# MARIANNA ZONE, ARK.

- geologic record of earthquake induced liquefaction older than NMSZ features
- northwest-trending lineament defined by (1-4-m-wide) sand blows near Daytona Beach ••possibly fault controlled 17 km (M6.5)
- 3 or 4 Holocene earthquakes between 5 and 9.6-10.2 ka
- some sand blows are comparable to NMSZ
- M6.7-7.7
- Default to background 0.5

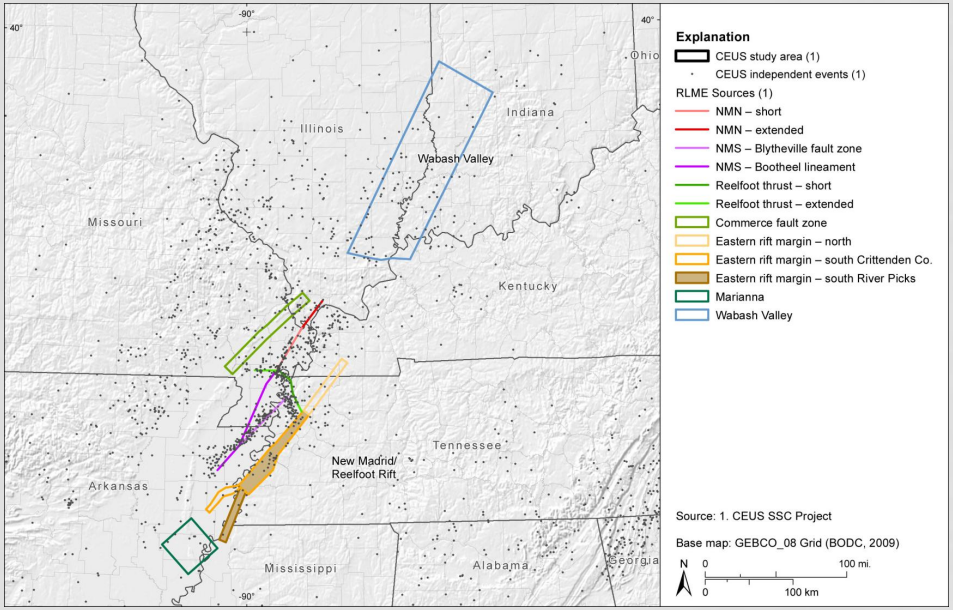



Fig 6.1.2b
CEUS SSC report

# RECENT PUBLICATIONS

- **Recent abstracts**

- **2010s**
  Al-Qadhi, O., 2010, Geophysical investigation of paleoseismological features in eastern Arkansas, USA: Ph.D. dissertation, University of Arkansas, Little Rock, 277 p.
- **2000s**
  Al-Shukri, H., Mahdi, H., Al Kadi, O., and Tuttle, M., 2009, Spatial and temporal characteristic of paleoseismic features in the southern terminus of the New Madrid seismic zone in eastern Arkansas: Final Technical Report Submitted to the U.S. Geological Survey under USGS External Grant Number 07HQGR0069, 24 p.
- Csontos, R., Van Arsdale, R., Cox, R., and Waldron, B., 2008, Reelfoot rift and its impact on Quaternary deformation in the central Mississippi River valley: *Geosphere*, v. 4, no. 1, pp. 145-158.
- Tuttle, M.P., 2008, Paleoseismological investigations at the East Site, The Gilmore/Tyronza Mitigation Project: in *Data Recovery at the Tyronza Sites, Poinsett County, Arkansas, The East Site (3P0610)*, technical report to Arkansas State Highway and Transportation Department, v. 4, pp. 259-277.
- Al-Shukri, H., Mahdi, H., and Tuttle, M., 2006, Three-dimensional imaging of earthquake-induced liquefaction features with ground penetrating radar near Marianna, Arkansas: *Seismological Research Letters*, v. 77, pp. 505-513.
- Tuttle, M.P., Al-Shukri, H., and Mahdi, H., 2006, Very large earthquakes centered southwest of the New Madrid seismic zone 5,000-7,000 years ago: *Seismological Research Letters*, v. 77, pp. 755-770.
- Al-Shukri, H., Lemmer, R.E., Mahdi, H., and Connelly, J.B., 2005, Spatial and temporal characteristics of paleoseismic features in the southern terminus of the New Madrid seismic zone in eastern Arkansas: *Seismological Research Letters*, v. 76, pp. 502-511.

