

# **PS Outcrop Characteristics for the Woodford Shale\***

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## **Abstract**

The Woodford Shale is the foremost hydrocarbon source rock and unconventional reservoir in Oklahoma. Depending on current depth of burial and thermal maturity, it produces natural gas and/or oil. In the most active play areas, the Woodford varies in thickness from about 100 to 300 ft; limited production from intervals as thin as ~25 ft thick also occurs. From field observations, the Woodford contains a variety of strata that is relatively consistent throughout a large areal extent. It consists predominantly of dark gray to black organic-rich siliceous shale and interbedded chert. The shale is extremely resistant to weathering, is brittle, and non-calcareous. At certain locations, fractures and bedding planes within the shale (and chert) contain dead oil (bitumen). Rust-colored staining within these strata signifies the presence of altered pyrite. Small, unaltered cubic pyrite crystals and pseudomorphs are plentiful; locally some are larger than 1 in. diameter.

The cherty beds are laterally continuous across most outcrops and are generally 1-3 in. thick. Normally, they are most abundant in the upper and lower parts of the formation and characteristically have numerous vertical fractures that tend to end vertically within the enclosing shale. The abundance of chert is due to cyclic deposition of radiolarian skeletal remains that can be seen locally with the aid of a hand lens. Within these same cherty intervals, phosphatic nodules ½ to 2 in. diameter may be abundant. Many are nearly perfectly spherical and contain concentric internal banding. The nodule core is typically calcareous. Thin siltstone and dolomitic beds ~1 ft thick may also be present in the middle to upper part of the formation. The Woodford always has anomalously high gamma-ray (GR) values that can be detected using a hand-held scintillometer.



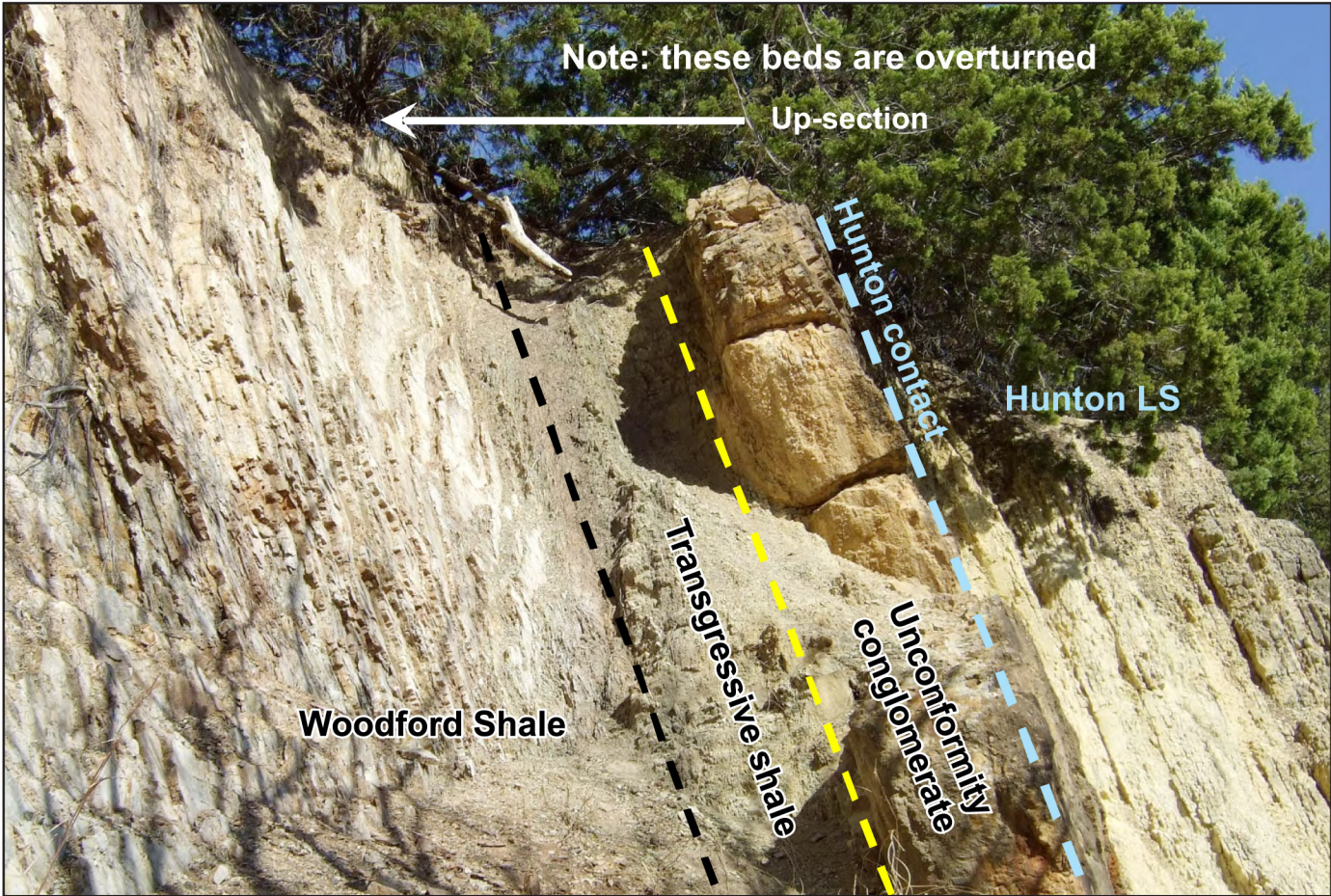
# Outcrop Characteristics for the Woodford Shale



The upper Woodford is characterized by thinly bedded, light-colored cherty beds as shown below. The contact with the overlying Sycamore (Mayes) occurs left of the dashed red line. This outcrop is on the west side of I-35 along the south flank of the Arbuckle Mountains.



