

SONS07 2007

Douglas N. Eames

Interagency Exercise Director



What happened 200 years ago

In 1811-1812 three earthquakes, magnitude 7.5-8.0, struck the Mississippi Valley; Thousands of aftershocks followed



Riverbanks caved



Riverbanks Falling In—Missouri River
Courtesy of the State Historical Society of Missouri,
Columbia, Mo.

Vast tracts of land sank and
were uplifted



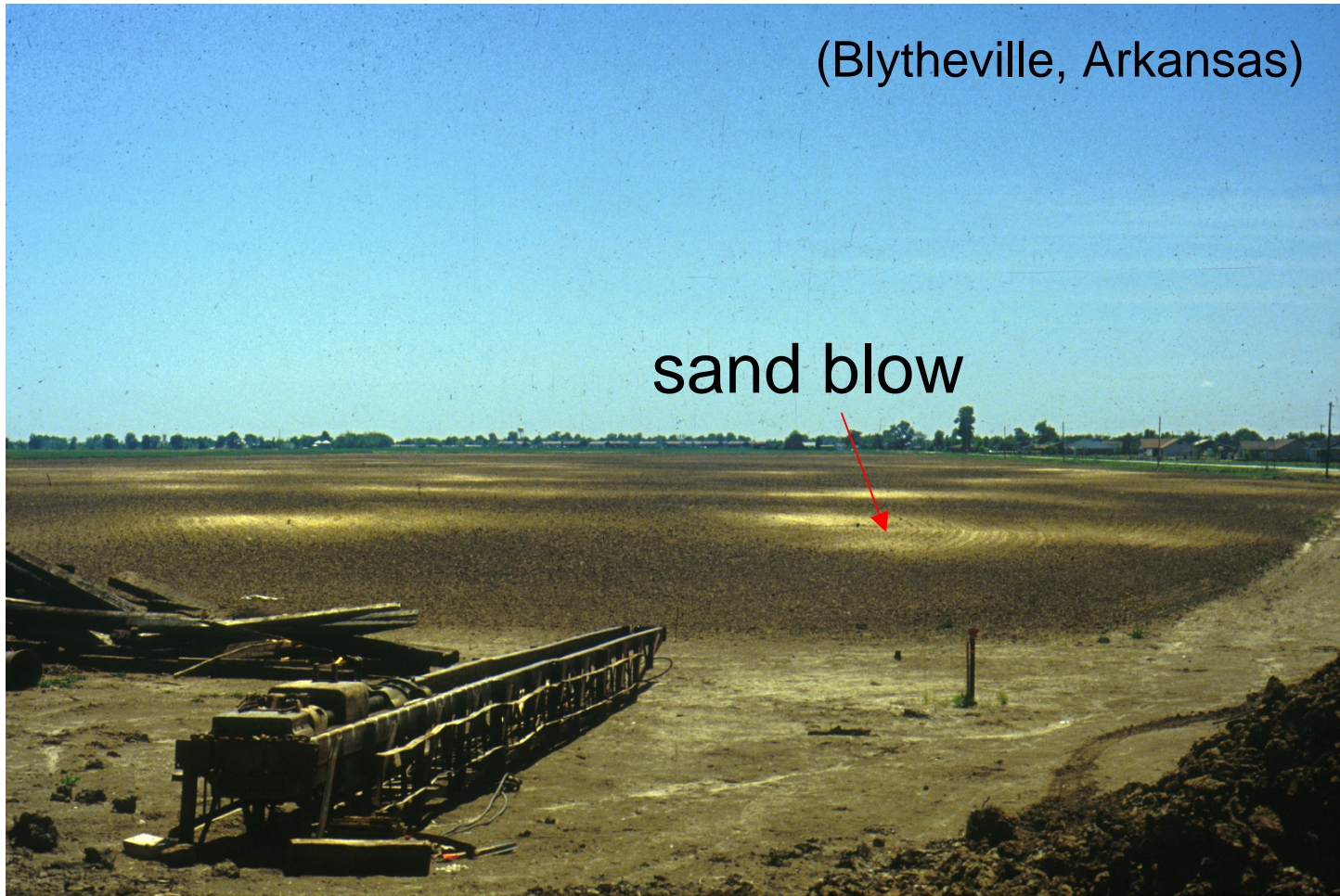
Landslides occurred all along the bluffs



What remains today...

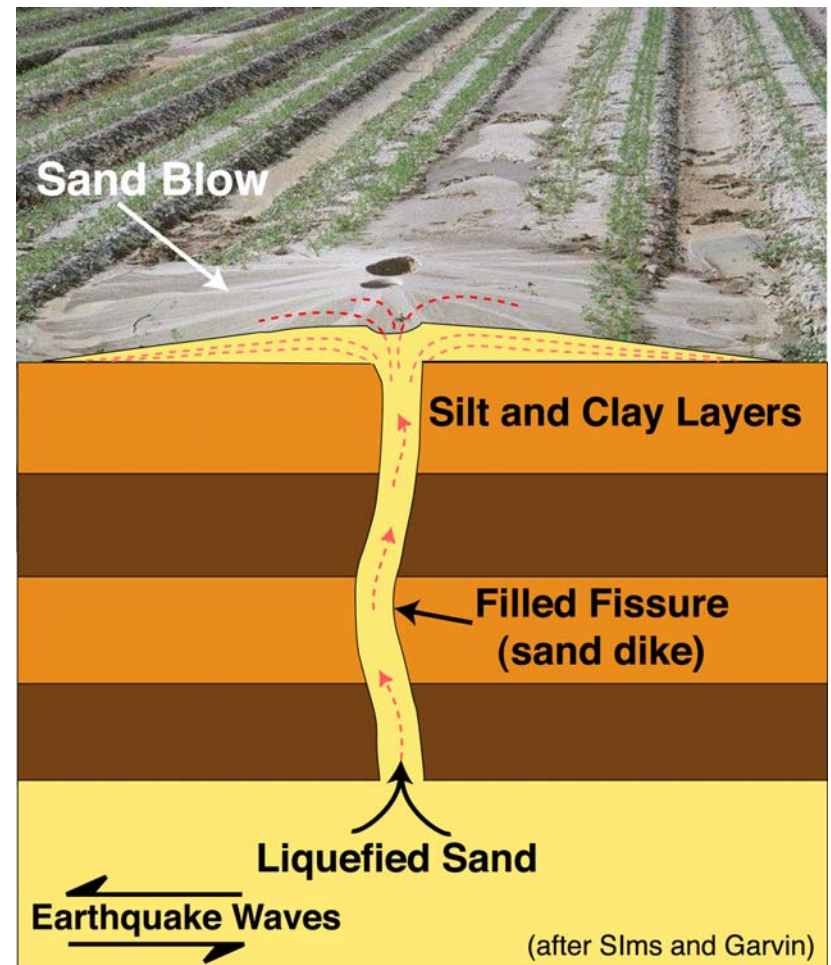
(Blytheville, Arkansas)

