The southeastern Absaroka volcanic sequence consists mainly of middle Eocene (50 to 43 m.y.B.P.) epiclastic rocks with minor pyroclastic rocks and lava flows near vent areas. The Wood River–Greybull River volcanic center is a major source of reworked material. From oldest to youngest, moderately colorful tan, brown, green, and maroon volcanic claystones, siltstone, and sandstones predominate in the Aycross Formation (1,000 ft, 305 m, thick); olive-drab volcanic sandstones and breccias predominate in the Tepee Trail Formation (2,500 ft, 760 m, thick); and light gray volcanic conglomerates and tuffaceous sandstones are most common in the Wiggins Formation (2,000 ft, 600 m, thick). The Aycross Formation contains abundant bentonitic material, forms a perched water table, and is probably an effective caprock. The Blue Point marker, a distinctive sequence of white bentonite beds, separates the Aycross and Tepee Trail Formations and is the best horizon for structural contouring within the volcanic rocks.

Broad gentle folds and horst blocks within Aycross, Tepee Trail, and lower Wiggins strata indicate movement on "Laramide structures" until approximately 45 m.y.B.P. However, several episodes of large-scale Eocene detachment faulting and mass movements locally obscure this relationship. Domal features beneath the volcanics and stratigraphic traps at the volcanic-nonvolcanic contact are the primary exploration targets, but significant traps related to the volcanic activity may be present locally.

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Macrofossils of Bakken Formation (Devonian and Mississippian), Williston Basin, North Dakota

Results of this study of the macrofossils of the Bakken Formation in North Dakota have reinforced the suggestion, based on previous paleontological work in Saskatchewan, that the Bakken is of both Devonian and Mississippian age, rather than being entirely of Lower Mississippian age as originally considered. Increased drilling and coring activity in the North Dakota part of the Williston basin has provided the opportunity for acquiring a larger fauna than was previously available. Most of the fossils were obtained from the middle part of the Bakken Formation.

Based on lithologic character, the Bakken has been divided into three informal members. These consist of a calcareous siltstone unit between two lithologically similar units of carbonaceous shale. These black shales contain similar faunas distinct from that of the middle member. The black shales contain inarticulate brachiopods, conchostracans, and rare cephalopods and fish remains as well as more abundant conodonts, ostracods, and palynomorphs. The middle siltstone unit contains a more abundant and diverse fauna consisting of inarticulate and articulate brachiopods together with corals, gastropods, cephalopods, ostracods, echinoderm remains, and trace fossils. This is the first report of cephalopods, conchostracans, ostracods, corals, trace fossils, and some of the brachiopods in the Bakken, although all, except the gastropods, have been reported from stratigraphic equivalents (Exshaw Formation of Alberta, the Sappington Member of the Three Forks Formation of south-central Montana, the Leatham Formation of northeastern Utah, and the middle member of the Pilot Shale in western Utah and eastern Nevada). The Bakken macrofauna adds another dimension to interpretation of the depositional environment and paleoecology of offshore, sediment-starved, basinal units.

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Possible Tectonic Influence on and Facies Distribution of Shannon Ridge Sandstones, Wyoming

In the Powder River basin of Wyoming, Upper Cretaceous Shannon Sandstone shelf sand ridges are formed along the crest of a broad, subtle, southwest to northeast-trending paleoarch. During Shannon deposition, relief on the arch was great enough to alter shelf energies and cause sand ridges to develop within a predominantly silty shale interval.

Possible recurrent movement in the Salt Creek anticline created a paleohigh which strongly localized development of thick sand ridge complexes in the Shannon Sandstone. During Shannon deposition, relief on the paleohigh apparently was strong enough to cause ridges to build laterally as well as vertically. Shannon ridge complexes at Salt Creek are more oblate, bigger, thicker, and more closely spaced than most central Powder River basin ridges. Also, there are two vertically stacked ridge systems developed within the Shannon Sandstone. While the lower ridge system is coeval with the Shannon ridge system in the central basin, the upper ridge system is only developed locally and, we believe, is related to active growth on the paleohigh during Shannon deposition. At no time, however, did the paleohigh cause ridges to be subaerially exposed.

Eleven Shannon shelf ridge and ridge-associated facies were defined in outcrops on the Salt Creek anticline. Vertical and lateral changes in facies are relatively abrupt where observed in closely spaced outcrop sections and, in general, facies are stacked in coarsening-upward sequences with central bar facies commonly immediately overlying interbar sandstone facies. Porous and permeable potential reservoir facies include: central bar facies, a clean, cross-bedded sandstone; bar margin facies (Type 1), a highly glauconitic, cross-bedded sandstone containing abundant shale and limonite (after siderite) rip-up clasts and lenses; and bar margin facies (Type 2), a cross-bedded to rippled sandstone. These facies were formed by sediment transported and deposited in the form of medium to large-scale troughs and sand waves on and across the tops of ridges by moderate to high-energy shelf currents.

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Influence of Tectonic Terranes Adjacent to Precambrian Wyoming Province on Petroleum Source and Reservoir Rock Stratigraphy in Northern Rocky Mountain Region

The perimeter of the Archean Precambrian Wyoming province can be defined generally. A Proterozoic suture belt separates the province from the Archean Superior province to the east. The western margin lies under the western Overthrust belt and extends at least as far west as southwest Montana and southeast Idaho. The province is bounded on the north and south by more regionally extensive Proterozoic mobile belts. In the northern belt, Archean rocks have been incorporated into the Proterozoic rocks, but the southern belt does not appear to contain rocks as old as Archean. The tectonic response of these Precambrian terranes to cratonic and continental margin vertical and horizontal forces has exerted a profound influence on Phanerozoic sedimentation and stratigraphic facies distribution. Petroleum source rock and reservoir rock stratigraphy of the northern Rocky Mountain region can be correlated with this structural history. In particular, the Devonian, Permian, and Jurassic sedimentation patterns can be shown to have been influenced by articulation among the different terranes comprising the ancient substructure. Depositional patterns in the Chester-Morrow carbonate and clastic sequence in the Central Montana trough are also related to this substructure. Further, a correlation between these tectonic terranes and the localization of regional hydrocarbon accumulations has been observed and has been useful in basin analyses for exploration planning.

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Depositional Environments of Middle Minnelusa "Leo" (Middle and Upper Pennsylvanian), Wyoming, South Dakota, and Nebraska

The informal middle member of the Minnelusa Formation, commonly known as Leo, consists of a spectrum of sediments including sandstone, dolomite, anhydrite, bedded chert, limestone, and radioactive carbonaceous shale. Deposition within the upper Paleozoic Alliance basin of the present day tri-state area of South Dakota, Wyoming, and Nebraska occurred in sabkha, tidal flat, and shallow subtidal environments. Major and minor cycles of eustatic sea level changes are manifest by the Leo section. Eolian sands, organic "black shales," supratidal to subtidal carbonates, and evaporites are intercalated in close vertical and lateral proximity.

Early Desmoinesian (lowermost Leo) sediments are open marine, upper subtidal limestone interbedded with restricted marine upper subtidal dolomite, anhydrite, and radioactive organic-rich dolomite. During the upper Desmoinesian and lower Missourian, most of the Alliance basin was a restricted carbonate tidal flat. Throughout the remainder of the Pennsylvanian, the prevalent environment was a restricted coastal to