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Quaternary Fault and Fold Database of the United States

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Monroe uplift (Class B) No. 1025

Last Review Date: 1998-04-16

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Synopsis	This feature is classified as a Class B feature because of the results of a study described by Burnett and Schumm (1983 #2815) and Schumm (1986 #2817), which suggests the possibility of Quaternary deformation. However, the available evidence is not compelling. The evidence of possible Quaternary uplift is based on an analysis of the fluvial geomorphology of rivers and streams that cross the Monroe uplift. Burnett and Schumm (1983 #2815) also briefly describe corroborative evidence of uplift from repeat geodetic surveys. Furthermore, if Quaternary deformation is occurring, it is not clear if the deformation is truly tectonic in origin or if it could be related to non-tectonic processes such as salt tectonics or differential subsidence. The inclusion of the Monroe uplift in this compilation is based on geomorphic evidence of possible Quaternary uplift of the entire structure. This inferred uplift is not related to individual faults so, it is impossible to define and measure fault-specific parameters such as azimuth, length, and dip for the Monroe uplift.

Name comments	The Monroe uplift is a subsurface structure that is defined largely on the basis of unconformities and stratigraphic pinch-outs of Jurassic through Upper Cretaceous rocks (Ewing, 1991 #1994). The uplift has been also referred to as the Ouachita uplift and the Sharkey platform; it has also been included as part of the Sabine uplift by some authors (Johnson, 1958 #2816).
County(s) and State(s)	MOREHOUSE COUNTY, LOUISIANA MADISON COUNTY, LOUISIANA EAST CARROLL COUNTY, LOUISIANA WEST CARROLL COUNTY, LOUISIANA RICHLAND COUNTY, LOUISIANA FRANKLIN COUNTY, LOUISIANA OUACHITA CIOUNTY, LOUISIANA ASHLEY COUNTY, ARKANSAS CHICOT COUNTY, ARKANSAS ISSAQUENA COUNTY, MISSISSIPPI SHARKEY COUNTY, MISSISSIPPI WARREN COUNTY, MISSISSIPPI WASHINGTON COUNTY, MISSISSIPPI YAZOO COUNTY, MISSISSIPPI
Physiographic province(s)	COASTAL PLAIN
Reliability of location	Poor Compiled at 1:2,500,000 scale. *Comments:* The feature's location is poorly known because it is largely defined on the basis of drill-hole data; it does not have any prominent surface expression. Furthermore, the limits of the uplift vary depending on the stratigraphic truncation that is used to define its boundary. If the uplift is defined on the truncation of the Annona chalk (Cretaceous age), then it is approximately 80 miles (129 km) in diameter; this is the generally accepted limit of the uplift according to Johnson (1958 #2816).
Geologic setting	The Monroe uplift is a small feature centered in extreme northeastern Louisiana and is defined on the basis of subsurface data. It is a second-order structural feature (Ewing, 1991 #1994) located along the northern flank of the Gulf of Mexico basin. The uplift is a complex structural dome that blends into the regional structure to the north and northwest (Johnson, 1958 #2816). It is bounded by the North Louisiana salt basin and the Mississippi salt basin on the southwest and southeast, respectively (Ewing, 1991

	#1994). The uplift is associated with Late Cretaceous igneous activity. The Monroe uplift developed as a discrete structural feature in Late Cretaceous time when uplift resulted in as much as 3 km of strata being eroded from the top of the feature. Uplift ended in latest Cretaceous time, and the feature was buried by Paleocene and younger sediments.
Length (km)	km.
Average strike	
Sense of movement	No data *Comments:* No movement on specific faults is reported. The geomorphic evidence reported by Burnett and Schumm (1983 #2815) and Schumm (1986 #2817) infers vertical uplift of the entire feature rather than movement on individual faults. The evidence for one or a few through-going, causal faults is speculative. The causal faluts, if any, remain unknown and uncharacterized.
Dip Direction	Unknown *Comments:* The evidence for one or a few through-going, causal faults is speculative. The causal faults, if any, remain unknown and uncharacterized.
Paleoseismology studies	Information indicative of possible neotectonic uplift of the Monroe uplift is from a study described by Burnett and Schumm (1983 #2815) and Schumm (1986 #2817). This study analyzed the channel morphology and longitudinal profiles of several major drainages that cross the uplift. They report that recent uplift has reduced the slope of stream valleys across the Monroe uplift, and as a result, sinuosity of the streams has been reduced and an anastamosing drainage pattern has developed. They also report that repeat geodetic surveys suggest an uplift rate of about 5 mm/yr on the Monroe uplift. No additional studies have been conducted to confirm the conclusions of the geodetic or geomorphic investigations. Without additional confirmation, the Monroe uplift is considered to be a Class B feature because it is located in a region of minimal historical seismicity and because the inferred deformation rates are anomalous for the geologic setting of the Gulf Coastal plain.

