INTRODUCTION

In recent years, the paleotopographic variation at the top of the Minnelusa Formation and sandstone reservoir distribution in the upper part of the formation in the northeastern Powder River Basin, Wyoming, have been mapped in great detail because of the highly economic oil accumulations which are trapped by those stratigraphic variables.

Similarly, large stratigraphic oil accumulations appear to have been trapped near the top of the Tensleep Formation in the Bighorn Basin, Wyoming, by the same two stratigraphic factors; however, more intense Laramide deformation in the Bighorn Basin apparently caused remigration of some oil from the postulated stratigraphic traps to nearby Laramide anticlinal traps.

Although structural dips are generally steeper in the Bighorn Basin than the Powder River Basin, there still seems to be some potential for undiscovered stratigraphic Tensleep oil accumulations in the Bighorn Basin that warrants further exploration consideration.

REGIONAL SETTING

An isopach map of the Tensleep-Amsden-Minnelusa and equivalent sedimentary rocks above the unconformity at the top of the Mississippian Madison Formation and below the unconformity at the top of the Permo-Pennsylvanian Tensleep-Minnelusa formations in Wyoming (Figure 1), shows three thinner areas in the middle part of the state which are flanked to the east and west by areas of thicker preserved sedimentary rocks.

Both the western and eastern basins subsided during early Pennsylvanian Morrow, Atoka and Des Moines and the western basin was filled with Amsden and Tensleep sedimentary rocks while the eastern basin was filled with lower Minnelusa and lower Hartville sedimentary rocks (Love, 1954). In the central part of Wyoming, where preserved rocks are thin over the Pathfinder Uplift (Mallory, 1972, p. 119), these early Pennsylvanian rocks were either not deposited or were eroded (Love, 1954). The western basin apparently did not subside much after filling with Des Moines Tensleep sedimentary rocks, but the eastern basin continued to subside during the Missouri and Virgil Pennsylvanian and Wolfcampian Permian. The Casper Formation, upper Minnelusa and upper Hartville sedimentary rocks filled this subsiding eastern basin during late Pennsylvanian and early Permian and even buried the Pathfinder Uplift (Love, 1954).

In contrast, the thin area of the Bighorn Basin in northern Wyoming (Figure 1) is caused by thinning of the Des Moines upper Tensleep rocks and absence, due to erosion or non-deposition, of Missouri, Virgil and Wolfcampian rocks (Mallory, 1972, Rascoe, 1972, p. 144). The gap in the rock record is approximately in the range of 35 million years (Palmer, 1983).

After a long period of erosion and non-deposition in the Bighorn Basin, Permian seas transgressed across the mature erosional surface at the top of the Tensleep Formation to deposit marine carbonates, red beds and evaporites of the Phosphoria Formation. The pattern of onlap of Permian marine deposits (Figure 2) (Lane, 1973) helps define a number of paleotopographic high areas, with reference to Permian sea level, particularly in northern Wyoming, where the Tensleep Formation was last buried by Permian deposits. One may also infer from this onlap map that the generalized paleotopographic slope of the erosion surface at the top of the Tensleep-Minnelusa was varied throughout northern Wyoming (Figure 3).