The lower part of the overlying Sycamore may consist of 10–50 ft of interbedded shale and limestone. The shale is visually similar to the Woodford but is mostly calcareous which is unlike the Woodford. Also, phosphatic nodules and thin cherty beds that are common in the upper Woodford are absent in this transitional interval.



The Woodford Shale normally overlies the Hunton Limestone except when the latter is eroded. Where this happens, a conglomeratic layer may immediately overly the eroded Hunton. The basal part of the Woodford grades downward into an earthy, green to black shale (transgressive shale).



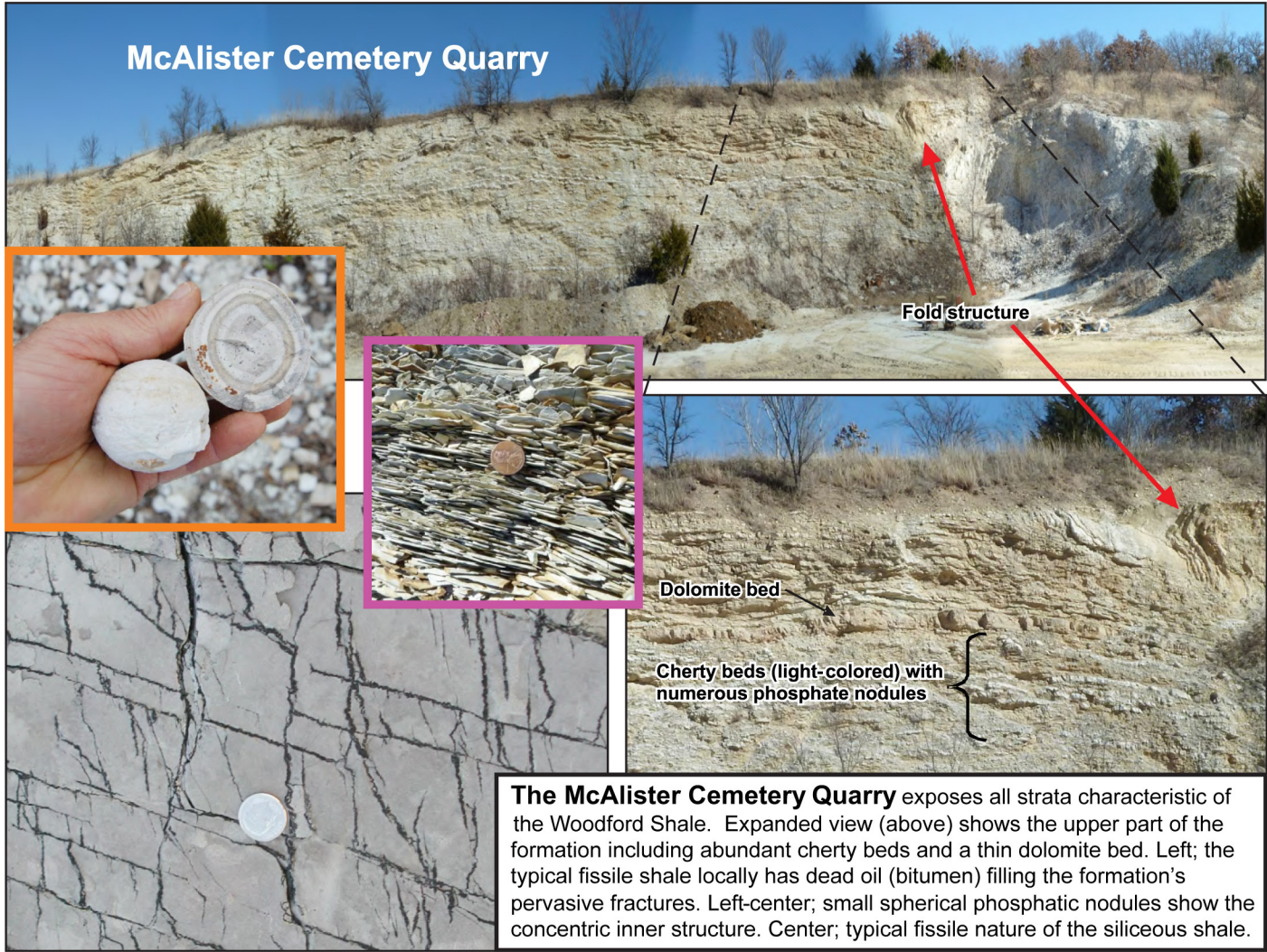
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Woodford Shale  
borrow-pit adjacent to  
Hunton Anticline



The middle part of the Woodford Shale is exposed along the north flank of Hunton Anticline. Left: typical strata consisting of dark gray shale and fractured chert. Note coin for scale. Inset above: iron-stained and fractured cherty beds with dead oil (bitumen).



McAlister Cemetery Quarry

Fold structure

Dolomite bed

Cherty beds (light-colored) with  
numerous phosphate nodules

**The McAlister Cemetery Quarry** exposes all strata characteristic of the Woodford Shale. Expanded view (above) shows the upper part of the formation including abundant cherty beds and a thin dolomite bed. Left; the typical fissile shale locally has dead oil (bitumen) filling the formation's pervasive fractures. Left-center; small spherical phosphatic nodules show the concentric inner structure. Center; typical fissile nature of the siliceous shale.