Geomorphic expression	The Monroe uplift does not have any conspicuous geomorphic expression, but the evidence used to infer Quaternary movement is derived from analysis of the area's fluvial geomorphology. The uplift is located in the floodplains of the Ouachita, Mississippi, and Yazoo Rivers (Johnson, 1958 #2816). The evidence of Quaternary uplift reported by Burnett and Schumm (1983 #2815) and Schumm (1986 #2817) includes longitudinal valley profiles and changes in channel morphology of five rivers across the uplift. Longitudinal profiles of Pleistocene and Holocene terraces along these drainages show pronounced convexities that are indicative of deformation (Schumm, 1986 #2817). Changes in the sinuosity, gradient, depth, and channel erosion and deposition of the rivers across the uplift are also interpreted as evidence of fluvial responses to uplift. Schumm (1986 #2817) notes that the Mississippi River has a highly irregular thalweg profile through the uplift and that the gradient of the thalweg slope is reduced and even reversed in part of the uplift. Burnett and Schumm (1983 #2815) and Schumm (1986 #2817) suggest that modern uplift may be responsible for these changes in the river's fluvial geomorphology and that the uplift is currently occurring because these geomorphic changes are affecting the modern river channels. As further support for their contention of modern uplift, they report that repeat geodetic surveys across the Monroe and the nearby Wiggins uplift indicate uplift rates of about 5 mm/yr. Other than simply noting these rates, they do not provide any detailed description or cite any references concerning the geodetic data.
Age of faulted surficial deposits	Holocene.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Deposits associated with the uplift are not faulted, but Burnett and Schumm (1983 #2815) and Schumm (1986 #2817) note that the modern river channels are responding to the deformation, which is indicative of contemporary deformation. Thus, the most recent deformation is Holocene in age.

Recurrence interval	*Comments:* The geomorphic evidence of Quaternary uplift implies that the deformation is a steady, on-going process. It is not clear that the deformation is episodic or coseismic, so it is impossible to quantify the deformation in terms of recurrence intervals.
Slip-rate category	Less than 0.2 mm/yr *Comments:* The evidence for one or a few through-going, causal faults is speculative. The causal faults, if any, remain unknown and uncharacterized. The inferred "slip rate" of this feature is not a "slip rate" in the conventional sense; it is really a an inferred uplift rate of the entire feature. Burnett and Schumm (1983 #2815) cite geodetic data that suggest an uplift rate of about 5 mm/yr, and Schumm (1986 #2817) estimates uplift rates of 0.01-1.4 mm/yr based on the amount of deformation that has affected terraces of various ages. A profile of Macon Ridge, the oldest, highest terrace described by Schumm (1986 #2817), has been affected by about 3.8 m of deformation. This terrace has an estimated age of about 33 ka, which indicates a low late Pleistocene uplift rate. If the amount of deformation and age of the terrace given by Schumm (1986 #2817) are correct, then the calculated uplift rate is an order of magnitude lower than the 1.0 mm/yr rate given by Schumm (1986 #2817). The slip-rate category cited favors a low geologic rate, in contrast to the high geodetic rate. The 5 mm/yr geodetic uplift rate is exceedingly high and is incompatible with the geologic and broad tectonic setting of the Gulf Coast province. If this rate were sustained for a geologically significant period of time, then the geomorphic and geologic expression of the uplift would be far more pronounced than it is at present. Thus, this geodetic rate is suspect in terms of it accurately reflecting a long-term uplift rate. The geologic rates of 0.01-1.4 mm/yr reported by Schumm (1986 #2817) are more consistent with the regional geologic setting, but it is not clear if this uplift occurs seismically or aseismically. Based of the sparse historical earthquakes in the region, aseismic deformation seems more likely. Furthermore, it is not clear if the uplift reflects long-term tectonic processes that produce tectonic strain that could be released by damaging earthquakes. Until some of these fundamental questions about the nature of the deformation are answered, the Monroe uplift is classified as a Class B feature.

Date and Compiler(s)	1998 Anthony J. Crone, U.S. Geological Survey, Emeritus
References	#2815 Burnett, A.W., and Schumm, S.A., 1983, Alluvial-river response to neotectonic deformation in Louisiana and Mississippi: Science, v. 222, p. 49-50. #1994 Ewing, T.E., 1991, Structural framework, *in* Salvador, A., ed., The Gulf of Mexico basin: Boulder, Colorado, Geological Society of America, The Geology of North America, v. J, p. 31-52. #2816 Johnson, O.H., Jr., 1958, The Monroe uplift: Transactions of the Gulf Coast Association of Geological Societies, v. 8, p. 24-32. #2817 Schumm, S.A., 1986, Alluvial river response to active tectonics, *in* Active tectonics: Washington, D.C., National Academy Press, p. 80-94.