



Hanna Basin

Oil and Gas Geology, Past Production, and Future Development

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Basin geology

The structural development of the Hanna Basin occurred in multiple stages. The Hanna Basin was first isolated from the Greater Green River Basin by the uplift of the Shirley and Granite mountains during the early Paleocene, followed by middle-Paleocene growth of the Sweetwater uplift. The Medicine Bow Mountains and Rawlins uplift occurred during the late Paleocene. The Cambrian through Jurassic age sedimentary strata that accumulated before the structural development of the Hanna Basin are less than 762 m (2,500 feet) thick.



Tensleep Sandstone, Goose Egg Formation, and Chugwater Formation (foreground), on the flanks of the Seminoe Mountains. Photo by W.A. Sullivan.

During the Laramide orogeny, the Hanna Basin was isolated from the surrounding basins and became a closed drainage. This structural configuration resulted in a thick succession of Upper Cretaceous to Lower Tertiary fluvial and lacustrine sedimentary deposits. These fluvial and lacustrine strata account for the bulk of the strata in the basin center, and can be up to 5,791 m (19,000 feet) thick.



Channels in the Ferris Formation on the banks of Seminoe Reservoir. Photo mosaic by B. McElroy.

Past production

Dyman and Condon (2005) define the Hanna–Mesaverde coalbed gas total petroleum system, in the Hanna Basin, as parts of the Mesaverde (Almond), Medicine Bow, Ferris, and Hanna formations. Very little gas has been produced from this system, and as of 2005, there were two

coalbed natural gas (CBNG) pilot projects in the basin. The Seminole Road CBNG pilot project contained 16 wells that produced 1,400 cubic feet of gas per day; the Hanna Draw CBNG pilot project has nine wells that averaged less than 1,000 cubic feet of gas per day (Dyman and Condon, 2005). No current production has been reported to the Wyoming Oil and Gas Conservation Commission (2017) from these fields.

Conventional oil and gas exploration occurred in the Hanna Basin throughout the 20th century. There are currently 18 named fields in the Hanna Basin, eight of which are abandoned (Toner and others, 2016). The most productive oil field, Big Medicine Bow field, produces from the Cloverly (Dakota) Formation, Sundance Formation, and Tensleep Sandstone (WOGCC, 2017). The most productive gas field, Separation Flats field, produced from the Muddy Sandstone but is no longer active. The Hanna Basin has not been extensively explored for undiscovered petroleum accumulations, and there are potential conventional and unconventional undiscovered accumulations (Dyman and Condon, 2007).



Petrified wood and coal in the Paleocene Hanna Formation. Photo by N. Jones.

Coal mining has been active in the Hanna Basin since 1868 (Flores and others, 1999). These mines operated at the town site of Carbon, Wyoming until 1900, when mining operations moved to the town of Hanna after the railroad was rerouted. Most of the coal extraction in the Hanna as well as Carbon basins (which is separated from the Hanna Basin by the northeast-southwest trending Saddleback Hills anticline), has been from the Hanna coal field (Pierce, 1996). Coal is primarily mined from the Upper Cretaceous and Paleocene Ferris Formation, as well as the Paleocene Hanna Formation.

Future development

Because of the anomalous structure of the Hanna Basin relative to other Laramide Basins (that is, it is a small but very deep basin), exploration targets are limited to the flanks of the basin—the basin center is considered too deep for most exploration. There has been very little exploration in the basin over the past few years, mostly limited to CBNG projects. There are a few confidential Cloverly (Dakota) Formation wells on the western flank of the Hanna Basin with as-yet unknown results. There are no proposed drilling projects on federal lands in the Hanna Basin. Currently, the Hanna Basin is not expected to experience much of an increase in oil and gas production, unless CBNG again becomes an economic resource.

References

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