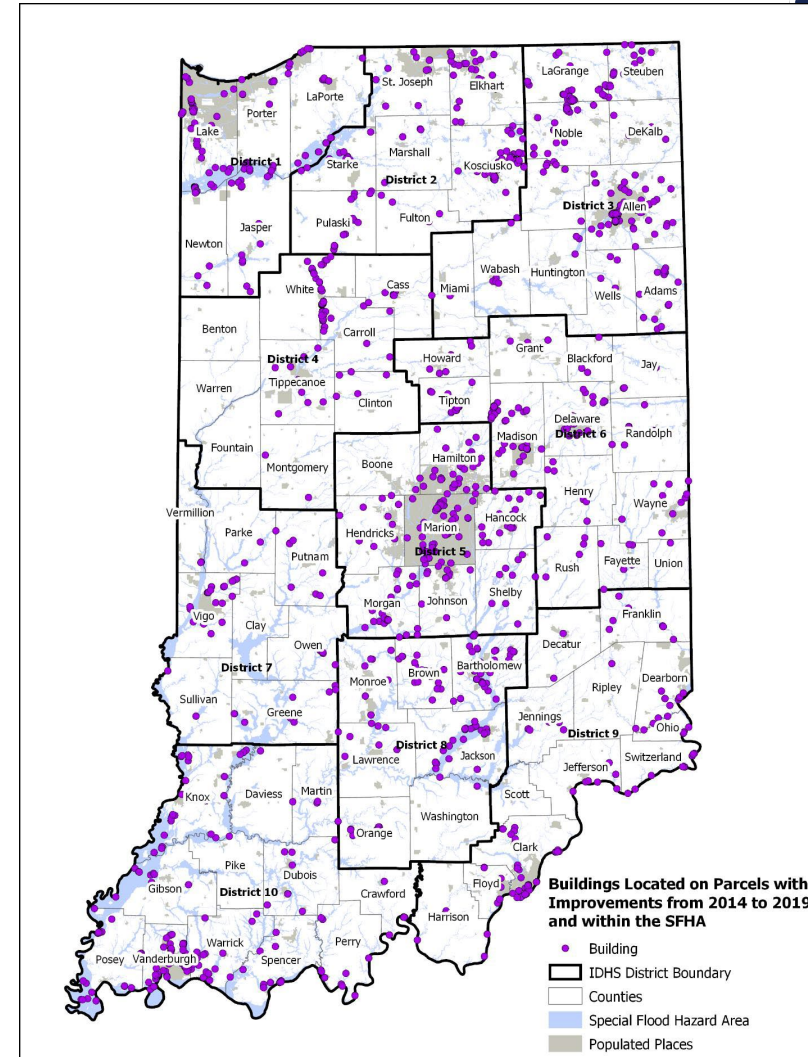
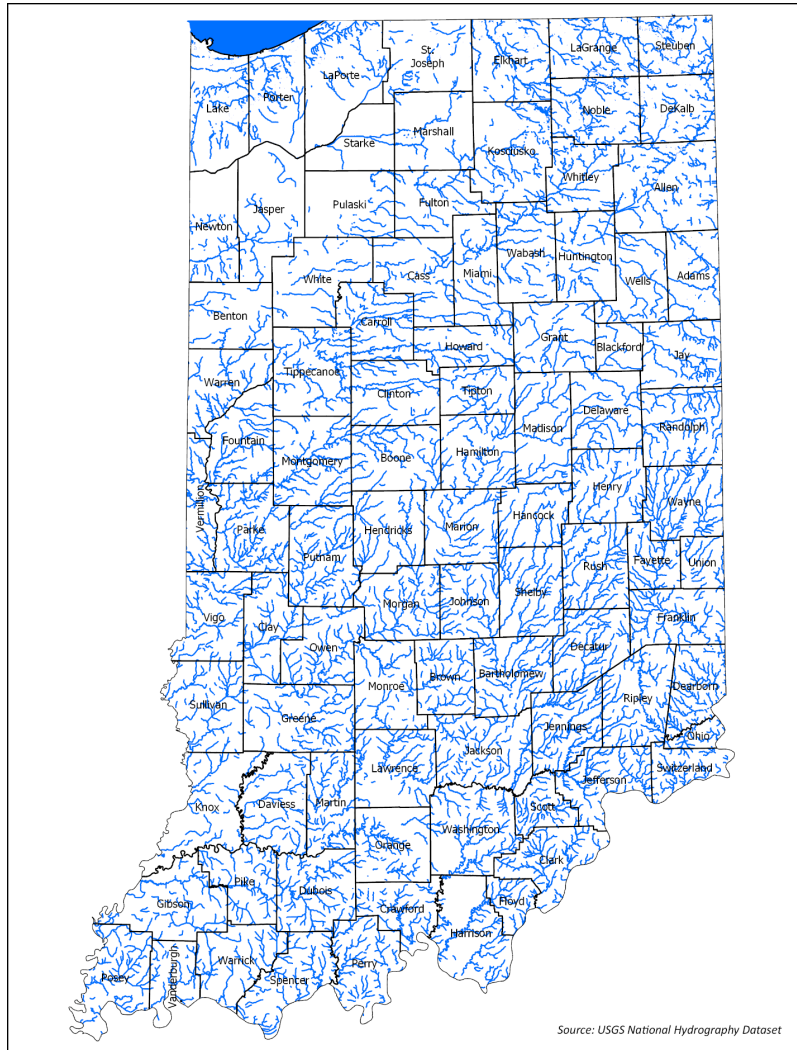
The Polis Center IUPUI

