Arkansas Geological Survey
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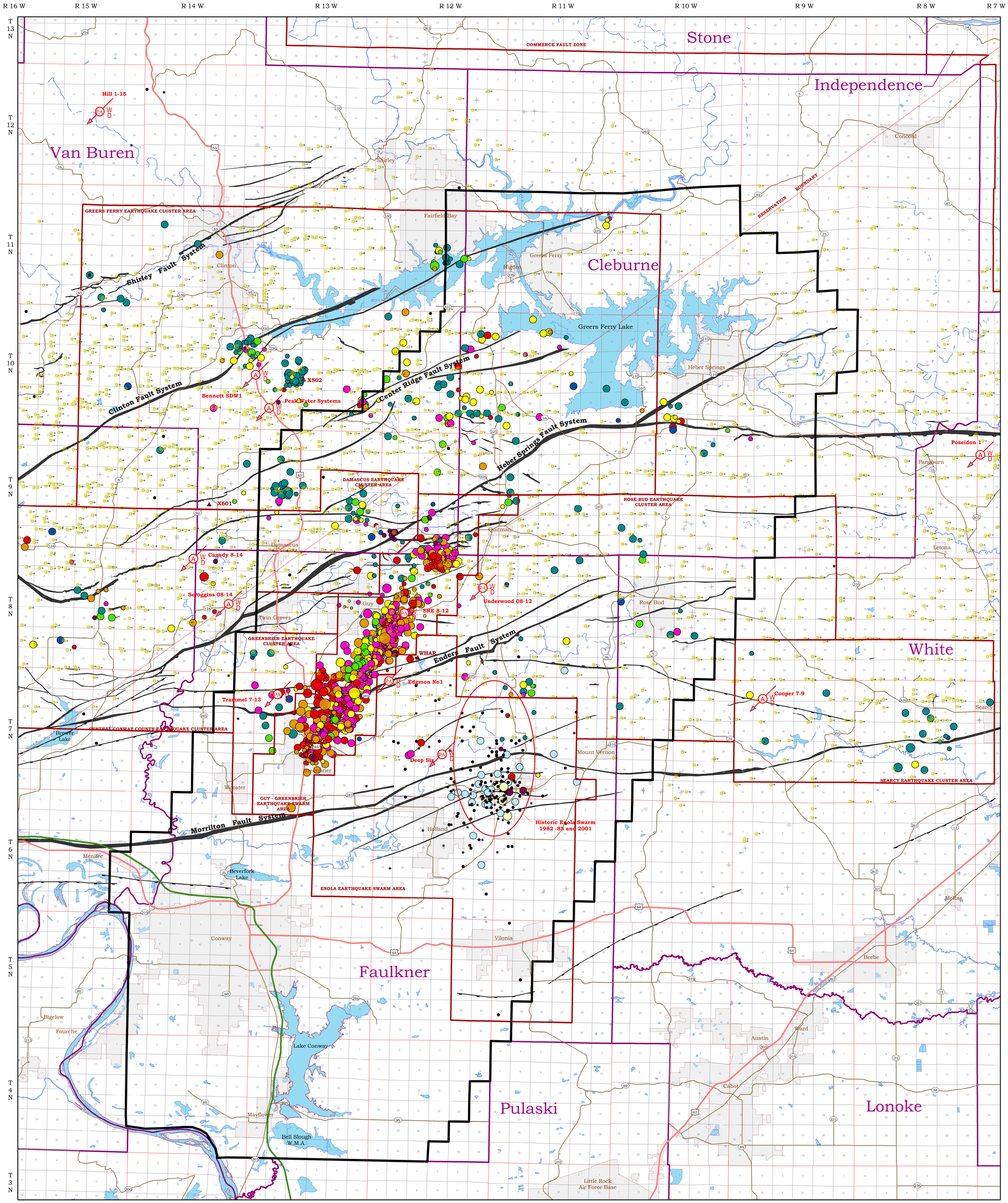
GH-EQ-USGS-CERI-EVENTS-001

Compilation of Recent and Historic Earthquakes in the Central Portion of the Fayetteville Shale Gas Play in North-Central Arkansas



About the Map

This map illustrates the location and magnitude of reported earthquakes that have occurred in the central portion of the Fayetteville Shale Play in north-central Arkansas. Earthquake epicenters in the area occur in scattered clusters and swarms (as delineated on the map). The earthquakes depicted on this map are derived from the Arkansas Geological Survey (AGS) earthquake catalog. This catalog has been compiled from various sources and publications (given below as references) and includes date, time, latitude, longitude, magnitude or intensity, and depth information. Some event records may contain incomplete data due to their date and/or source. The AGS earthquake catalog is dynamic and continually updated as event parameters are modified, new events are added and occasionally past events are deleted.

