strata range from Middle Jurassic to Holocene, including one of the most complete early Tertiary sections in Utah. The rocks have undergone several episodes of faulting and folding, resulting in complex and often puzzling geologic relationships. At least seven factors have been important in development of the present structural configuration of the area: (1) relationship to the Utah hinge line, (2) position in relation to the Colorado Plateau, (3) effects of Sevier orogenic deformation, (4) effects of Basin and Range faulting, (5) effect and timing of the Wasatch monocline, (6) possible effects of older faults, and (7) results of evaporite flowage of the Arapien Shale. Extent of Sevier faulting and evaporite movement are the most controversial of these. Previous interpretations in the area range from control primarily by Sevier deformation to control primarily by evaporite flowage. Recently acquired data support an interpretation based on the combined effects of evaporite flowage and faulting to produce the features now present in the quadrangle.

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Laramide History of Northwestern Wind River Basin and Washakie Range, Wyoming

A complex history of Laramide tectonism, erosion, and deposition is recorded in lower Cenozoic rocks of the northwestern Wind River basin and Washakie Range, Wyoming. These rocks include the Indian Meadows Formation (lower Eocene), Wind River Formation (middle to uppermost lower Eocene), and Aycross Formation (middle Eocene), separated by unconformities.

Major structures developed during latest Cretaceous through earliest Eocene time, prior to deposition of preserved Tertiary rocks. During this interval, the Washakie Range arched upward and thrust southwestward over the basin axis and erosion stripped more than 5,000 ft (1,500 m) of upper Mesozoic rocks from the area, forming the basal Tertiary unconformity.

During the Eocene, the Indian Meadows Formation accumulated as alluvial fans spread from deep mountain valleys southward across the basin. Large Paleozoic masses slid southward off the oversteepened range front. Near the end of Indian Meadows deposition, a new fold arched and thrust southward, depressing and downfaulting the older range front and disturbing rocks in the basin.

During the middle early Eocene, the Wind River Formation accumulated as new alluvial fans spread southward from canyons of the rejuvenated range. Erosion had breached the Precambrian core of the range, flooding downstream areas with granitic debris.

During the early middle Eocene, the range collapsed along normal faults. The Aycross Formation accumulated in flood plains in the basin and in broad valleys that developed along normal fault traces in the range. During this time, the Absaroka volcanic field to the north became the dominant local source. By the end of Aycross deposition, the basin and all but the highest parts of the collapsed, deeply eroded range were buried by volcaniclastic debris.

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Meeteetse Field, Bighorn Basin, Wyoming

Lower Cretaceous Muddy and Upper Cretaceous Frontier sandstone reservoirs remain popular objectives for new energy reserves in the Bighorn basin of northwestern Wyoming. Predominantly structural reserves approximate 1 million bbl of oil and 20 bcf of gas from six Muddy fields, and 210 million bbl of oil and 100 bcf of gas from 16 Frontier fields. Newly established structural-stratigraphic gas production from these reservoirs is at Meeteetse field (T48-49N, R99W) on the west flank of the basin where Muddy Frontier bar sandstones trend across a long, narrow, horst-associated anticline.

Terra Resources 1-33 Federal (Sec. 33, T49N, R99W) established the shallower pool discovery in 1979. Ten wells are now drilled along or near the axis of the structure. Production history is only now beginning because wells were shut in during field development due to absence of a gas line.

The Frontier is productive in the middle two of its four units. Most initial production rates are between 1 and 2 MMCFGD; small amounts of oil, condensate, and water have been produced from some wells. The Muddy is a discrete sandstone unit with thin shale interbeds. Most initial production rates are between 1 and 3 MMCFGD; small amounts of oil, condensate, and water are also produced. Some production is from commingled Frontier zones and from commingled Frontier and Muddy.

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Boise Geothermal System, Western Snake River Plain, Idaho

The Boise geothermal system lies in an area of high heat flow along the northern margin of the western Snake River plain. Exploratory drilling for petroleum and geothermal water, seismic reflection profiling, and regional gravity data permit construction of a detailed structure section across the western plain. A faulted acoustic basement of volcanic rocks lies at depths of 2,400 to 6,000 ft (730-1,830 m) beneath late Cenozoic lacustrine and fluvial deposits in the center of the plain. Volcanic rocks of the acoustic basement are typically basalt out in the plain, but the acoustic basement along the north margin in the vicinity of Boise is largely silicic volcanic rock. Geologic mapping and geothermal well data have provided information on the late Cenozoic geologic units and structures important to the understanding of the Boise geothermal system. The main geothermal aquifer is a sequence of rhyolite layers and minor arkosic and tuffaceous sediment of the Miocene Idavada Volcanics. The aquifer is confined by a sequence of impermeable basaltic tuffs. The aquifer has sufficient fracture permeability to yield 150°-170°F (65°-76.6°C) hot water for space heating at a rate of 600 to 1,200 gpm from wells drilled in the metropolitan area, north of the Boise River. In this area the rhyolite lies at a depth of 900-2,000 ft (274-610 m). Artesian pressure typically lifts water to an elevation of about 2,760 ft (840 m). A conceptual model of recharge assumes percolation driven by the topographic head to a depth of more than 7,000 ft (2,135 m) beneath the granitic highlands northeast of the city. Heated water convects upward through northwest-trending range-front faults.