1200 Waterway Boulevard Indianapolis, Indiana 46202

<http://polis.iupui.edu>



FLOOD RISK



JUNE 2008 FLOODS

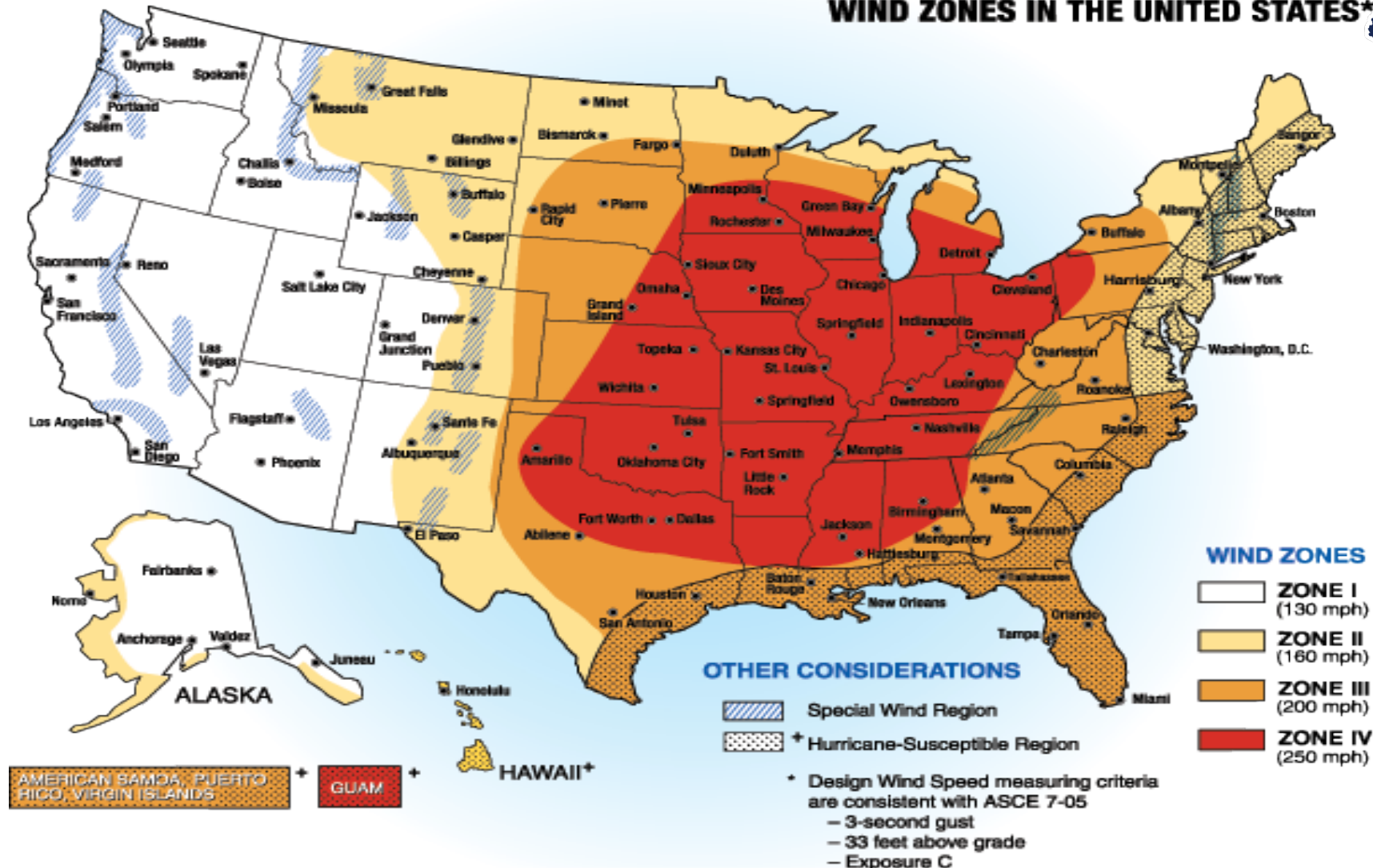


- By end of event, 40 Indiana Counties included in Presidential Disaster Declaration
- Monthly rainfall totals 3-24 inches of rain
- Over 25,000 in Indiana affected
- Exceeded \$1 billion in flood damages
- Affected roads, railroads, homes, businesses, hospitals, dams, parks, and utilities
- Impacted 9% of the state's farmland (largest agriculture disaster to date)
- Led to legislative change on reconstruction of structures in a floodway
- Over 280 flood damaged homes acquired and returned to natural flood storage