The faults depicted on the map represent a series west-to-east, northwest-to-southeast and east-to-northeast-trending subsurface normal faults. The majority of the faults are downthrown to the south and the amount of displacement varies along the length of the fault (but can be up to 2000 feet locally). The named fault systems represent a zone of single and multiple low to high-angle faults that typically form an en echelon map pattern. In the subsurface, the high-angle faults extend from the Precambrian basement up to the Mississippian-Pennsylvanian unconformity while the lower angle faults extend from that unconformity through the Pennsylvanian strata and may or may not reach the surface. In the Fayetteville Shale Play, the majority of the earthquakes appear to originate from the deeper Precambrian basement and *lower* Paleozoic faults; however earthquakes have also occurred along the shallower *upper* Paleozoic faults.

Recent Earthquakes (2008 to Present)

Depth
- <1.9 km
- 2.0-2.9 km
- 3.0-3.9 km
- 4.0-4.9 km
- 5.0-5.9 km
- 6.0-6.9 km
- 7.0-7.9 km
- >8.0 km

Magnitude
- < 0.0
- 0.0 - 0.9
- 1.0 - 1.9
- 2.0 - 2.9
- 3.0 - 3.9
- 4.0 - 4.9

Historic Earthquakes (Prior to 2008)

Magnitude
- 0.0 - 1.9
- 2.0 - 2.9
- 3.0 - 3.9
- 4.0 - 4.9

Disposal Well

- Active
- Permitted
- Plugged, Abandoned
- Shut-In
- Temporarily Abandoned

Gas Wells

- Permitted Well
- Producing
- Recently Completed
- Dry and Abandoned
- Plugged
- Shut In
- Temporarily Abandoned
- Proposed Injection

Map Symbols

- Arkansas Seismic Stations
- Interstate
- US HWY
- State HWY
- Incorporated Areas
- Water
- AOGC Moratorium Area
- Seismic Areas/Zones
- Arbenz Subsurface Faults *(Teeth denotes downthrown side)*
- *AOGC, AGS Subsurface Faults (Fault thickness depicts amount of displacement and teeth denotes downthrown side)*

References

Advanced National Seismic System (ANSS) earthquake database web page: URL: http://earthquake.usgs.gov/monitoring/anss/

Arbenz, J.K., 1984, Generalized Geologic-Structural Map of the Ouachita Mountains and Arkhoma Basin, Oklahoma and Arkansas. 1 sheet.

Arbenz, J.K., 2008, Structural framework of the Ouachita Mountains, in Stratigraphic and structural evolution of the Ouachita Mountains and Arkhoma Basin, southeastern Oklahoma and west-central Arkansas: Applications to petroleum exploration: 2004 field symposium: The Arbenz-Misch/Oles Volume: Oklahoma Geological Survey Circular 112-A, 40 p., Plate 2.

Center for Earthquake Research and Information (CERI) - New Madrid Earthquake Catalog: URL: http://folkworm.ceri.memphis.edu/catalogs/html/cat_nm.html

Haar, L. C., J.B. Fletcher, and C.S. Mueller, 1984, The 1982 Enola, Arkansas swarm and scaling of ground motion in the eastern United States: Bulletin of the Seismological Society of America V. 74, N. 6, p. 2463-2482.

Johnston2, A.C. and A. Metzger, 1982, TEIC Special Report # 8: The central Arkansas earthquake swarm parts 1 & 2, Tennessee Earthquake Information Center.

National Center for Earthquake Engineering Research (NCEER) – earthquake catalog for the central and eastern United States, 1627–1985. URL: http://folkworm.ceri.memphis.edu/catalogs/html/cat_nceer.html

St. Louis University (SLU) Earthquake Center web page: URL: http://www.eas.slu.edu/eqc/

Tennessee Earthquake Information Center (TEIC) – succeeded by University of Memphis Center for Earthquake Research and Information (CERI) – taken from CERI New Madrid Earthquake Catalog. URL: http://www.ceri.memphis.edu/seismic/catalogs/cat_nm.html
United States Geological Survey USGS) Earthquake Notification Service (ENS).

Faults provided by the AOGC were compiled from integration dockets prepared by various geologists of the companies operating in the Fayetteville Shale Gas Play. ULR: http://www.aogc.state.ar.us

Feature Class Data used in the making of this map was acquired online at: URL: http://www.geostor.arkansas.gov

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Disclaimer

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The depicted earthquakes, faults and delineated seismic areas/zones are for illustration purposes and may or may not represent all seismically active faults and areas or indicate the exact origin of the earthquakes depicted on this map. The named faults/fault systems delineated on this map may or may not correspond with named faults at the surface or in the subsurface that originate from other published sources.

2 1 0 2 4 6 8 10 Miles

2 1 0 2 4 6 8 10 12 14 Kilometers

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