This study analyzes nine sedimentary rock samples collected from the Illinois Basin, a dominantly Paleozoic-aged sedimentary catchment that covers the much of Illinois, southern Indiana, and part of western Kentucky. Eight samples are from the Borden Group, while one is from the Pendleton Sandstone bed. The main goal of this study was to determine whether the sediment source region of the Illinois Basin was the Appalachians or Canadian Shield. In addition, whole rock geochemistry and diagenetic processes of each sample are studied.

Detrital zircon, tourmaline, monazite, rutile, anatase, pumpellyite, chlorite, and sapphirine were found throughout the sample set. In addition, authigenic fluorite, pyrite, sphalerite, and glauconite were identified within the Borden samples. The data also indicate that the Borden Group samples are relatively similar, mostly greywacke or siltstones. The outlier from a petrographic standpoint is the Pendleton Sandstone bed sample, which classifies as a
quartz arenite. The variety of detrital heavy minerals indicates that the Appalachians are the dominant source region for the samples in this study, as the majority of these minerals would have weathered out of the Canadian Shield assemblage, due to its age. The presence of pyrite indicates an anoxic environment post-deposition, while fluorite, sphalerite and possibly anatase are evidence of metal-rich hydrothermal fluid intrusions.