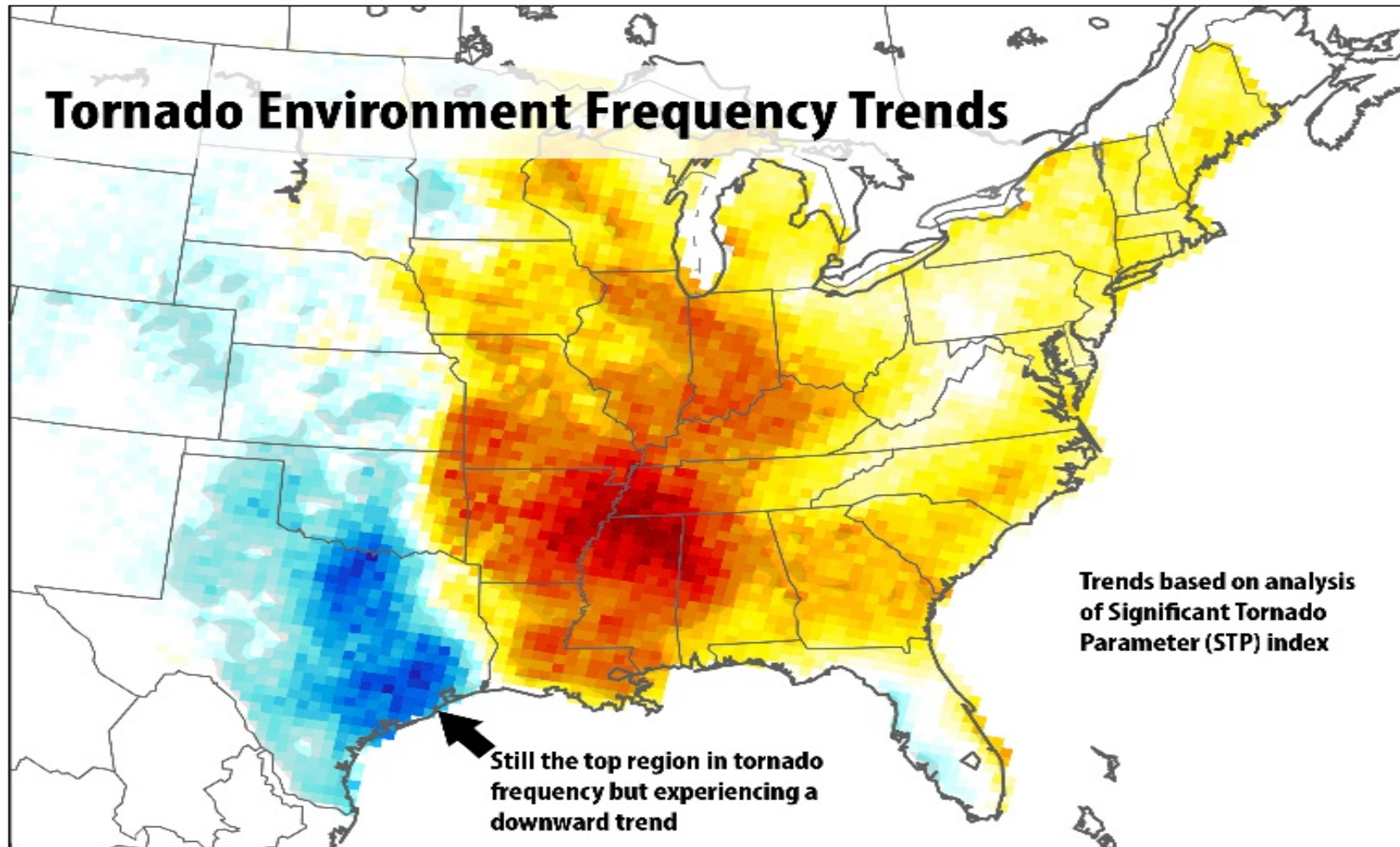
SEVERE STORMS, WIND & TORNADIC RISK



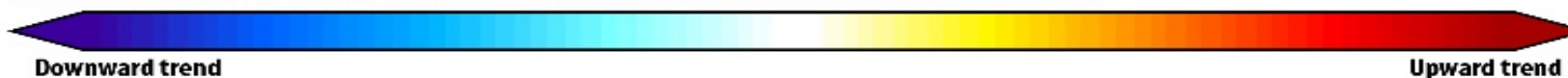
WIND ZONES IN THE UNITED STATES*



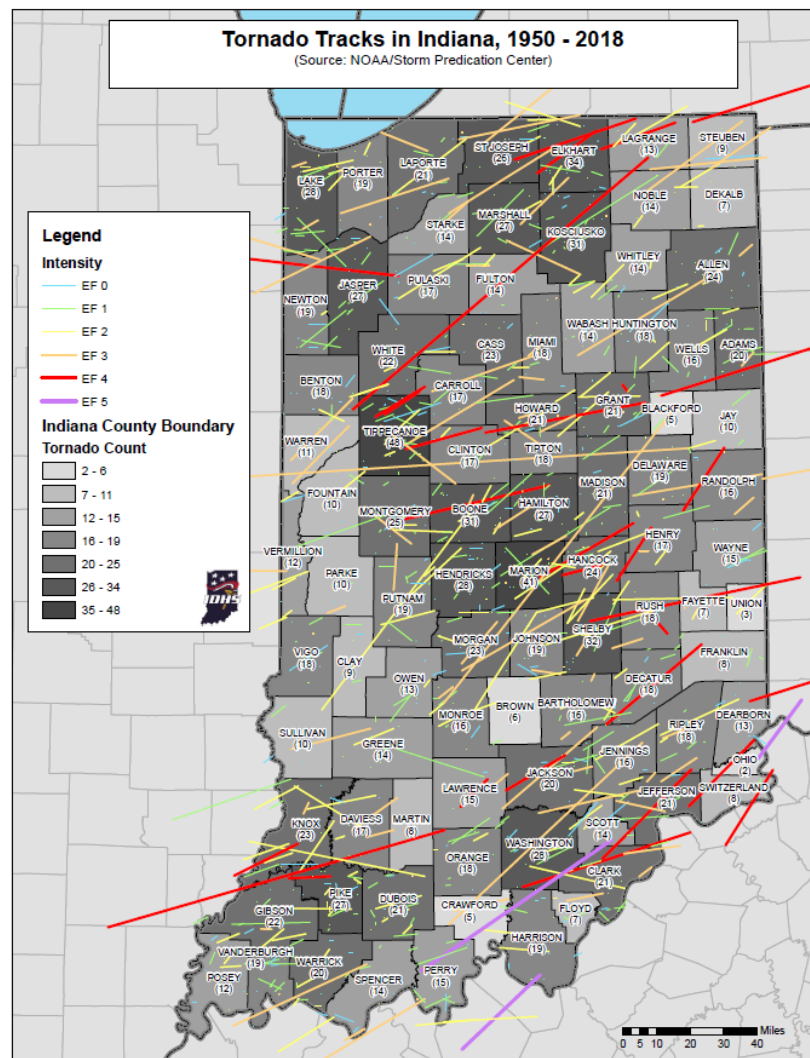
SEVERE STORMS, WIND & TORNADIC RISK



Adapted by NIU from *npj Climate and Atmospheric Science*, Gensini/Brooks 2018 (<http://creativecommons.org/licenses/by/4.0/>)



