

stones have calcareous cement, and they contain abundant pale green to brown glauconite (up to 30%). The Primrose sandstones also contain chert grains (up to 1%), and limestone rock fragments.... Laminated carbonate mudstones and calcareous shale are locally found in this member. These contain silty laminae and minute sized fossil fragments.... Fossils from the sandstones and limestones include sponge spicules, ostracods, crinoids, brachiopods, calcispheres, and wood fragments." According to Meek (1983, p. 42), the chert and limestone fragments in the Primrose indicate that the most likely source was the Criner Hills–Wichita uplift, or possibly another uplift further to the northwest. Brown and Corrigan (1997, p. 5) state that "the first Wichitan deformation is manifested by uplift of the Criner Hills. Wichitan deformation generated coarse-grained sediment supply from the south (Primrose Ss.) and separated the Marietta and Ardmore basins."

McBride (1986, p. 57–58) reports that, in sec. 3, T. 3 S., R. 2 E., the Primrose Sandstone is a fine-grained, angular to subangular, well-sorted sublitharenite to litharenite. Dark green glauconite pellets amount to 7–10% of the total rock. Scattered gray shale partings may be found throughout the Primrose. The clay matrix of the Primrose is mainly smectite but also includes minor amounts of kaolinite and illite. Clay is abundant in the Primrose, and it locally may account for as much as 58% of the total rock. Carbonate cement and asphaltic hydrocarbons also are present as bonding agents; they compose up to 40% and 3% of the rock, respectively. Porosity generally has been destroyed by calcite cements, clays, and asphaltic hydrocarbons and is only $\leq 5\%$ (McBride, 1986, p. 58).

Petrology and Petrography

In general, the outcropping Springer sandstones and the Primrose Sandstone are composed of four types of sandstone: quartzarenite, subarkose, sublitharenite, and litharenite (McBride, 1986, p. 58). Figure 4 is a quartz-feldspar-rock (Q.F.R.) fragment diagram that shows the composition of the Springer sandstones and the Primrose Sandstone.

Quartz is the dominant framework grain in all four of the sandstone classifications; it averages 98% in the

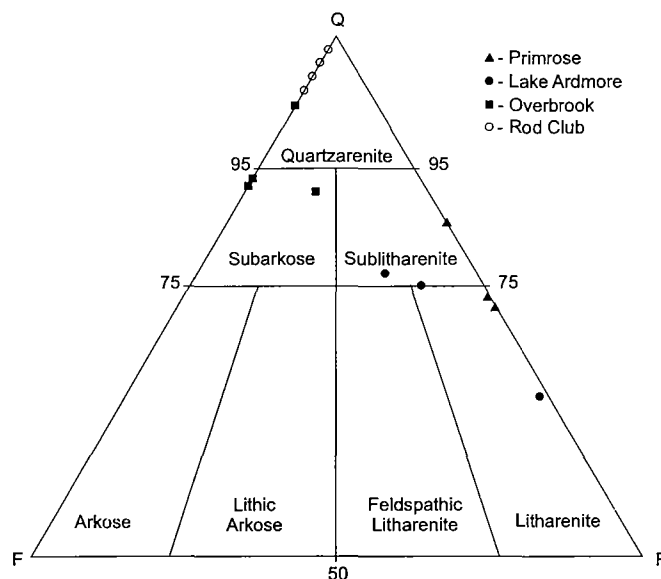


Figure 4. A quartz-feldspar-rock (QFR) diagram shows the composition (by percentage) of outcropping lower Morrowan and Springer sandstones according to Folk's (1974) classification. From McBride (1986, fig. 12).

quartzarenites, 93% in the subarkoses, 79% in the sublitharenites, and 64% in the litharenites (McBride, 1986, p. 58). Feldspars make up 0.5–6% of the framework grains in the four classifications, and rock fragments (mostly glauconite pellets and fossil fragments) make up 0–35%.

Cement occurs as (1) quartz overgrowths; (2) carbonate minerals (mainly calcite and traces of siderite), both as intergranular cement and as grain replacements; and (3) hematite, which fills pores and is associated with partially corroded feldspar grains.

Asphaltic hydrocarbons compose 3–5% of some rocks sampled; they occur as pore-filling and pore-lining material, and as thick films of bitumen. Clay materials include kaolinite, smectite, and minor amounts of illite (McBride, 1986, p. 58–63).