sand blow



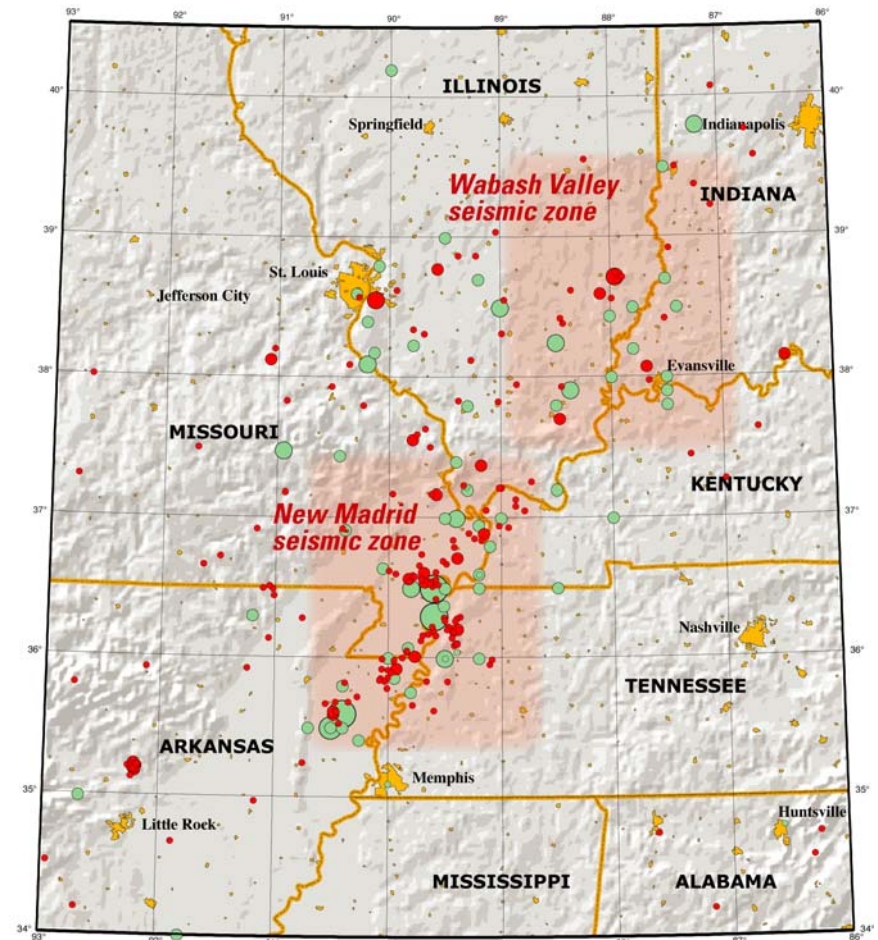
Liquefaction and Sand Blow Formation

During strong ground shaking, water pressure in wet, loose sand increases until the sand loses its strength and acts like a liquid, finally erupting to the ground surface through fissures, forming sand blows.



What's the situation today?

**Earthquakes
continue up and
down the Mississippi
Valley as well as
along the Wabash
Valley and south
Central Illinois**



What do we expect in the future?

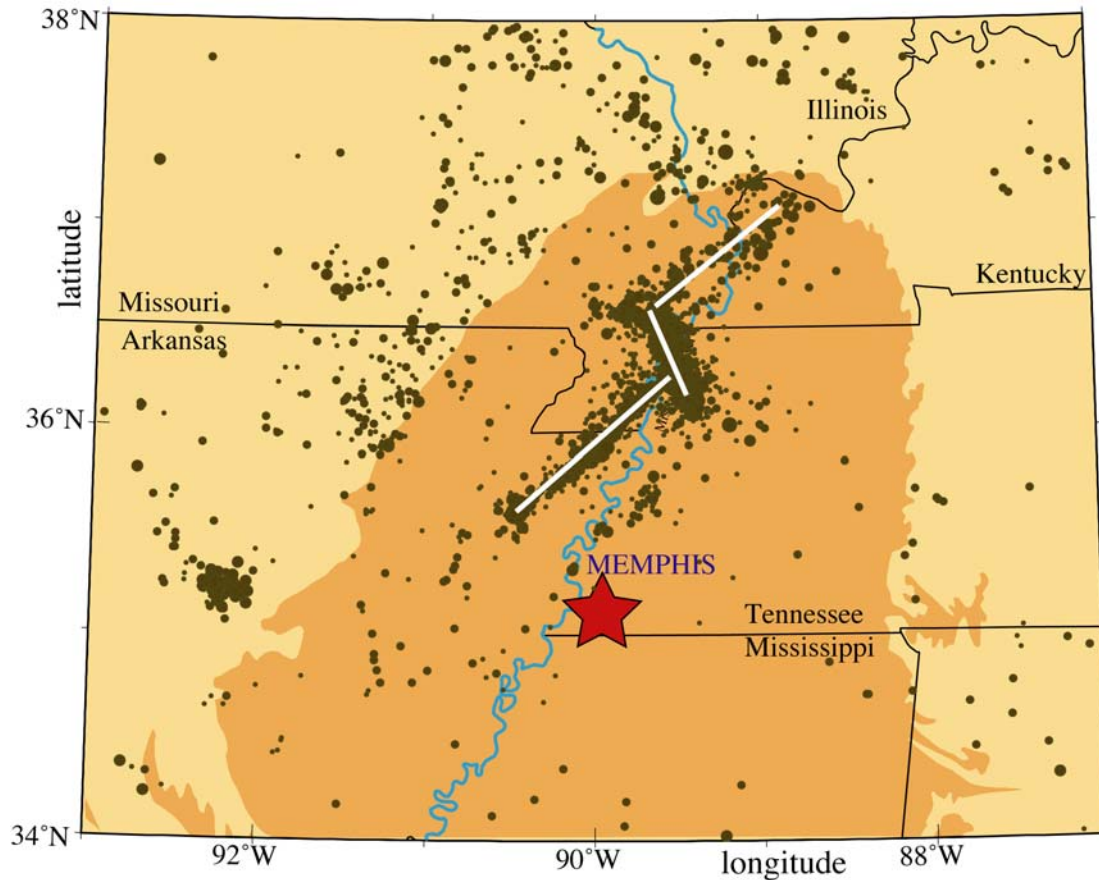
- About a 10% chance of an earthquake similar in size to the 1811-1812 earthquakes (about magnitude 7.7)
- Likely to be a sequence
- May trigger other more distant earthquakes

How do we estimate the likelihood of future earthquakes?

- We study the record of buried sand blows
- Prehistoric earthquakes in 900 and 1450 A.D.



Where will future earthquakes occur?