HISTORIC TORNADO PATHS 1950-2018



APRIL 1965 PALM SUNDAY OUTBREAK

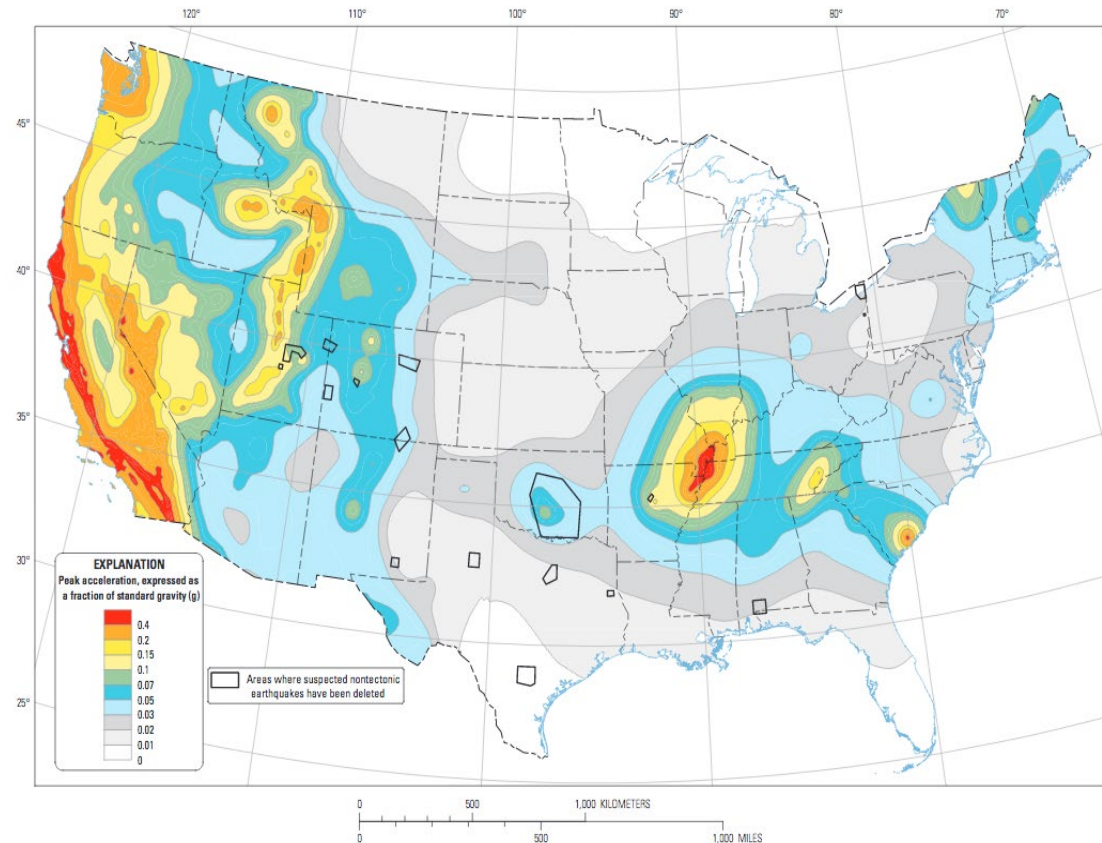
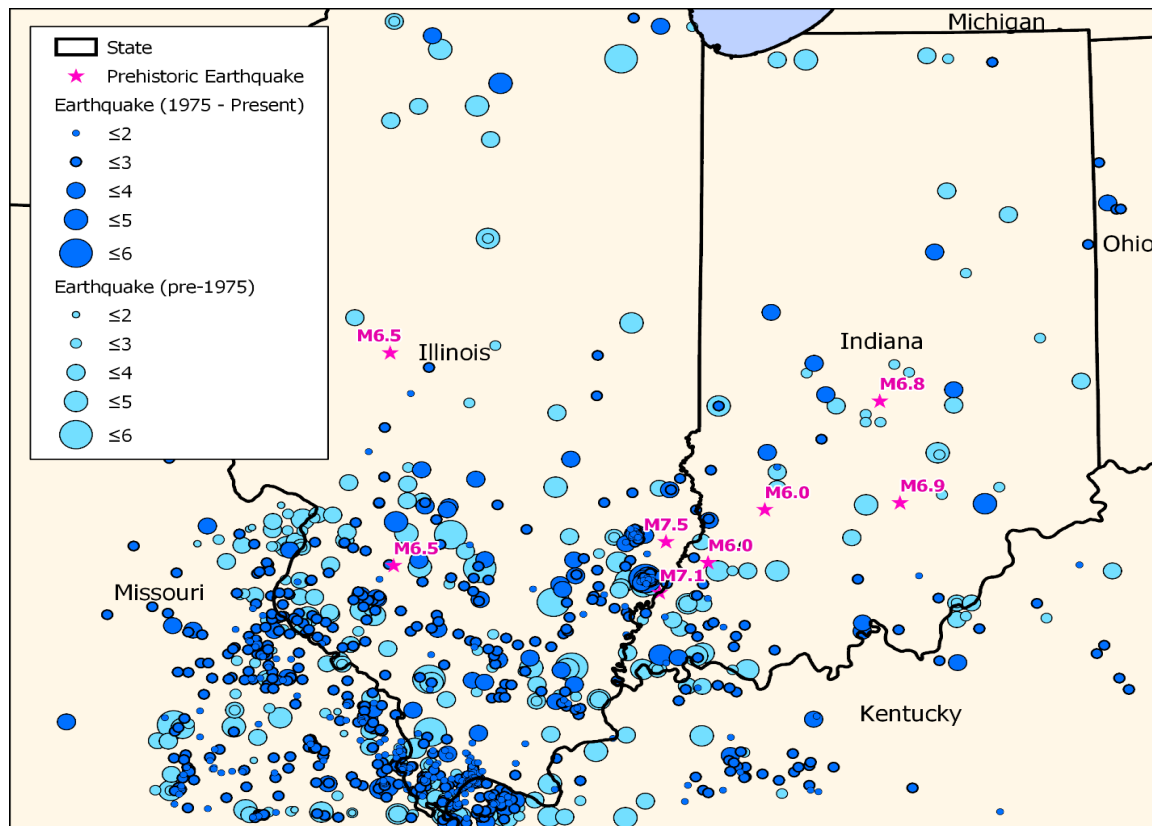


- 1965 Palm Sunday Tornado Event
 - 47 Tornadoes
 - 271 deaths (145 Indiana)
 - 1,500 Injuries (1,200 Indiana)
 - \$5.5 billion in damages