USGS science for a changing world

# PRELIMINARY CONCLUSIONS

- Five generations of sand blows and related feeder dikes in Marianna area
- Weathering characteristics, stratigraphic and structural relations of features, and dating of buried soils suggest that liquefaction features formed during paleoearthquakes ~ 4.8, 5.5, 6.8, 9.9, and 9.9–38 ka
- Marianna sand blows are likely due to local, not New Madrid, earthquakes:
  - Very large size of liquefaction features
  - Lack of similarly large features that formed in AD 1811–1812, 1450, and 900

USGS science for a changing world

# DAYTONA BEACH LINEAMENT

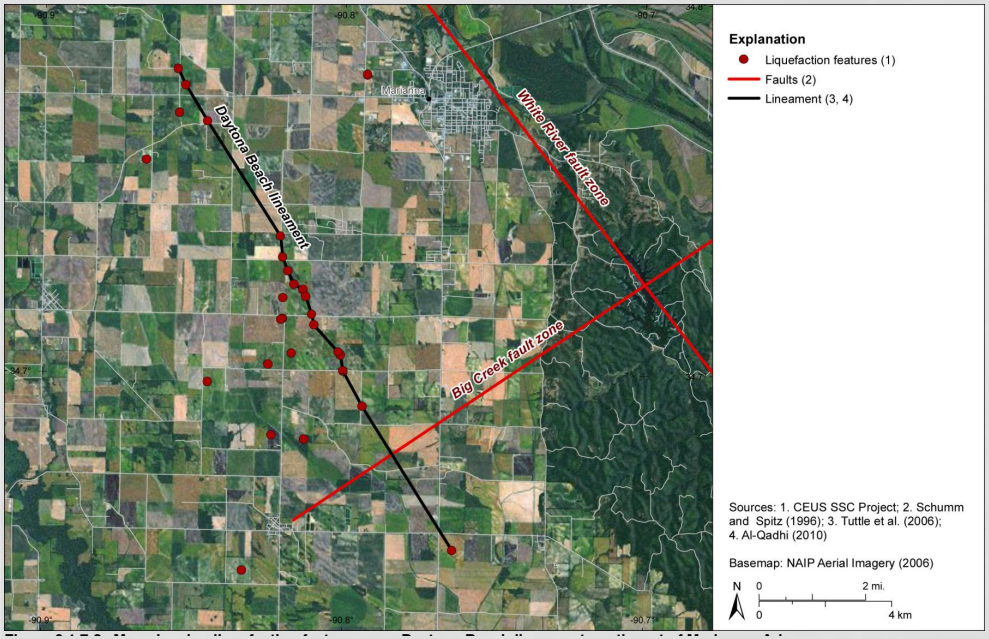



Fig 6.1.7-3
CEUS SSC report

- many large sand blows
- severe ground failure
- may be surface expression of fault at depth; perhaps western member of White River FZ

USGS science for a changing world

# PRELIMINARY CONCLUSIONS

- Marianna sand blows are likely due to local, not New Madrid, earthquakes:
  - Very large size of liquefaction features
  - Lack of similarly large features that formed in AD 1811–1812, 1450, and 900
- Some liquefaction evidence of complex faulting perhaps involving White River FZ and Eastern Margin Reelfoot Rift FZ
- Marianna paleoearthquakes were probably very large ($M \geq 7$); but warrants further study
- Findings suggest max average recurrence time of ~1.7 k.y. and clustered behavior with minimum active period of ~5 k.y.
- Implication – currently "quiet" members of Reelfoot Rift fault system may produce very large earthquakes in future

