

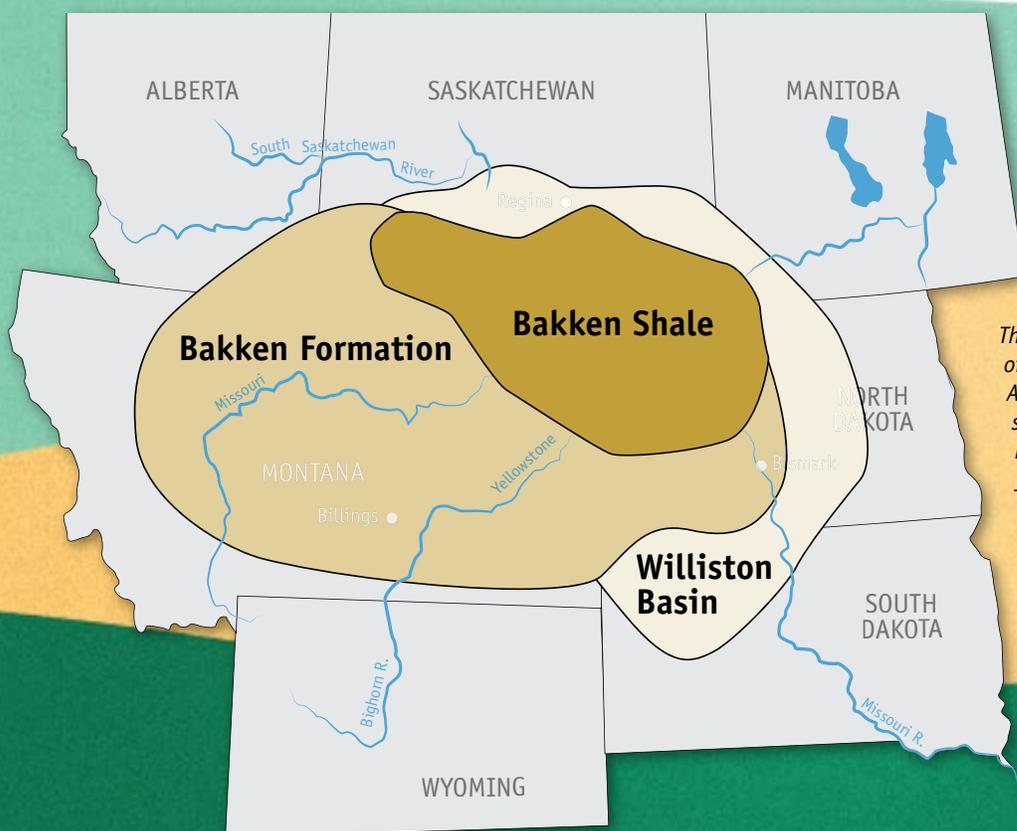
Introduction

In Saskatchewan, Montana and North Dakota, the Bakken has become one of the most important light oil plays. In Saskatchewan alone, the Bakken accounts for over half of the light oil production in the entire province. Reservoirs such as the Shaunavon and Viking in Saskatchewan, the Three Forks in North Dakota and Manitoba, and Alberta's Cardium formation are similar in nature and require similar extraction techniques to access the oil from the very low permeability rock matrix. Although the Bakken play has only been active since about 2005, preliminary data shows the decline rates to be relatively sharp. Even with multi-stage fracturing technology, only a small portion of the oil in place is ever produced from Bakken wells; therefore, secondary and tertiary recovery will become very important factors in the future of Bakken and other tight oil production. This package of projects within the PTRC's STEPS program is to address the issues that will face producers of Bakken and other tight oil as they stimulate reservoirs and move to secondary and tertiary recovery from these large and important oil plays.

Program areas underway

Characteristics of Bakken Reservoirs in Saskatchewan: Implications for Selection and Implementation of Production Strategies – The goal of this incubation project is to document and characterize lithological variation between Bakken reservoirs in Saskatchewan. An improved understanding of the geological variation will be useful for developing production strategies in the existing producing pools, as well as identifying exploration opportunities in the Bakken oil outside of the present production areas.

Development of CO₂ EOR Techniques for Unlocking Resources in Tight Oil Formations – While CO₂ injection may be the most suitable option for recovery, its flooding mechanisms and performance have not been well understood in the Bakken and other tight oil formations. This project will develop pragmatic and sustainable techniques for unlocking resources in tight oil formations via CO₂ injection.



The Bakken play is a vast area of tight oil that stretches over southeastern Alberta, southern Saskatchewan, southwestern Manitoba, North Dakota and Montana. Production from wells in the Bakken is often impressive but falls off quickly and sharply. PTRC's research hopes to extend the lives of these wells.



The PTRC mentors students in oil research in Canada and in the US.

New projects

PTRC has already committed nearly \$2 million in unconventional tight oil EOR research over the next two years. New projects include the following:

Tight Formation Characterization and Multistage Fracturing Optimization – In tight formations, natural and hydraulic fracture systems required for reservoirs could be economically developed; therefore, it is important to accurately model the effects of the fracture system on production performance. Research objectives include developing and testing new modeling technology for tight reservoirs with natural and artificial fractures and investigating the practical approaches on modeling fractures in commercial simulators. Findings would be used to optimize well spacing and fracturing strategies.

Unlocking Bakken Potential through CO₂ Huff and Puff – Based on previous University of Regina studies, this recovery technique can be applied as an efficient means of EOR from fractured reservoirs. In addition to using CO₂, there is the potential to use mixtures such as CO₂/field gas, CO₂/methane or CO₂/propane to further improve the oil recovery under different operating conditions. Because of the low permeability of the Bakken formation, it is essential to characterize and investigate the role of both induced and naturally occurring fractures in the oil recovery process.

Optimum CO₂ and Water-Based Oil Recovery Processes for Bakken Formations – This research will examine the oil recovery mechanisms and assess the overall performance of WAG, GAW, and SWAG processes, in comparison to CO₂ flooding alone under miscible conditions. This study will aim to determine the proper timing and slug sizes for different CO₂ and water-based oil recovery processes, as well as their effects on the total oil recovery and overall project implementation, duration, and economics, in comparison with CO₂ flooding alone.

Investigation of Geological and Geomechanical Controls on Hydraulic Fracturing in the Bakken Formation – At present there is a shortage of core-scale analysis of the mechanical properties that affect fracturing in the Bakken. This project proposes to conduct core-scale analyses in the University of Saskatchewan Rock Mechanics Laboratory, in collaboration with U of S geologists who can provide detailed descriptions of the cores, so as to provide a “mapping” between mechanical properties and geological attributes. The study will include both reservoir and caprock samples, to advance our understanding of fracture propagation both within and out of zone.

We invite you to participate with the PTRC in a consortium-based program to improve and evaluate oil recovery opportunities from tight oil plays, with particular reference to the Bakken.

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