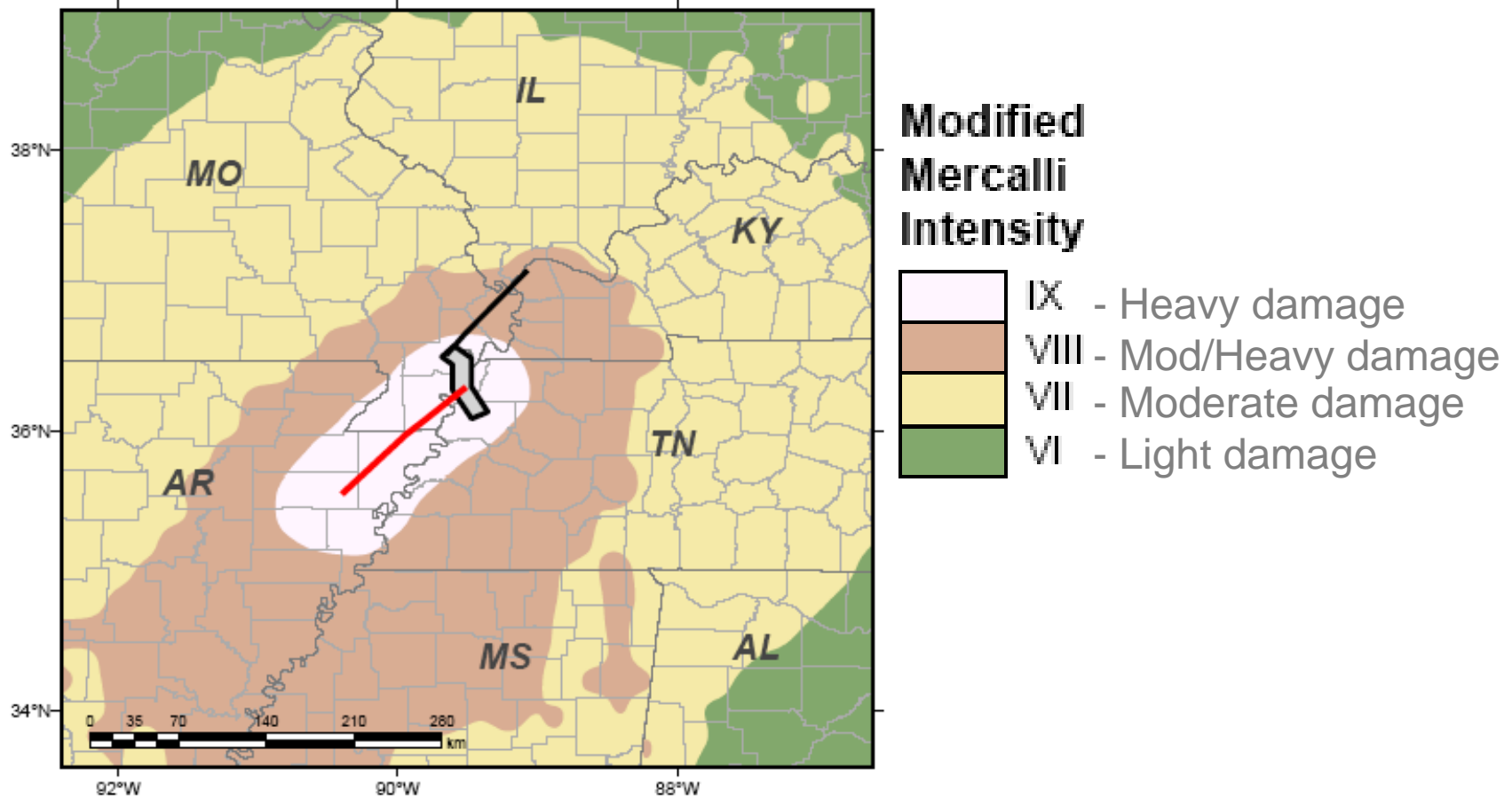


- Safe to assume the same faults will rupture as in 1811-1812

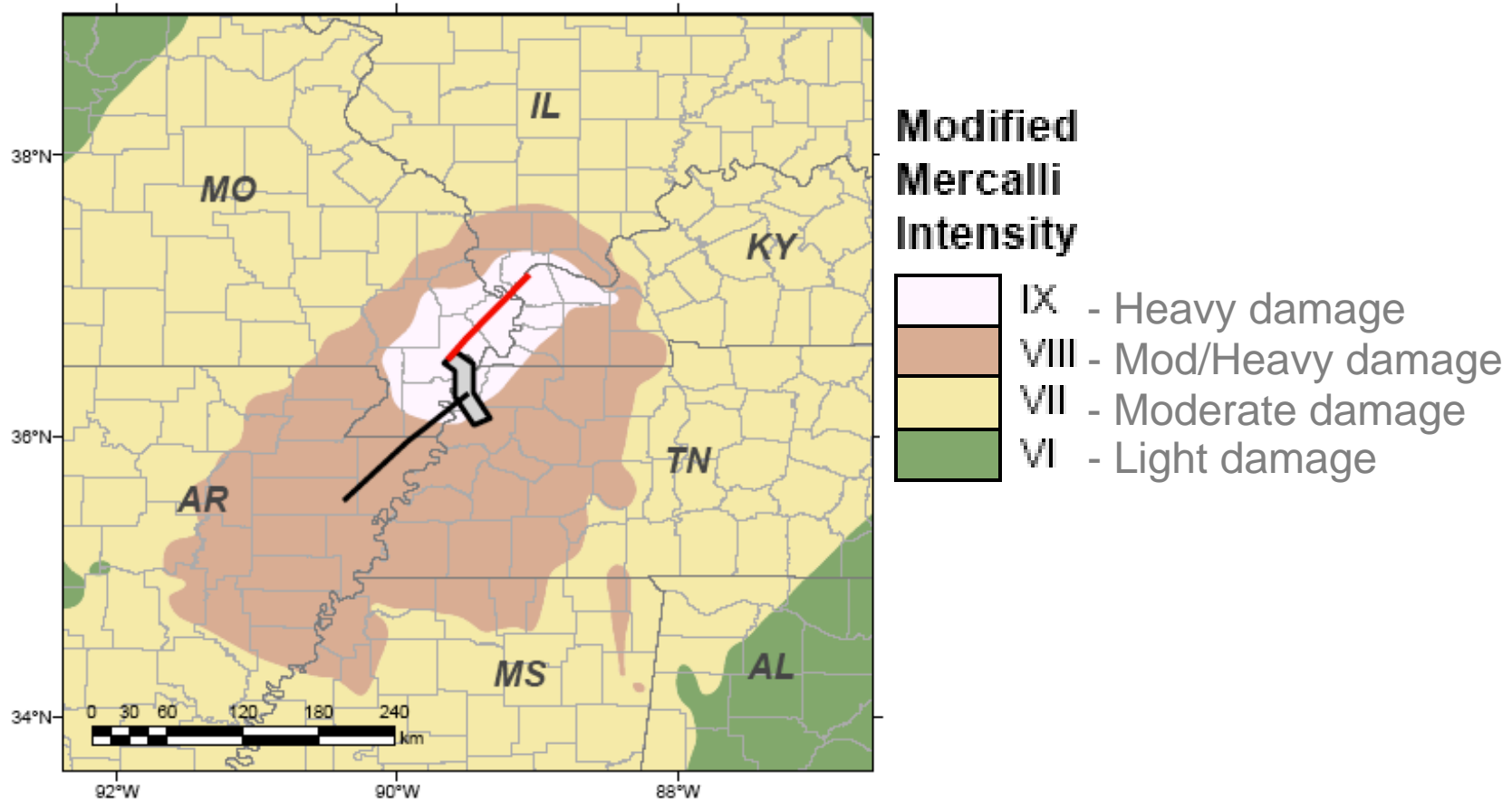
Shaking: Modified Mercalli Intensity Scale

- VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
- VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
- VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
- IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
- X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

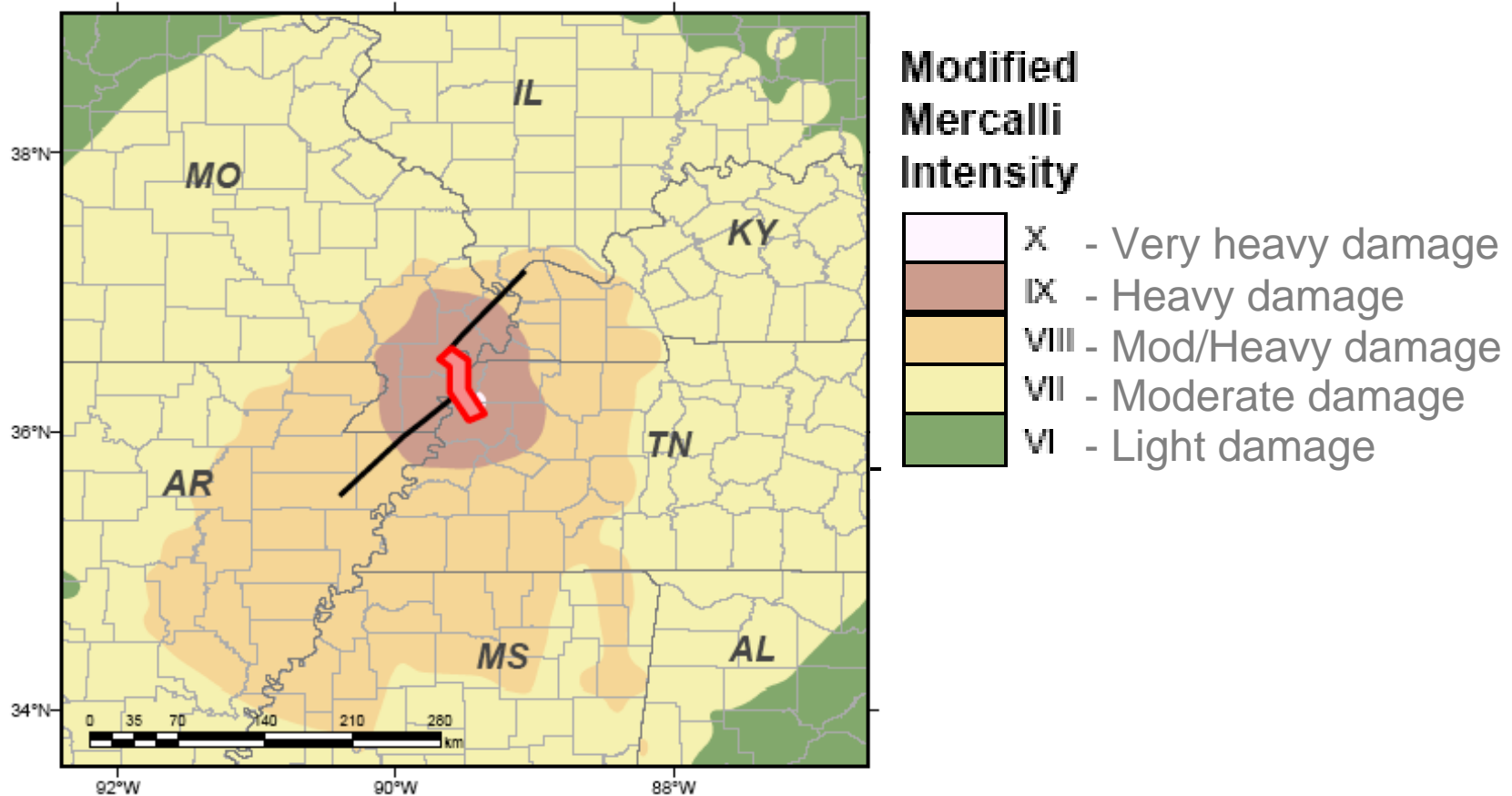
Scenario Intensity Map: M 7.7 Southwest Segment New Madrid Seismic Zone



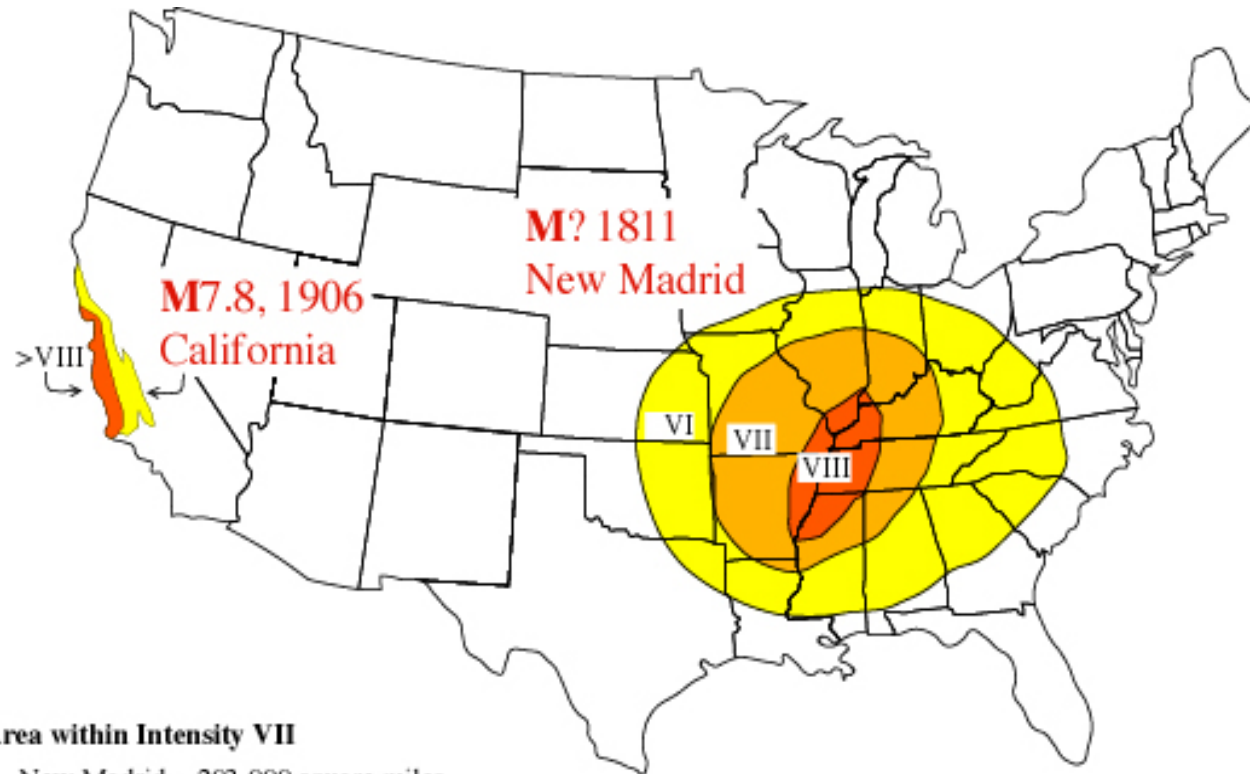
Scenario Intensity Map: M 7.7 Northeast Segment New Madrid Seismic Zone



