

The 2019 Washington County Earthquake



David T. Dockery III and Barbara Yassin

On Tuesday, January 8, at 4:26 a.m., a 3.7 magnitude earthquake shook the Mississippi Delta and was recorded on Louis Lyell's seismography in Jackson, Mississippi, (Figure 1). The epicenter was five miles from Hollandale in Washington County on the flank of Panther Burn Dome as shown on the residual magnetic map in Figure 2. According to Steve Walkinshaw, President of Vision Exploration (as cited by Dockery in the January 10, 2019, edition of the *Delta Democrat-Times*), Panther Burn Dome is "a large Paleozoic horst block that has moved periodically since its suspected origin in the Late Permian...The block's most prominent uplift occurred during the Late Cretaceous." This latter uplift was associated with an ancient volcanic island. The center of the magnetic anomaly is over the throat of the volcano, while the uplifted block extends beyond the anomaly to include the epicenter on its northwester flank.

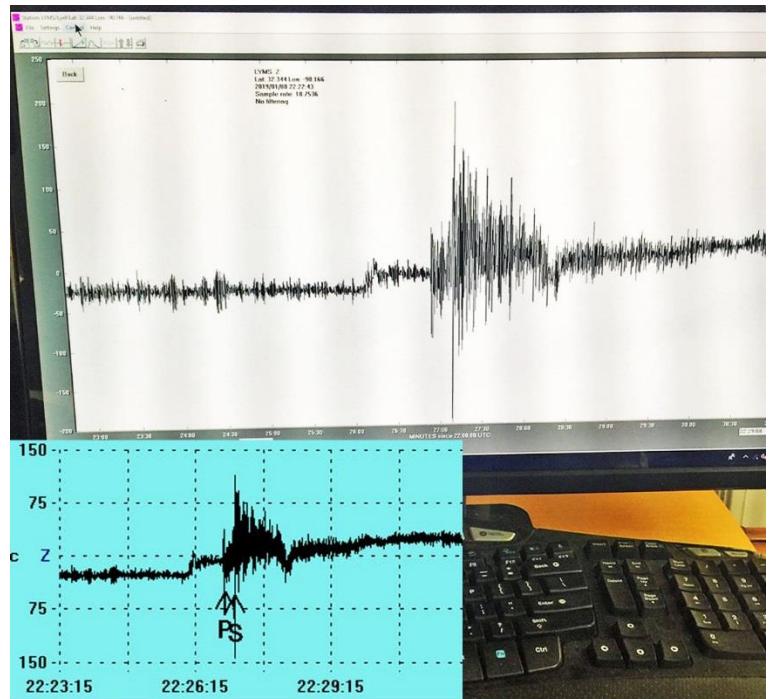


Figure 1. January 8, 2019, Greenville earthquake as recorded on the seismograph of Louis Lyell in north Jackson, with processed seismogram inset.