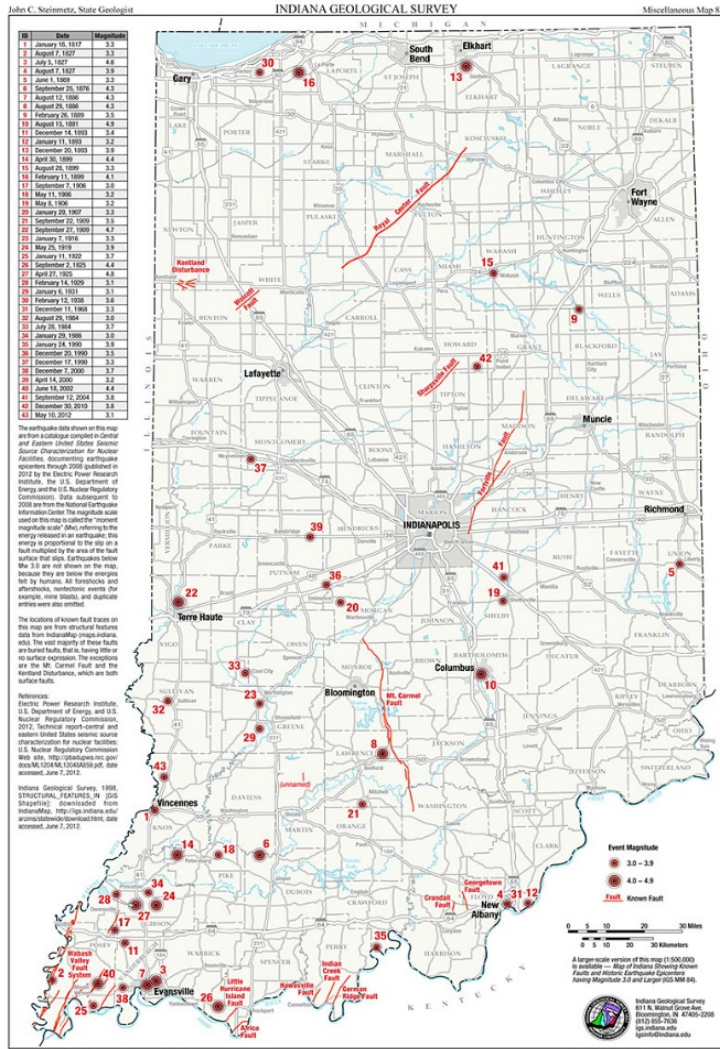


INDIANA EQ FAULTS & HISTORIC EPICENTERS

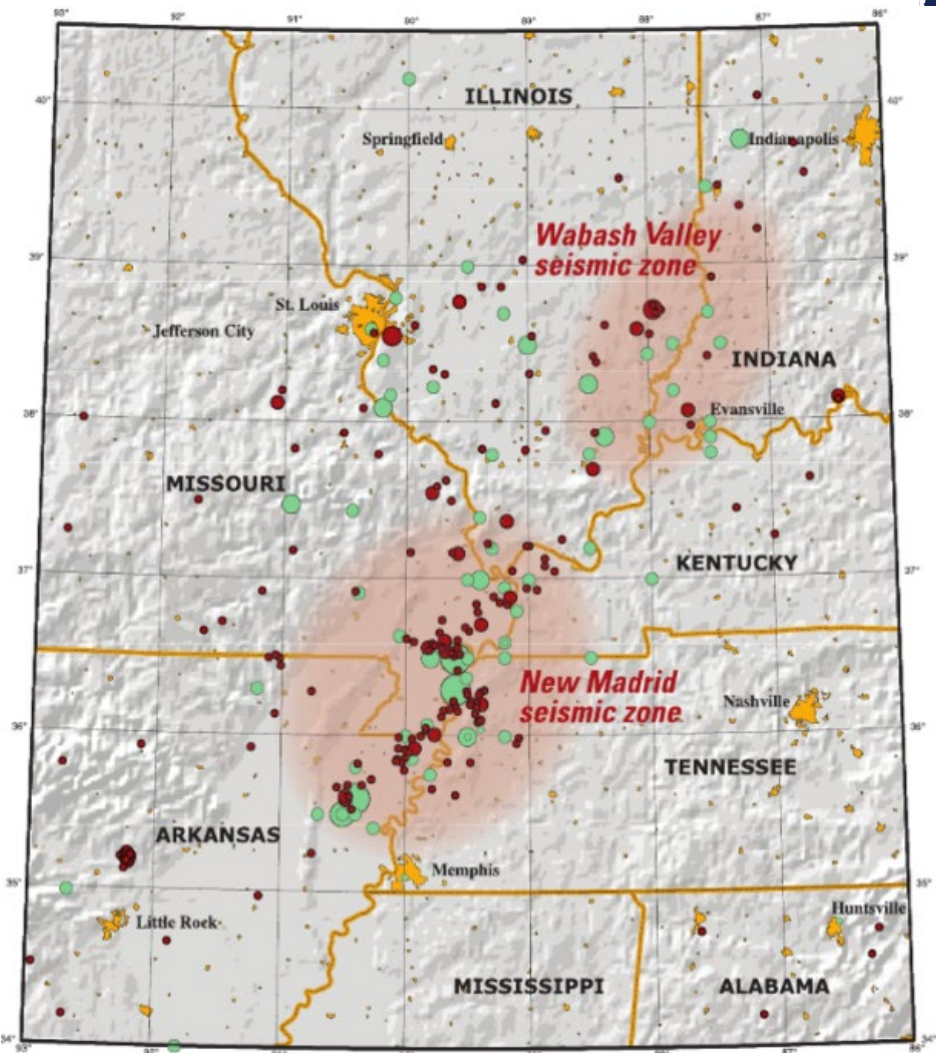


Ten-percent probability of exceedance in 50 years map of peak ground acceleration

INDIANA EQ FAULTS & SEISMIC ZONES



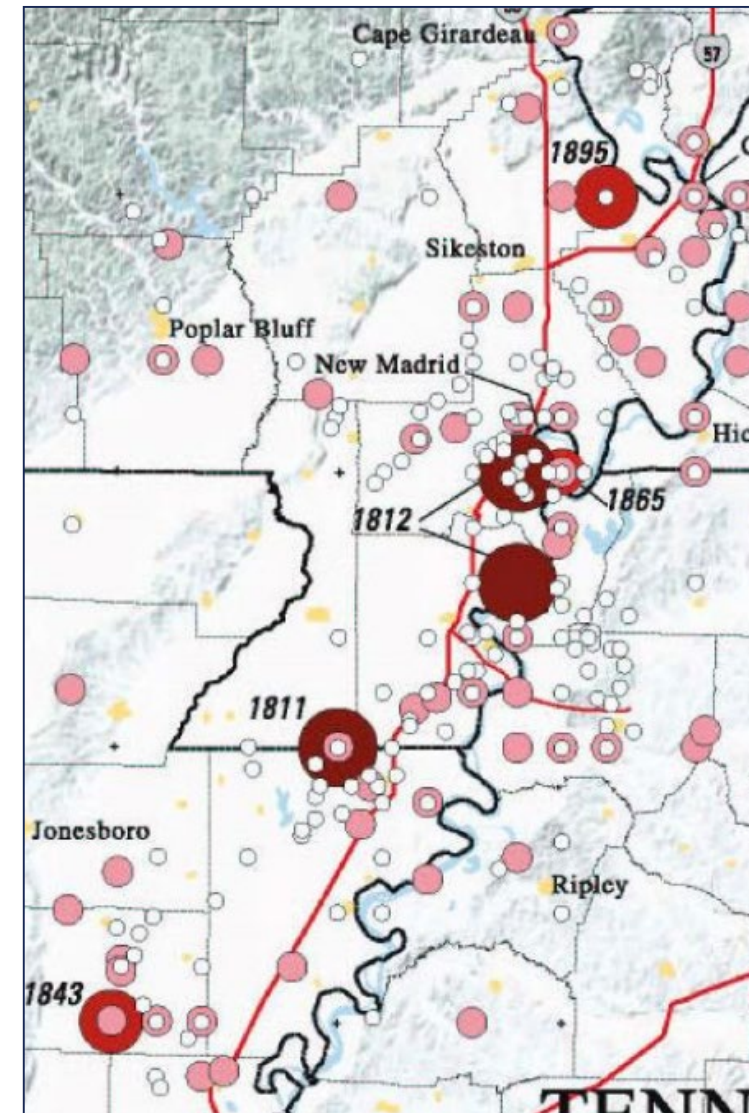
Map Showing Known Faults and Historic Earthquake Epicenters having Magnitude 3.0 and Larger in Indiana
 by
 Walter E. Gray and John C. Steinmetz
 2012