Scenario Intensity Map: M 7.7 Central Segment New Madrid Seismic Zone



in the central & eastern U.S., earthquakes affect much larger areas than in the west

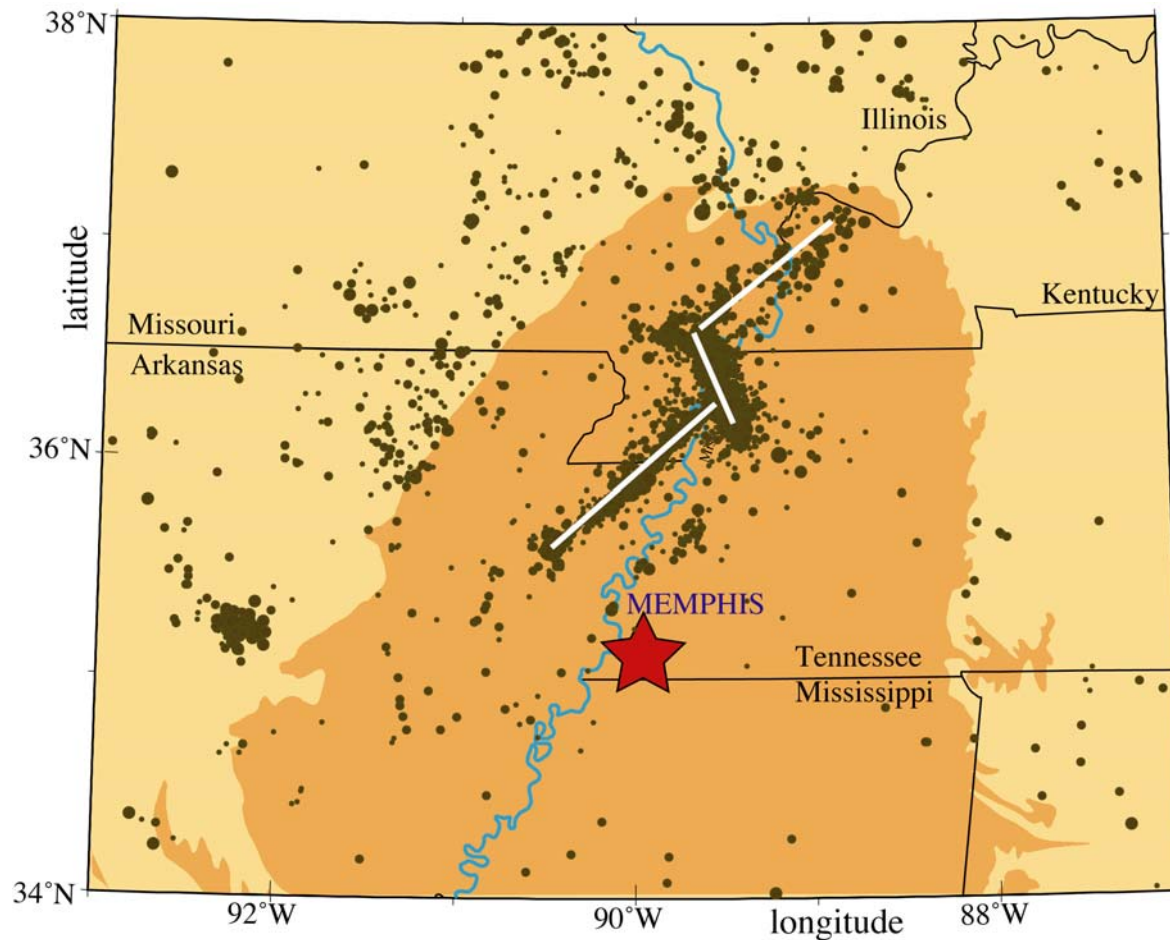


Area within Intensity VII

New Madrid = 203,000 square miles

San Francisco = only 12,000 square miles!

Double Whammy: The Mississippi Valley sediments can also significantly increase the shaking



Damage from Shaking

- Most buildings in the region were built before the advent of codes that took earthquake shaking into account
- Same for much of the infrastructure

Liquefaction

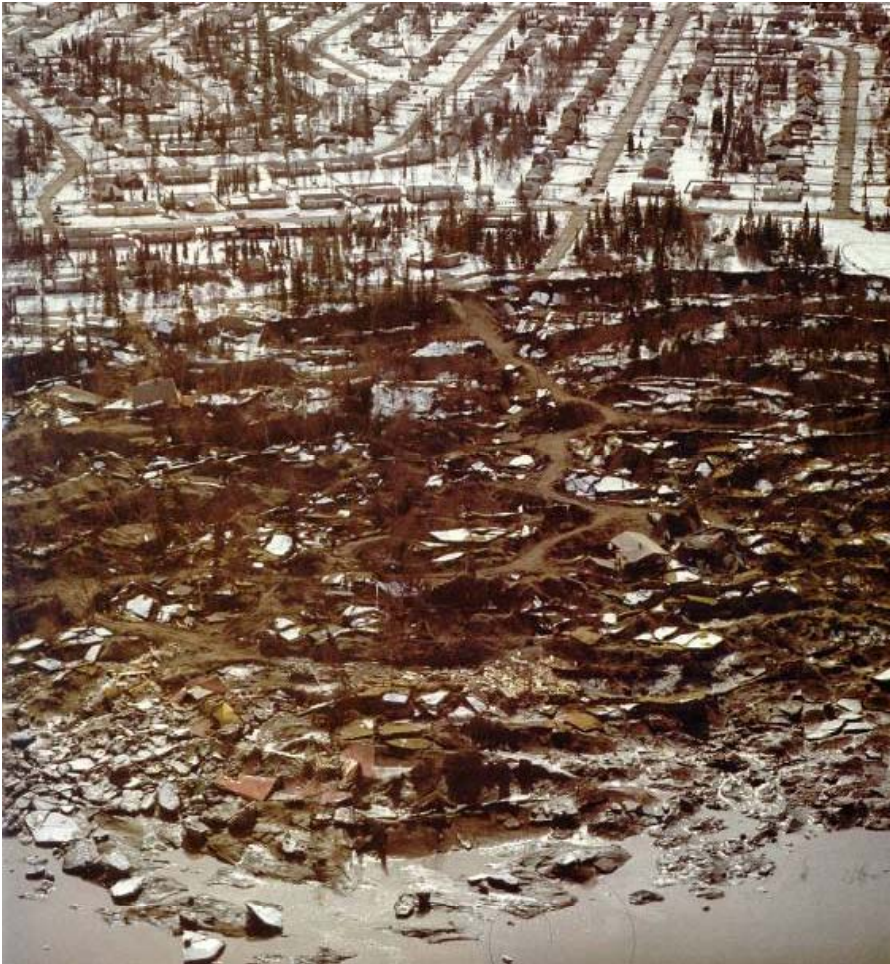


- There is no place in the world that has experience such intense liquefaction over such a broad region as the New Madrid seismic zone
- In 1811-1812, fields over tens of thousands of square miles covered in sand, mud, and water

