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### **The Fruitland Formation CBM Hydrocarbon System: A Step-by-Step Analysis**

The tectonic framework of the present-day San Juan Basin of New Mexico and Colorado was initiated by rifting events during the Mississippian. The structures emplaced then continued to move through time and exerted strong influences on the distribution of marine shoreline trends during the late Cretaceous when beaches of Pictured Cliffs Sandstone allowed accumulation of the Fruitland coals in back-barrier environments, between 73 and 75 Mybp. Basin subsidence continued through the end of the Cretaceous until the earliest Oligocene, 40 to 35 Mybp, when uplift of the basin core and flanks began to bring the basin into its present configuration. This uplift occurred after the Fruitland coals had reached a level of maturity sufficient for gas generation, and allowed some of that gas to desorb and fill cleats whose development had begun with diagenesis and lithification and was enhanced by the invasion of meteoric waters from the now-eroding basin margins. Continued uplift until approximately 35 Mybp allowed additional desorption to occur, and that gas, along with gas which migrated into the formation from deeper sources, diminished the formation's relative permeability to water sufficiently to prevent further fresh water invasion.

Present-day methane seeps and springs at the outcrop are manifestations that the CBM hydrocarbon system is still active, albeit behaving differently. The individual biosomes which make up the Fruitland coals are being successively breached by surface erosion and are slowly yielding their contained gas to the surface. Fractures which have opened since the Rio Grande Rift began to form in the late Oligocene, approximately 30 Mybp, today allow fluids from the Fruitland and deeper formations to make their way to the surface. These processes have been demonstrably ongoing for hundreds of years – and have probably been active since the late Miocene.