ABSTRACT

A comprehensive study of the upper Pennsylvanian and Permian strata of northeast Utah and northwest Colorado was undertaken to understand the distribution of Permo-Pennsylvanian oil pools in this area. Hydrocarbon shows, isopach, isolith, and ratio maps were constructed for the Weber, Park City, and equivalent formations from which the following conclusions were made. The most plausible sources for Weber oil are the Park City and Phosphoria Formations of Idaho, Wyoming, and Utah. Furthermore, oil could have been formed from these source rocks, and migrated to Paleozoic traps in northeast Utah and northwest Colorado prior to the Laramide orogeny. Evidence is presented showing the existence of late Paleozoic stratigraphic traps along the Weber-Maroon facies change. Late Paleozoic structural traps also seem to have been in existence in the study area. It postulated that these traps were only enhanced by the formation of Laramide structures.

INTRODUCTION

Because of increased drilling activity in southwest Wyoming, northeast Utah, and northwest Colorado, a regional study of the Pennsylvanian and Permian formations in this area was undertaken. Some initial observations made were the unusual distribution of Weber oil fields and hydrocarbon shows (Fig. 1 and 2), the lack of Park City age oil production (Fig. 3), and the lack of nearby source beds for the Weber crude oil. Previous studies by Campbell (1955), Bissel and Childs (1958), Bissel (1964), Quigley (1965), Williams (1969), and others have only briefly touched upon these subjects if at all. The purpose of this paper is to explore these subjects and present some interpretations concerning them.

The previous studies mentioned above demonstrated the presence of an ancestral Uncompahgre uplift and an ancestral Front Range uplift during late Pennsylvanian and early Permian time (see Fig. 4 and 6). These uplifts shed continental sediments of the Maroon Formation into northwest Colorado and northeast Utah which became interbedded with the eolian, beach, and nearshore marine sands of the Weber Formation to the northwest. The same pattern of sedimentation existed during Park City time when the predominant red siltstones and shales of the State Bridge Formation intertongued with the carbonates and organic shales of the Park City Formation (Fig. 7 and 9).

Sample logs, core descriptions, measured surface sections, and published sample descriptions indicate that the sandstone of the Weber Formation is usually a fine-grained, orthoquartzitic sandstone that is subrounded, well sorted, white to buff in color, and usually cemented by calcareous or siliceous cement. In the Weber-Maroon transition zone only the cleanest Weber tongues are porous and oil bearing. The barren Weber sandstones commonly have a calcite filled matrix, but this matrix may also be mica, clay, or hematite filled. Weber sandstones are also cross-stratified with large, trough shaped cross strata predominating. The above textural and structural characteristics are usually attributed to an eolian, beach, and shallow, nearshore marine environment here called a transitional coastal environment. The sediments of the Maroon Formation consist of arkosic conglomerates and conglomeratic sandstones which are interbedded with red and maroon siltstones and shales. The conglomerates and sandstones usually form cross strata in troughs and channels that are incised into the shale and siltstone beds. These rocks are characteristic of continental sediments which are rapidly eroded and redeposited near the highly elevated source area. They are often associated with alluvial fan deposition. Larson (1975) also indicates that some of the Maroon sediments at Rangely could have been deposited under deltaic conditions. The Pennsylvanian State Bridge Formation consists of red, calcareous silts and shales that contain an occasional sandstone or carbonate bed. This formation seems to have been deposited in a deltaic environment. The Utah equivalent of the State Bridge Formation, the Park City Formation, consists of interbedded dolomites, limestones, and phosphatic, organic shales. In the Park City Formation porosity is sporadic from well to well as is the content of oil in these rocks. The Park City Formation was deposited in a relatively shallow, marine environment.

SOURCE OF OIL

In the study area the discussed formations are bounded by thousands of feet of sandstones and red beds which are poor source rocks. Some of the Morgan Formation shales in