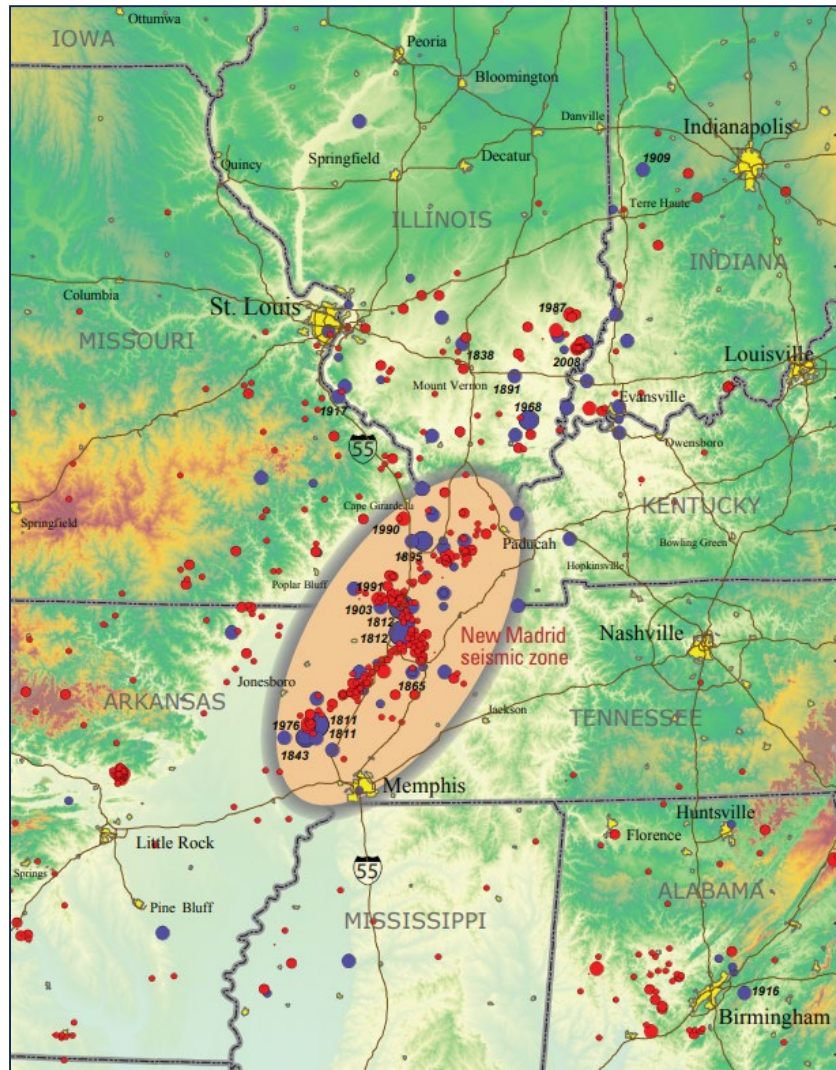
HISTORY OF 1811-1812 NEW MADRID



- Winter of 1811-1812
- New Madrid sequence consisted of three large earthquakes:
 - M~7.5 on December 16, 1811
 - M~7.3 on January 23, 1812
 - M~7.5 on February 7, 1812
- Hundreds of moderate level aftershocks follow...



HISTORY OF 1811-1812 NEW MADRID

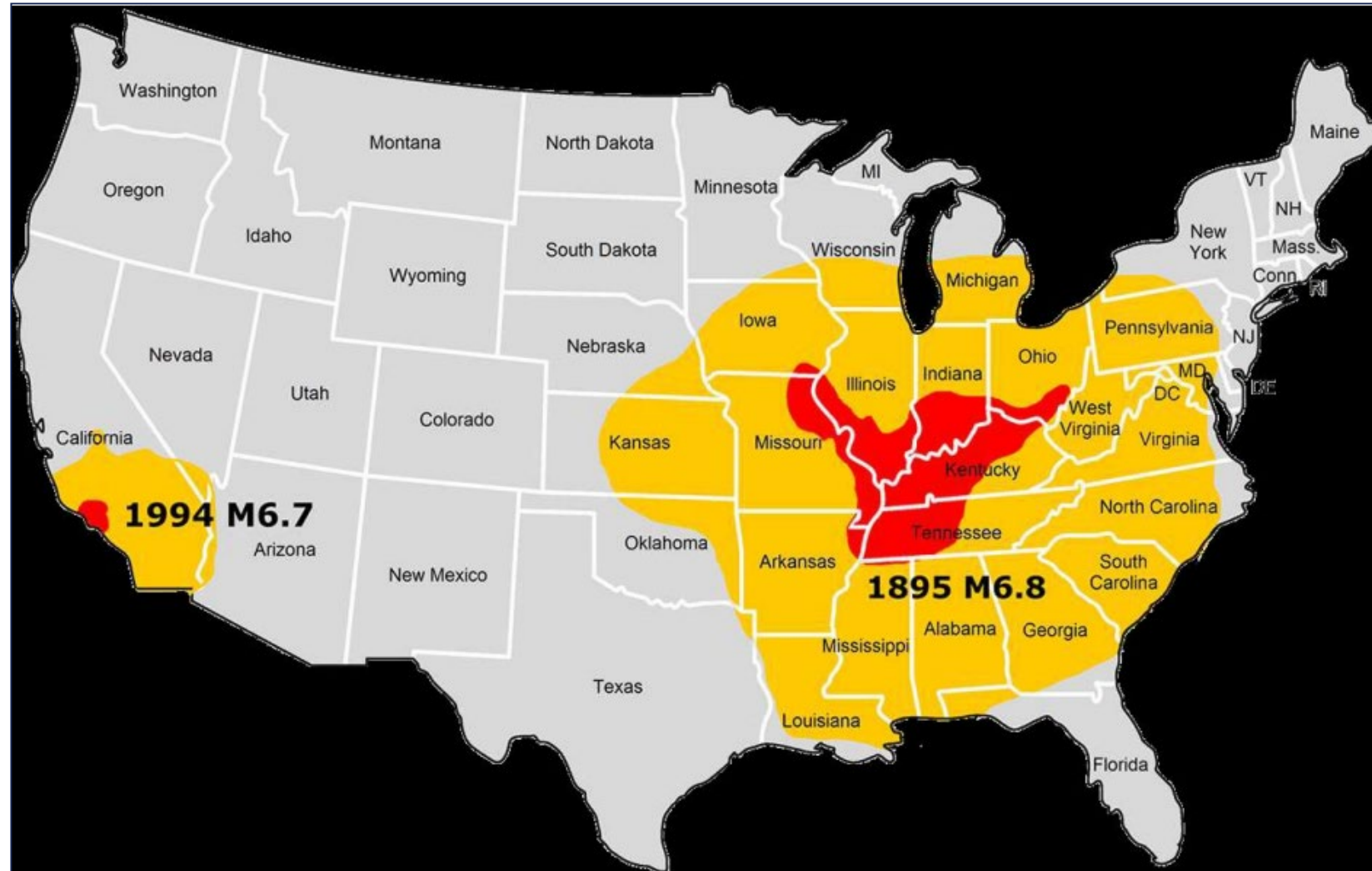


- The first earthquake was followed by 6 aftershocks in the range M5.5-6.3 in the first 2 days alone.
- The geologic record of pre-1811 earthquakes reveals that the New Madrid seismic zone has repeatedly produced sequences of major earthquakes, including several of magnitude 7 to 8, over the past 4,500 years.

GEOGRAPHIC REACH – 10X GREATER



- For similar magnitude earthquakes, shaking area is about **10 times** greater in the central and eastern U.S.



