

Discovery of “Pronghorn” and “Lewis and Clark” Fields: Sweet-spots within the Bakken Petroleum System producing from the Sanish/Pronghorn Member NOT the Middle Bakken or Three Forks!

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Discovery of various Bakken Petroleum System sweet-spots over the last 10 years typically advanced through application of preceding paradigms to new areas. By contrast, each new sweet-spot represents a distinct combination of multiple play factors (source rock quality, maturity, reservoir quality, pressures, etc.). Remaining open-minded to a variety of sweet-spot factors is fundamental to tight oil resource play exploration. Whiting’s position in North Dakota’s Sanish field was based on regional mapping with a focus on the “B facies” of the middle Bakken juxtaposed to a thermally mature, lower Bakken shale depocenter. Sanish and adjacent Parshall fields of Mountrail County, ND each represent giant oil fields producing from both the middle Bakken and Three Forks.

Our emphasis on core-based sedimentology and stratigraphy led us to refine our understanding of middle Bakken facies and recognize the significance of the 2nd-order regional angular unconformity separating the Three Forks and the lower Bakken shale. Low accommodation conditions succeeding this unconformity controlled depositional patterns of the entire lowstand (Pronghorn Member of Bakken) to transgressive (lower, middle, and upper Bakken) systems tracts, up to an MFS at the overlying Scallion Member of the Lodgepole. Regional, core-calibrated correlation in both the Pronghorn and the middle Bakken demonstrate that regional variations in siliciclastic and detrital dolomitic sediment supply and in carbonate productivity during this low accommodation LST-TST period critically impacted matrix reservoir quality.

Across the northern Williston Basin, the basal transgressive Pronghorn member veneer (type-section being Antelope Field) has a northeastern-derived, siliciclastic provenance. By contrast, the southern Williston Basin was the locus of detrital dolomites derived from the Cedar Creek paleostructure. The Pronghorn member extends well south of any preserved lower, middle, and upper Bakken deposits and is composed of a transgressive succession of restricted marine detrital dolomites capped by a locally preserved, burrowed limestone that represents open marine conditions *prior to* the restricted to anoxic episode marking lower Bakken deposition. Core-based definition of the Pronghorn Member’s varying provenance, coupled with core- and cuttings-calibrated resistivity mapping to confirm oil saturation, recently led to discovery of significant new sweet-spots at Whiting’s “Pronghorn” and “Lewis and Clark” prospects in Stark, Billings, and southernmost McKenzie counties, ND.

The authors would like thank management for permission to present this work, and of course all our Whiting colleagues of multiple disciplines who contributed immensely to turning the concepts described here into economic reality. We are appreciative of the vast, unmatched core collection afforded by the North Dakota Geological Survey and to Julie LeFever and Kent Hollands of the ND Core Lab, in particular, for their support during our biannual “core trips” to Grand Forks, ND.