Niagaran (Silurian) pinnacle reefs in the Michigan Basin have produced over 500 million barrels of oil and 2.9 trillion cubic feet of gas. The reefs are currently being targeted for gas storage, CO2 sequestration, and enhanced oil recovery. Old models from the time of the reservoir discovery in the seventies suggests that the reef internal facies are randomly distributed within a symmetrical reef structure whereas a newly published facies model, based on core and well log observations from a series of Niagaran reefs, suggests that facies distributions are strongly controlled by paleo-wind direction Rine et al. (2017). However, Evidence from a series of Silurian reefs suggests that reef architecture and internal facies distributions are strongly controlled by relative sea-level fluctuation and water depth in which reefs were grown. This means that the reef depositional facies are not random and can be predicted. To test the applicability of the model, internal facies distributions were mapped using core and log observations for shallow and deep Niagaran reefs. The results demonstrated an inconsistent relationship between reef geometry, facies distribution and single paleo wind direction. The results additionally indicated consistent/correlative depositional sequences in the shallow and deep reefs based on facies stacking patterns, exposure surfaces, and flooding events, depositional cycles were interpreted as the direct result of the sea level changes through reef growth time.