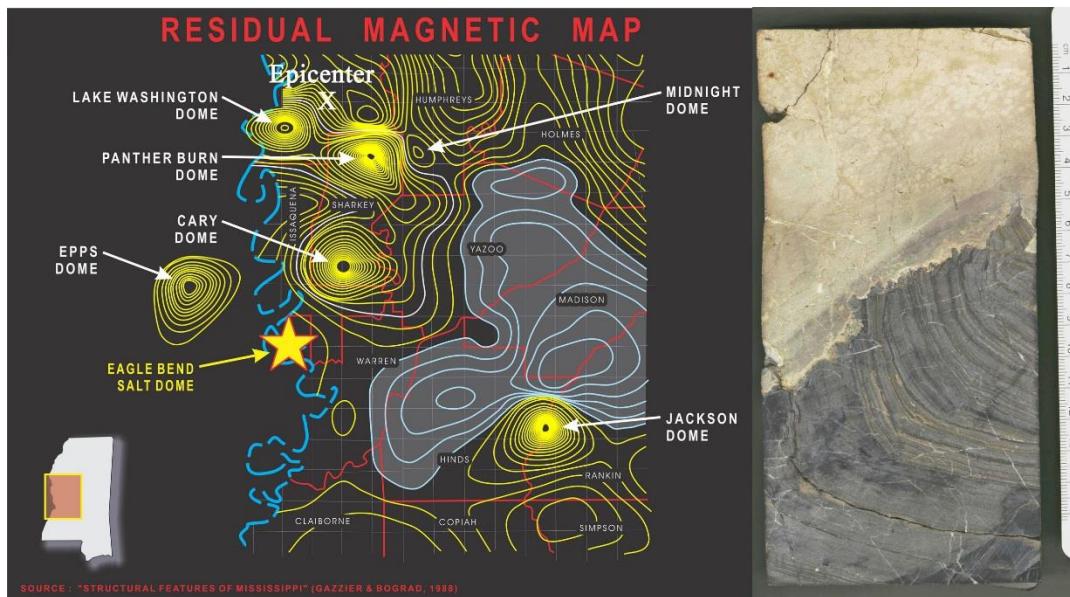


Figure 2. Residual magnetic map on left, showing the magnetic anomaly over Panther Burn Dome and the earthquake epicenter on the northwest side. At right is a core from the Mississippi Valley Gas #1 Terry Bell on the dome with a 71.6 million old volcanic intrusion of phonolite (top) ripping back layers of Smackover Limestone.

The earthquake radiated northwest and north of the epicenter near Hollandale rather than to the east and south (Figure 3). This is due to the depth of the earthquake, estimated at 16 kilometers (10 miles), and the reflection of earthquake waves by the Panther Burn horst, a buried mountain to the southeast. It is also likely that the Hollandale earthquake was amplified in the alluvial fill of the Mississippi Delta.

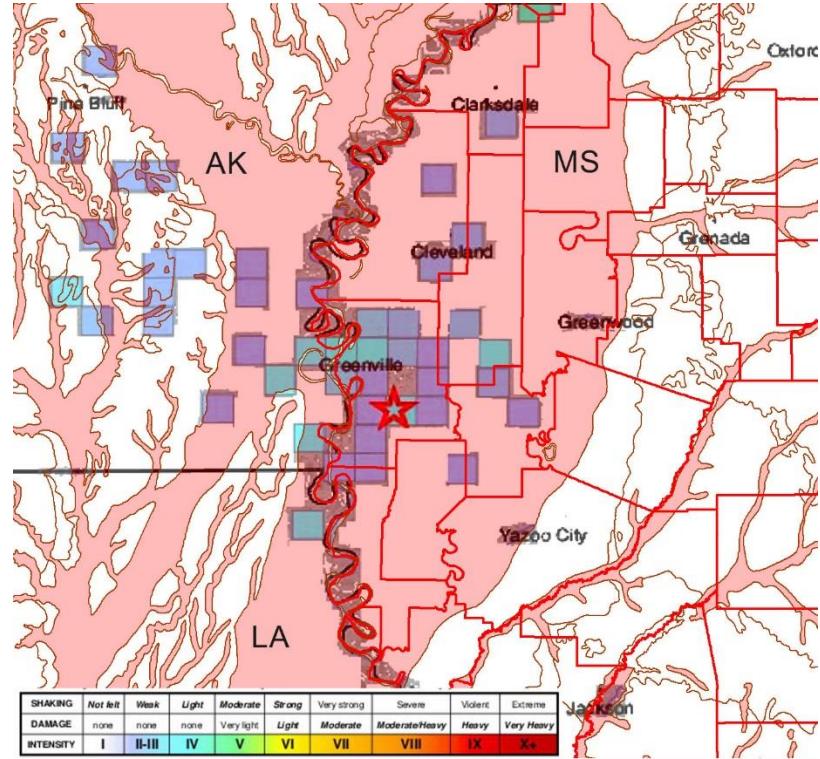


Figure 3. Felt area points for earthquake shaking during the January 8, 2019, Hollandale earthquake. Epicenter is marked by the star.

Earthquakes and Geologic Maps. In a Public Broadcasting Service (PBS) interview, Betsy Mason and co-author Greg Mill (Figure 4) explained the importance of old paper maps in the digital age in their book *All Over the Map: A Cartographic Odyssey* published by the National Geographic Society. One of their examples was how geologic maps of the San Francisco area were matched with the destruction pattern of the 1906 earthquake. This led to the discovery that “the geology that underlies a structure is a big factor in the risk that it has (for collapsing).” Soil Site Class Maps based on shear-wave velocity data are now important resources for first responders following a major earthquake. Earthquake waves travel at high velocities through rigid bedrock but slow in poorly consolidated material such as alluvial fill. Accompanying the velocity change is a significant amplification in ground shaking.

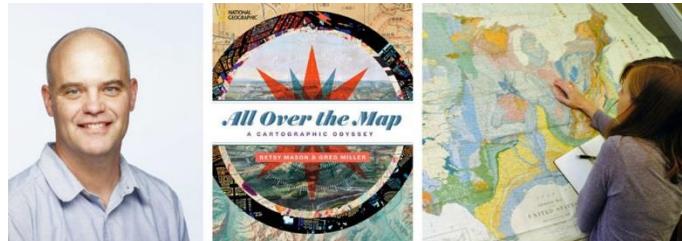


Figure 4. Greg Mill and Betsy Mason, featuring their book *All Over the Map*. Betsy is viewing the Geologic Map of the United States (from PRN).

