The Stanley Formation (Mississippian) is composed predominantly of grayish-black to brownish-gray shale, with lesser amounts of olive to mossy-buff, grayish-gray to brownish-gray chert-conglomerate siltstones. Weathering causes the shale to turn olive-gray and the sandstone to become more porous and brown. Interbedded layers of thin black effusive slate and chert are present and are used to subdivide the formation in other areas. Locally, volcanic tuffs (primarily the Hatton Tuff Member) and a quartzeous sandstone-chert conglomerate unit (Hill Spring Sandstone Member) are present in the lower Stanley. Cross-beds and calcite veins and fractures are present in shale. Most of the Stanley is late Mississippian (Fontainian) and is indicated by conodonts and plant fossils and includes the Randallville and Cave Stations formations. The upper Stanley is deep-water marine siliciclastic sequence derived primarily from a limestone platform that extended along the southern margin of the Ouachita trough.

The Missouri Mountain Formation (Sylvanite) occurs in the upper portion of the Sylvanite Mountains. The Missouri Mountain consists of shale interbedded with conglomerate, tuff, and sandstone. Fossiliferous fossils have been found in this formation. The unit was deposited in a deep marine environment and is about 500 feet thick.

References