Liquefaction: Loss of bearing strength

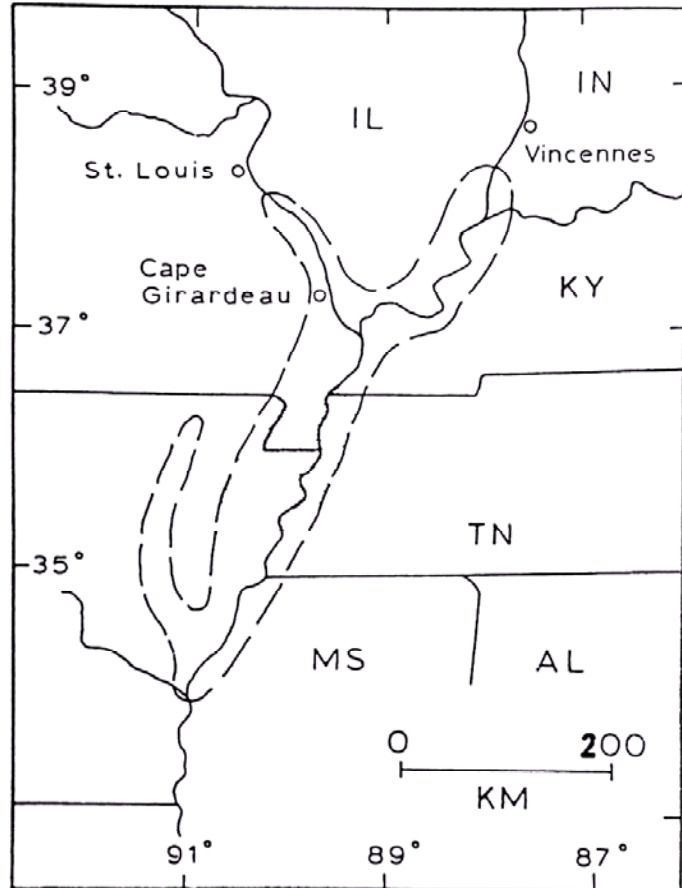


Liquefaction: Lateral spread landslides



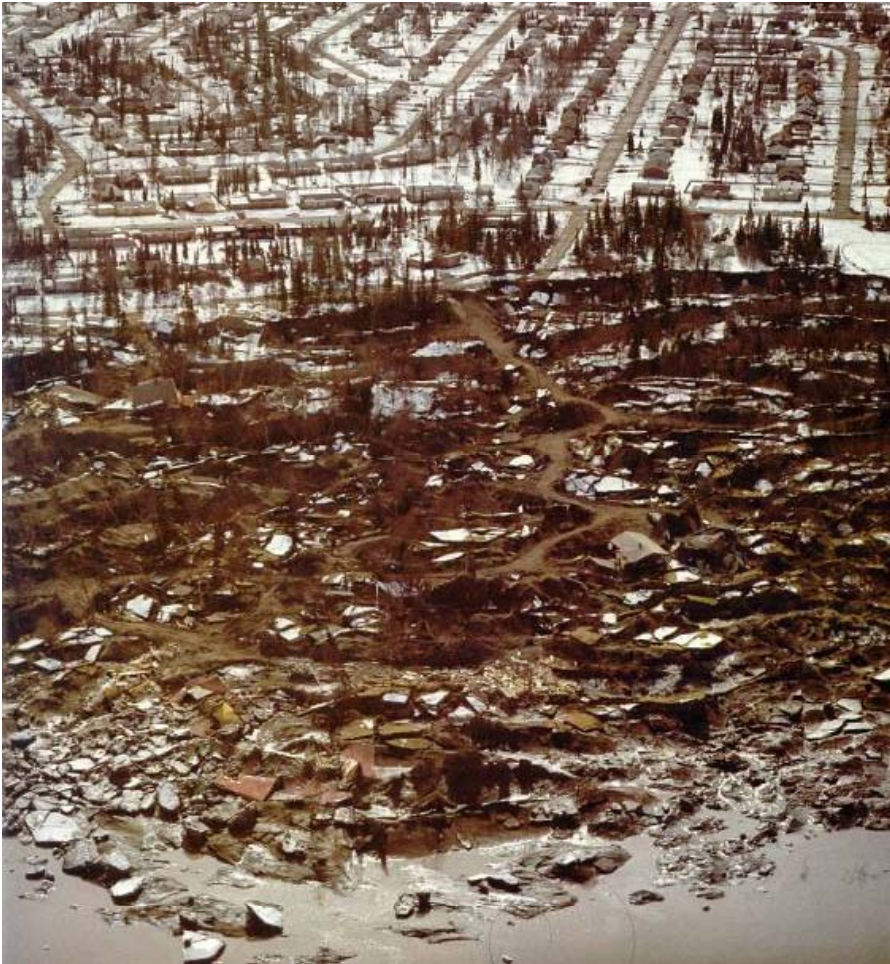
- With the slightest slope, soil over liquefied sand will move downhill
- Responsible for much of the failure of the bluffs, loss of islands, etc. in 1811-1812

Liquefaction and Landslides



Area of major ground failures (liquefaction and landslides) in 1811-1812 (Myron Fuller, USGS, 1912)