For the reasons given above, MDEQ's Office of Geology has created a Soil Site Class Map of Mississippi that translates the state's geologic map into areas rated as to earthquake-wave-amplification susceptibility and liquefaction susceptibility. Figure 5 shows the Central U.S. Earthquake Consortium (CUSEC, eight-states surrounding the New Madrid Seismic Zone) Soil Site Class Map and the Mississippi Liquefaction Map. Mississippi felt reports from the January 8 Hollandale earthquake came only from within the Mississippi River Alluvial Plain, which is coded red for the highest susceptibility.

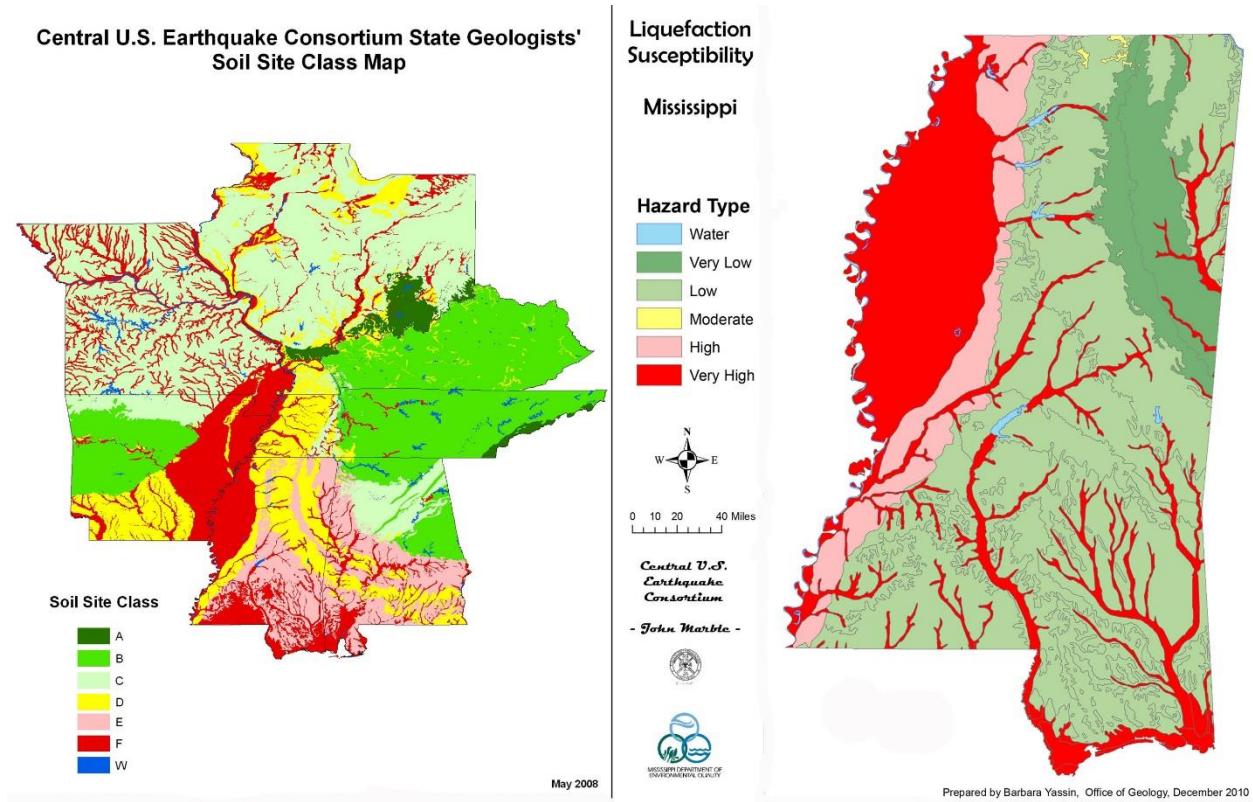


Figure 5. Central U.S. Earthquake Consortium (CUSEC) Soil Site Class Map (left) and Mississippi Liquefaction Susceptibility Map (right).

For more information about earthquake history in Mississippi, a factsheet on Mississippi earthquake epicenters, which date back to 1853 in Biloxi, is available at the following link:
<https://www.mdeq.ms.gov/geology/work-areas/publications-and-map-sales/categories/factsheets/earthquakes-in-mississippi-12509/>.