USGS science for a changing world

# MARIANNA PALEOLIQUEFACTION

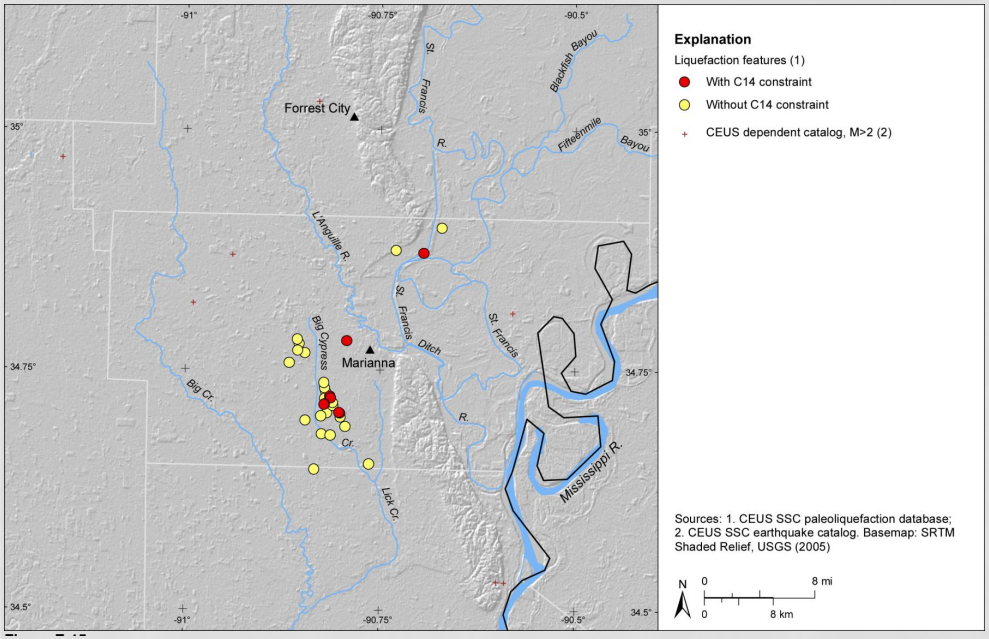



Fig E-15
CEUS SSC report

- Five generations of sand blows and related feeder dikes in Marianna area
- Field identification degree of weathering stratigraphic & structural relations dating of buried soils
- Paleoliquefaction formed about 4.8, 5.5, 6.8, 9.9, and 9.9–38 ka