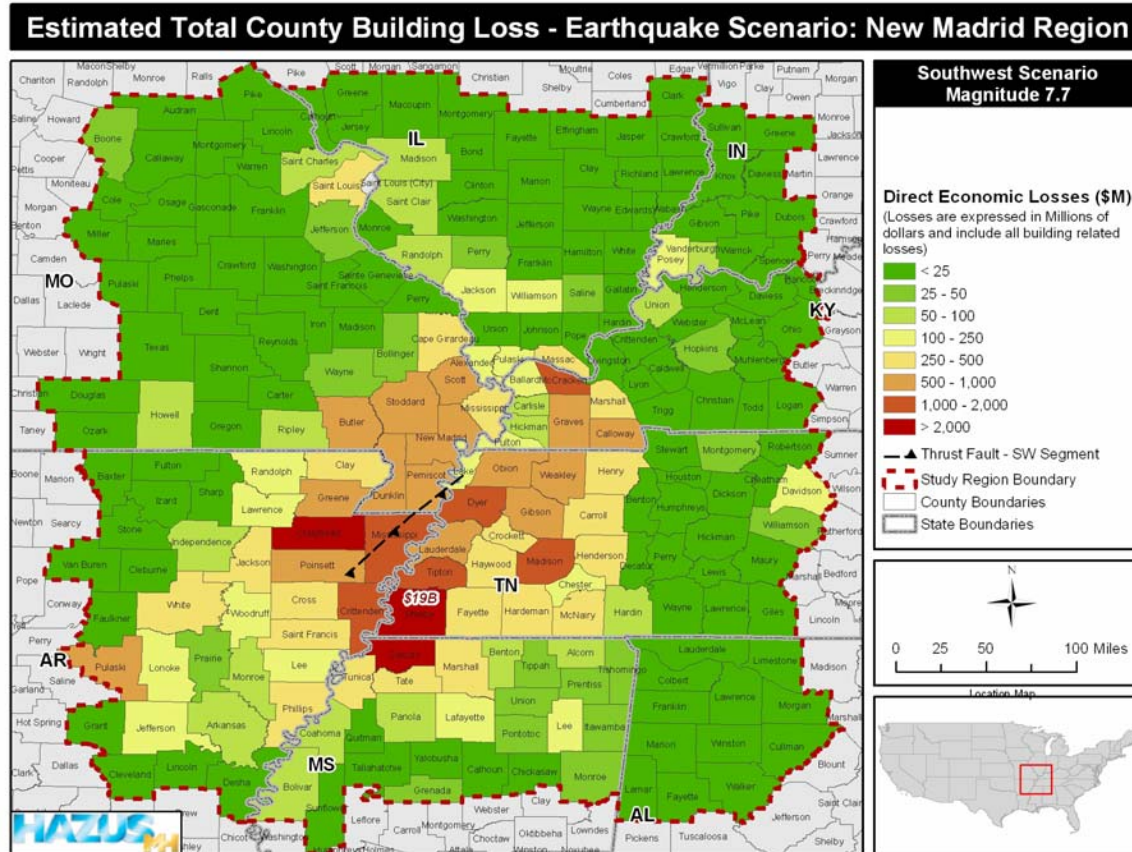
Liquefaction and Landslides: Likely consequences



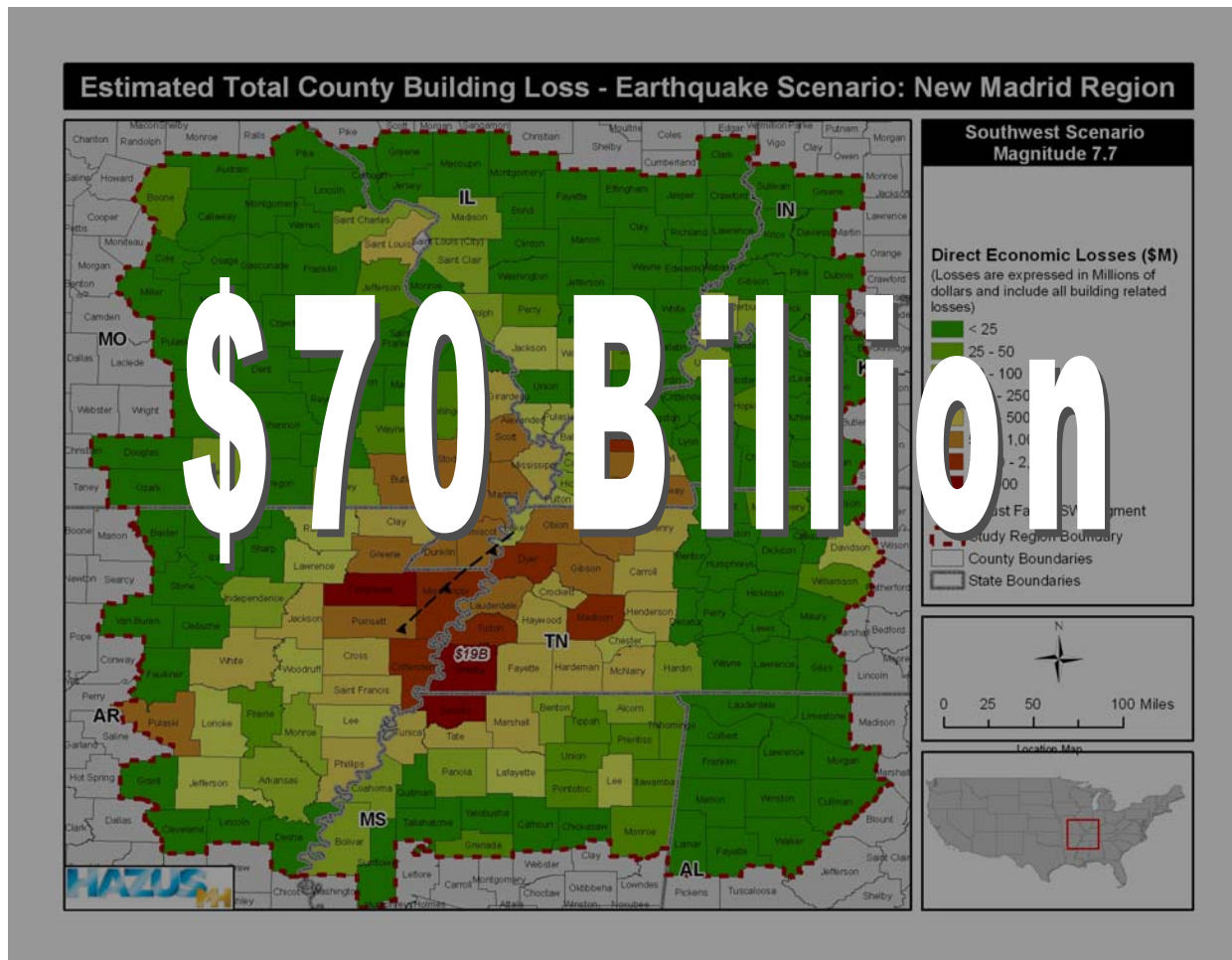
- A magnitude 7.7 earthquake today will likely cause:
 - Failure of bluffs
 - Failure of earthen levees
 - Local loss of navigation
 - Failure of bridge supports and approaches over a very large region
 - Roadways impassible in low-lying areas
 - Rupture of pipelines and cables crossing the Mississippi and other rivers
 - Buried tanks may float to the surface, breaking connections

Estimates of Losses

- Magnitude 7.7, southwest arm



Estimates of Losses



- Magnitude 7.7, southwest arm

SONS 07

Exercise Vision

It is our vision to conduct a national-level exercise that provides an environment for an unprecedented level of cooperation throughout all levels of government, industry and non-governmental organizations in response to a major natural disaster. The impacts to critical infrastructure, public health, public safety and security, and the environment (oil spill and hazardous material releases) will offer broad opportunities to practice plans and procedures. This robust participation, will create sustainable integrated solutions and foster relationships that are essential to maintaining public health and safety, national security, economic stability, and public confidence.