WIDESPREAD EFFECTS



Widespread Effects from 1811-12 Earthquakes:

- Numerous reports of landslides, ground failures and uplifts, sand blows, etc.
- Church bells rang in Charleston, SC
- New U.S. Capitol in D.C. damaged
- Sidewalks cracked in Cleveland
- Earthquakes were felt as far away as Canada and the Caribbean

CASCADING THREATS

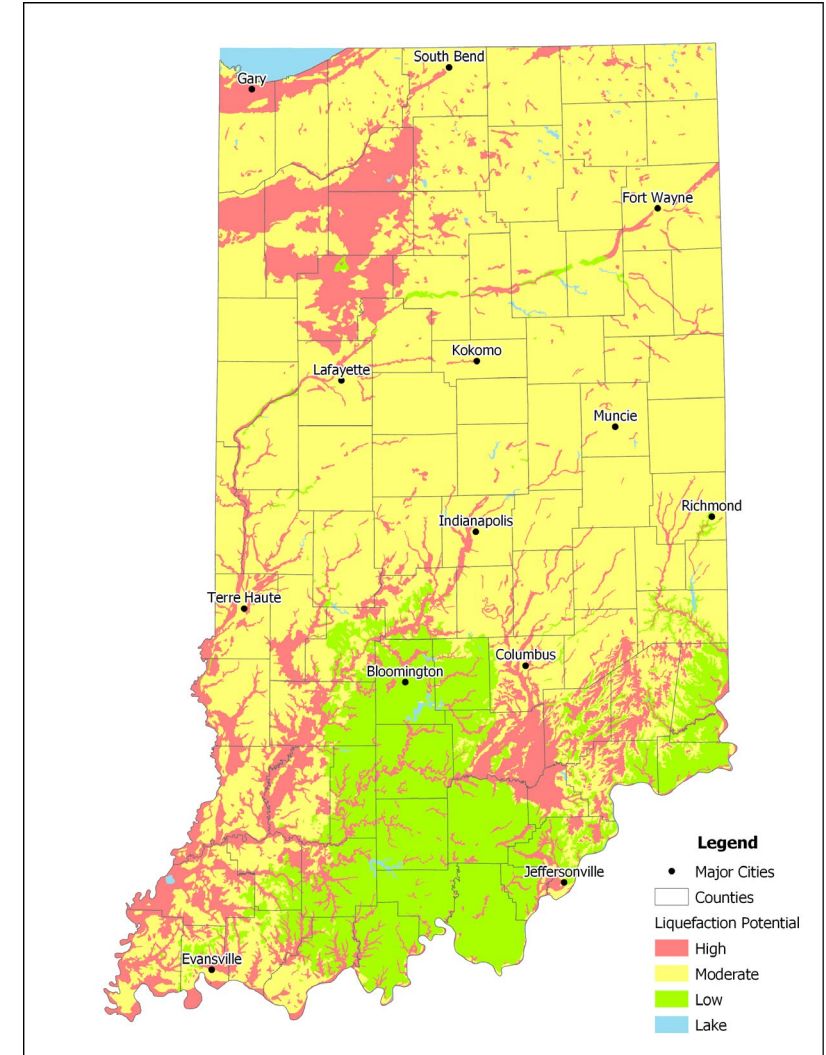


- Liquefaction
- Unreinforced Masonry Buildings
- Gas/Water Lines broken – Fires
- Watch out for broken glass, tripping on debris
- Beware of aftershocks
- Can happen anytime, without warning!

LIQUEFACTION POTENTIAL



- Secondary effect of earthquakes as the strength of the soil is modified by earthquake shaking.
- Responsible for tremendous damage
- Turns normally solid soils into “quicksand”
- Can also lead to major subsidence, fracturing, and horizontal sliding of ground surface.



LIQUEFACTION



UNREINFORCED MASONRY BUILDINGS



RUPTURED GAS LINES



Example: Fire and lateral spread caused by the 1994 Northridge earthquake. The ground in the lateral spread slid to the right, riding on liquefied sediment, and opened the fissure. Extension across the fissure stretched and broke the natural gas pipeline, causing the fire.

CHRISTCHURCH, NEW ZEALAND 2010 (BEFORE)



- 2011 Christchurch Earthquake: 6.2 Magnitude
- 361 aftershocks within the first week
 - Ranging 6.0-5.0






CHRISTCHURCH, NEW ZEALAND 2014 (AFTER)



- Became 2nd → 3rd most populous city in New Zealand after event
- 185 individuals were killed
 - *Mainly due to weak, unreinforced masonry buildings*

BENEFITS OF MITIGATION & RESILIENCE



National Benefit-Cost Ratio Per Peril <small>*BCR numbers in this study have been rounded</small>		Exceed common code requirements	Meet common code requirements	Utilities and transportation	Federally funded
Overall Hazard Benefit-Cost Ratio		4:1	11:1	4:1	6:1
 Riverine Flood		5:1	6:1	8:1	7:1
 Hurricane Surge		7:1	Not applicable	Not applicable	Too few grants
 Wind		5:1	10:1	7:1	5:1
 Earthquake		4:1	12:1	3:1	3:1
 Wildland-Urban Interface Fire		4:1	Not applicable	Not applicable	3:1

“MITIGATION SAVES” REPORT



- National Institute of Building Sciences “Mitigation Saves” Report
 - Adopting Model Codes Saves \$11 per \$1 Spent (for adopting the 2018 IRC)
 - Projected these actions alone would prevent 600 deaths, 1 million nonfatal injuries, and 4,000 cases of post-traumatic stress disorder
 - Designing new buildings to exceed the 2015 IRC and IBC would result in 87,000 new, long-term jobs, and an approximate 1% increase in utilization of domestically produced construction materials.
 - Communities consistently meet the latest editions of commonly adopted code requirements, culminating in the 2018 IRC and IBC have added 30,000 new jobs to the construction-materials industry and an approximate .3% increase in utilization of domestically produced construction materials for each year of new construction over what it would have been if buildings were designed as they were in 1990.