USGS science for a changing world

# ESTIMATED TIME OF PALEOLIQUEFACTION FORMATION

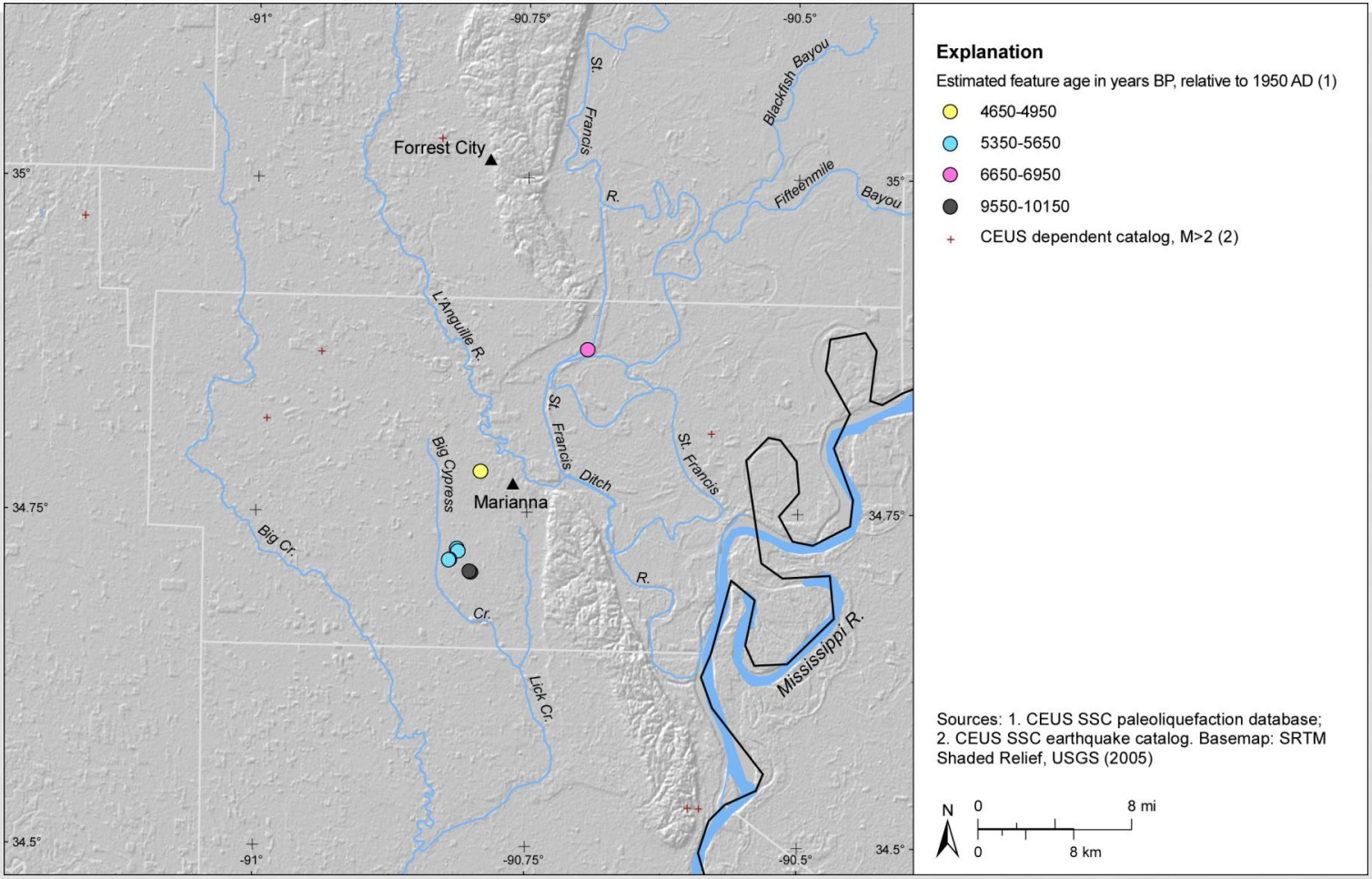
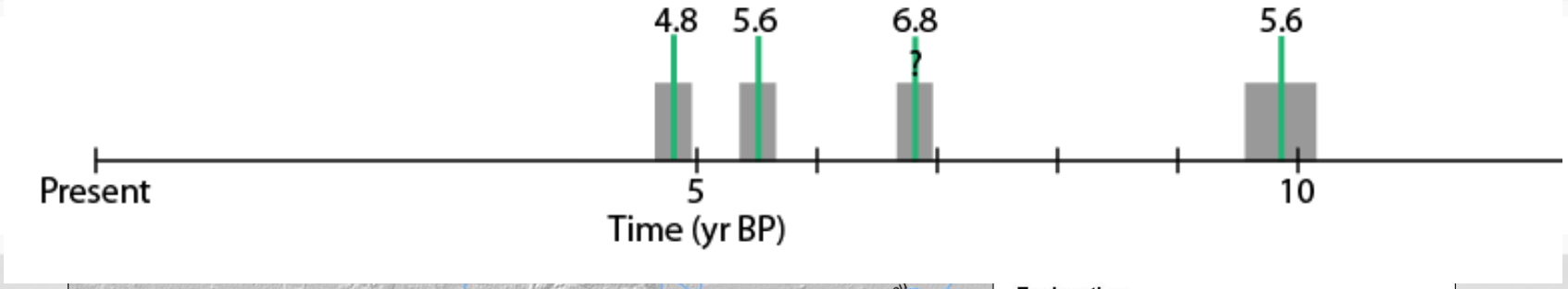