SONS 07

Historical Development

- Spill of National Significance Program
 - EPA and USCG Requirement
 - First Exercise in Fresh Water
 - First Exercise Initiated by a Natural Disaster
- FEMA Catastrophic Planning Initiative
 - FEMA Headquarters Planning Initiative
 - CUSEC: Regional and State Level Planning
- Combined Exercise Opportunities
 - Opportunity to Capitalize on Recent Natural Disaster Lessons Learned

A PARTNERSHIP

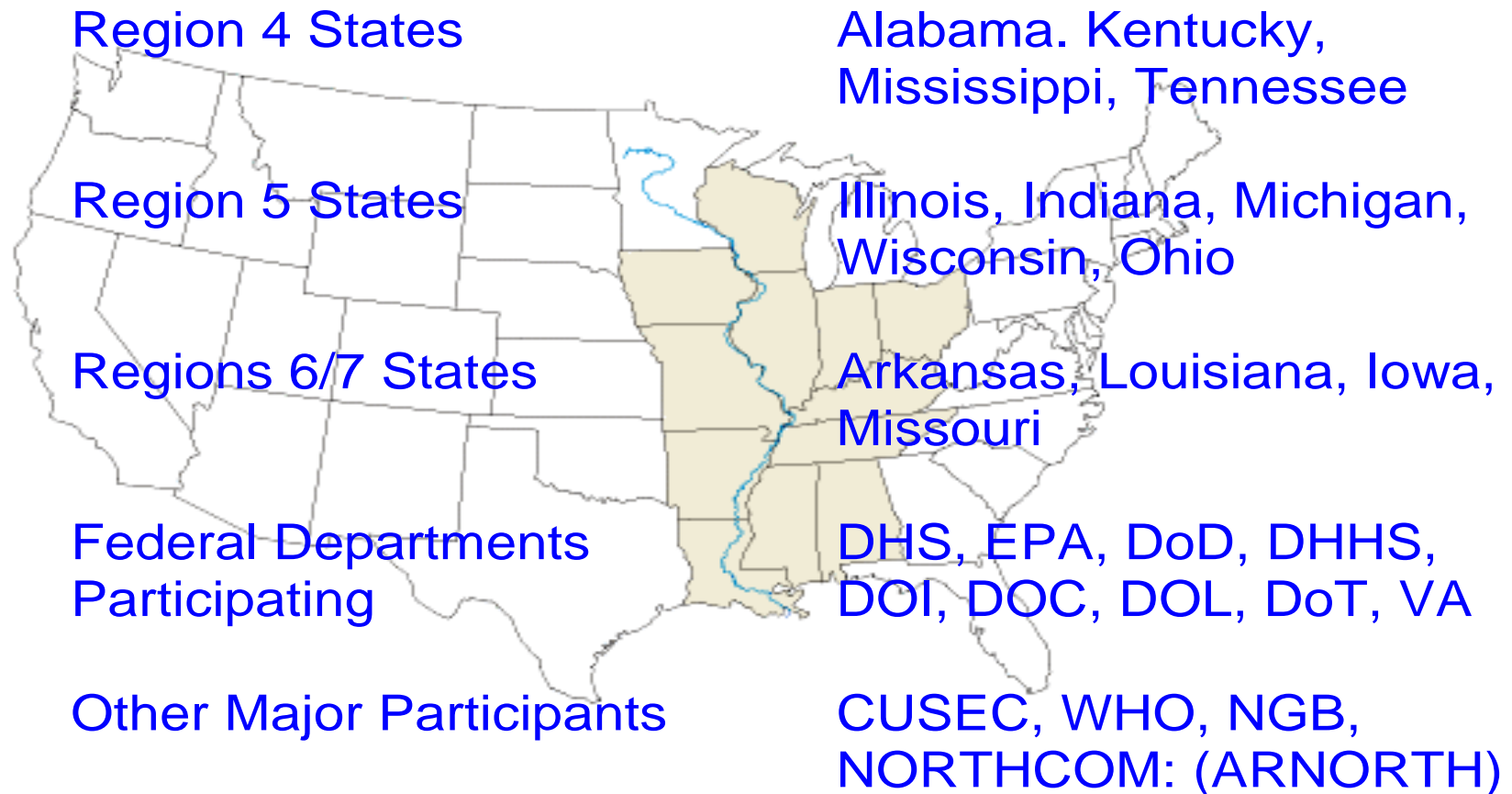
From the beginning, the SONS 2007 exercise has been a joint effort and partnership

The Partnership is led by the EPA, USCG, FEMA CUSEC and API

The planning organization is a multi-agency collaborative effort at national and regional levels

SONS 07

Participants



SONS 07

Exercise Design

- **Two-Stage Exercise**
 - **Two Consecutive Weeks**
 - Execute June 2007
 - **Week 1**
 - Full Scale Exercises
 - Initial Responders
 - **Week 2**
 - Roundtable Discussions
 - Vertical and Horizontal Plan Alignment
 - **30 Days after Full Scale Exercise**
 - Senior Official's Exercise/Seminar

SONS 07

Exercise Design (cont'd)

- **Week 1**
 - **Full Scale Exercise Week 1 (1-5 Days of FSE)**
 - First Responders
 - Damage Assessment
 - Continuity of Government
 - Federal Response Development and Deployment
 - **Multiple Levels of Participation**
 - TTX
 - CPX
 - FSE
 - **Federal Government Organizing for Initial Response**
 - Establish requirements for JFOs
 - First Response

SONS 07

Exercise Design (cont'd)

- **Week 2 (2-3 Days of Discussions)**
 - Table Top Exercise and Roundtable Discussions
 - Focus on ESF/JFO Functionality and Support to the States
 - Vertical and Horizontal Discussions from the ESF Perspective
 - Discussions Groups Could be Led by ESF Lead Agency Representative with a Facilitator
 - Additional Discussion Groups
 - Continuity of Government
 - Industry Focus
 - Politics
 - Economics
 - Media
- **Senior Officials Exercise/Seminar (Washington D.C.)**

SONS 07

Exercise Focus

- **Focus on Validating Plans**
 - Can we do what our Plans say we will do?
 - Do the Plans exist?
 - No Pass/Fail
 - Training and Performance Assessment will occur
- **Do we have Vertical and Horizontal Alignment Between our family of Plans?**
 - Local Jurisdictions to State
 - State to Regional
 - Regional to National
 - Bottom to Top, Top to Bottom, and Cross-Functional

SONS 07

Exercise Scope

- Multiple Levels of Governmental and Industry Participation
 - Local Jurisdictions
 - States
 - Regional
 - National
- Private Industry
 - Oil/hazmat
 - Power
 - Communications
- There May Be as Many as 13 JFOs
 - What will the Federal Response look like?
 - What will be the Initial Response?

SONS 07

Planning Conferences

- Initial Planning Conference
 - February 21-23, 2006
 - Memphis, TN
- Middle Planning Conference
 - October 2006
 - St. Louis, MO
- Final Planning Conference
 - March 2007
 - Memphis, TN

SONS07 2014?

Questions?

www.sons-program.org



SONS 07

2014?