TOTAL COSTS & BENEFITS OF MEETING THE 2018 IRC & IBC

Benefit: \$13 billion

46% – Property: \$7

23% – Additional living expenses and direct business interruption: \$3

12% – Casualties and PTSD: \$1

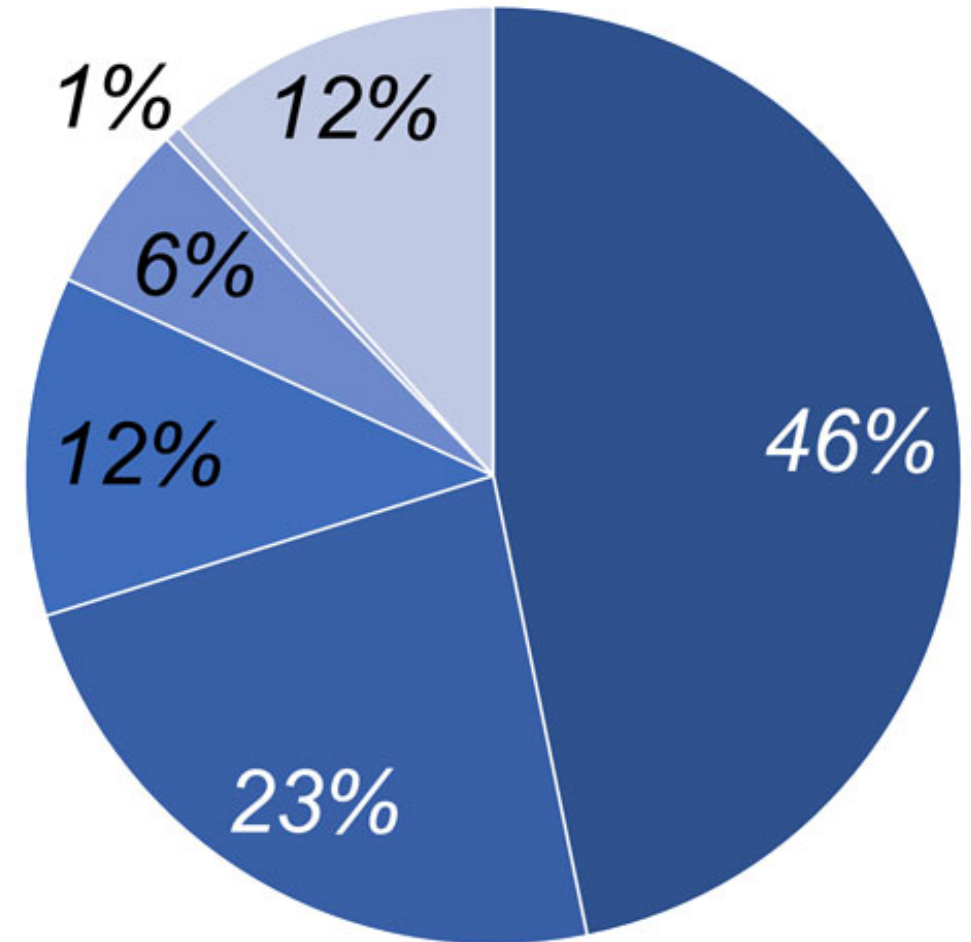
12% – Indirect business interruption: \$1

6% – Insurance: \$1

1% – Urban search and rescue: \$0.02

Billions 2018 USD

Cost: \$1.2 billion



PREPAREDNESS & MITIGATION ACTIONS



- Jurisdictional Actions

- Encourage the purchase of hazard specific insurance (Flood, EQ, Sewer back up)
- Consider adopting stronger building codes
- Support compliance for the National Flood Insurance Program
- Consider future risks in ALL community development planning
- Promote research, education, and outreach to expand knowledge of disasters and impacts
- Implement hazard specific Mitigation projects (flood acquisitions, safe rooms, building code upgrades, outdoor warning sirens)

PREPAREDNESS & MITIGATION ACTIONS



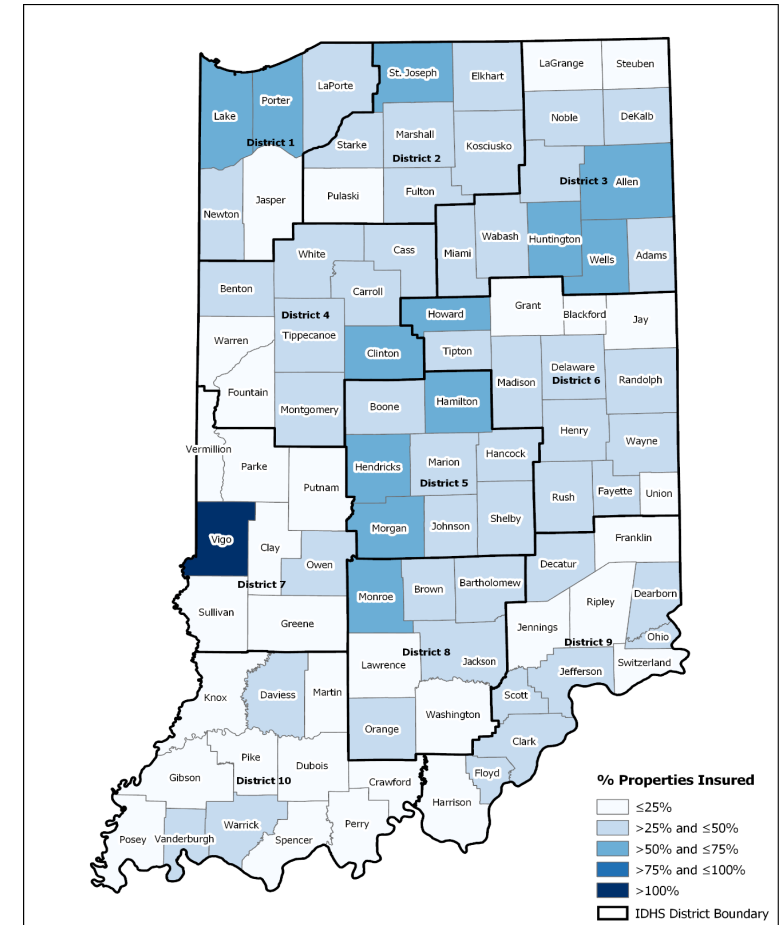
- Individual Actions
 - INSURANCE INSURANCE INSURANCE!!!!!!!!!!!!!!
 - Educate yourself on risks you in your area
 - Family preparedness and reunification plans
 - Family preparedness kits
 - Smoke detectors
 - Weather Radios
 - Avoid living in special risk areas
 - Organize important documents
 - Plan for pets (food, medicine, allowed in shelters)
 - Plan for continuity of operations and government



Indiana Flood Insurance: by the numbers



Number Policies	Total Coverage	Total Buildings in the SFHA	Total Replacement Cost of Buildings in SFHA	Approximate % of Buildings Insured
21,777	\$4,384,909,000	57,377	\$5,254,196,216	38%



STATE (IDHS) & LOCAL PARTNERSHIP MITIGATION EFFORTS



- More than 1,400 acquisitions of properties with flood risk/damage
- 20 Outdoor Warning Systems installed
- 21 Individual Safe Rooms installed
- 3 School Safe Rooms being installed
- 2 Boy Scout Camp Safe Rooms installed
- Earthquake Retrofits of 2 Hospitals and 4 Fire Stations
- Earthquake Education and Outreach
- Low Head Dam Initiatives
- All 92 Counties have (in process or have received funding) developed current FEMA approved Local Hazard Mitigation Plans (83% of Indiana residents covered)
- 2003-2020 \$86,306,254 Federal Mitigation funds awarded to Indiana
- IDHS member of the Silver Jackets Risk Reduction Task Force



QUESTIONS?