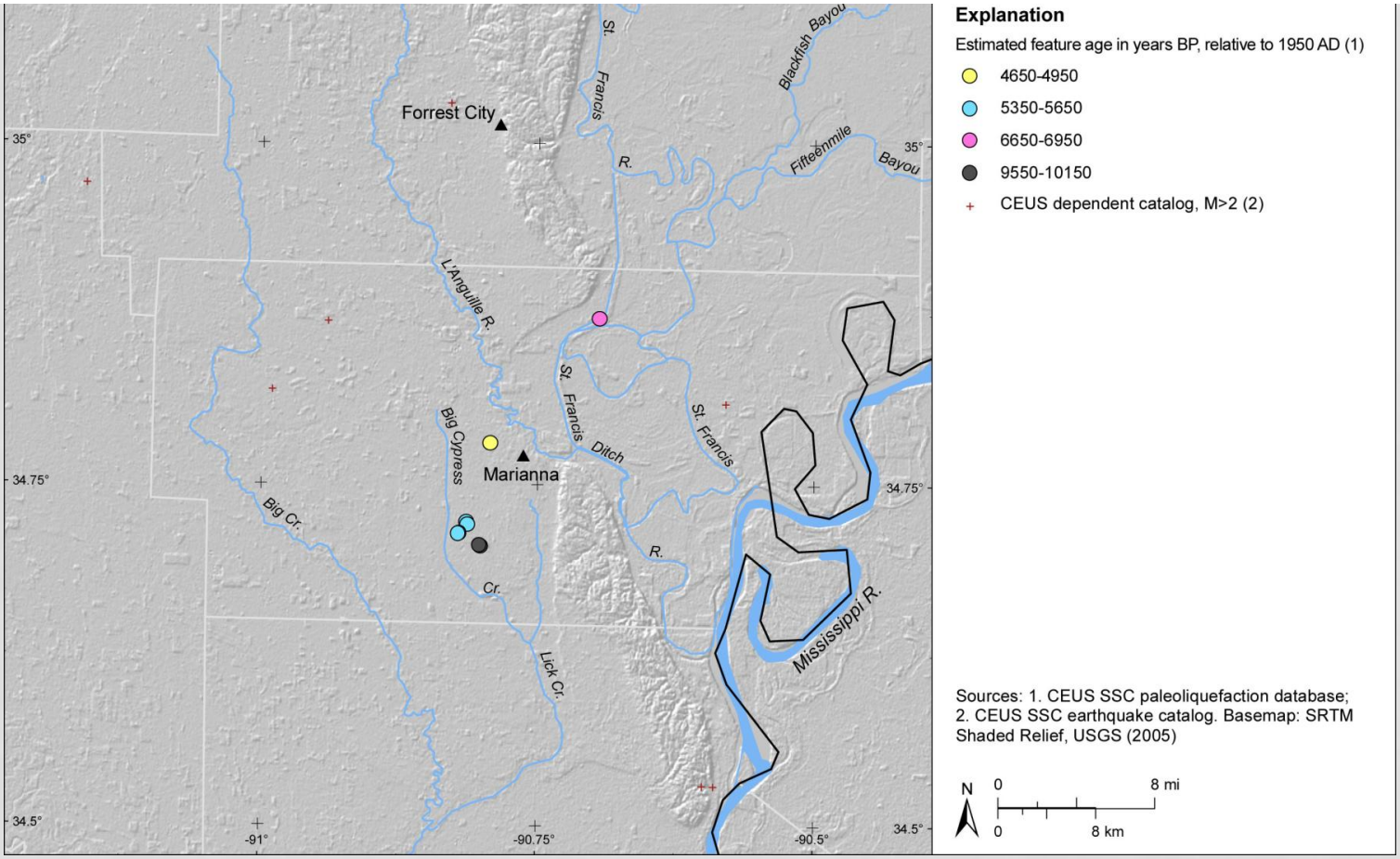



Fig E-17
CEUS SSC report

USGS science for a changing world




USGS science for a changing world