

## **Residual Oil Zones: The Long term Future of Enhanced Oil Recovery in the Permian Basin and Elsewhere**

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Residual Oil Zones (ROZ's) have for 60 years intrigued both explorationists and production engineers and geologists. ROZ's have very similar core, cuttings, fluid and log properties as producing wells in modern waterfloods, and typically produce large volumes of water but little if any oil on tests. They are the result of "Mother Nature's Waterflood" during the Cenozoic, as tectonically driven lateral flushing has swept oil and connate fluids out of the lower portions of Permian Basin oil reservoirs.

Over the past two decades, a number of operators have demonstrated that ROZ's beneath existing fields are economically viable targets for EOR. These ROZ's are only producible with tertiary recovery methods (CO<sub>2</sub> and, presumably, Chemical) and it is estimated that there are >10 Billion barrels of recoverable reserves in the ROZ's in the upper Guadalupian carbonate reservoirs in the Permian Basin alone. "Greenfields" are areas with no associated Main Pay zones, where significant thicknesses of ROZ's exist. Large areas on the northern Central Basin Platform and the Northwest Shelf are believed to be underlain by San Andres Greenfields. These areas also have multi-billion barrel potential and can serve as sites for combined CO<sub>2</sub> EOR and Carbon Sequestration.

There are additional ROZ's in other producing intervals in the Basin which await documentation. Substantial ROZ's are believed to also exist in other basins in the U.S.. Regional and reservoir modeling of this natural waterflood process is ongoing.