



Hanna Basin

Oil and Gas Geology, Production, and Future Development

www.wsgs.uwyo.edu
Updated May 1, 2014

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.

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 Seminoe 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 (2014) from these fields.

Conventional oil and gas exploration has occurred in the Hanna Basin throughout the 20th century. Prior to 1978, production from ten fields was reported to the Wyoming Oil and Gas Conservation. Since 1978, an additional five fields have reported production, as well as a handful of wildcat wells. These fields are primarily on the flanks of the basin. Of these 15 fields, 11 reported oil production and 10 reported gas production, for a total through 2013 of 9.8 million barrels of oil and 10.0 billion cubic feet of gas (WOGCC, 2014).

The most productive oil field, Big Medicine Bow field, produces from the Cloverly (Dakota) Formation, Sundance Formation, and Tensleep Sandstone, and produced 6.5 million barrels of oil and 2.5 billion cubic feet of gas through 2012 (WOGCC, 2014). The most productive gas field, Separation Flats field, produces from the Muddy Sandstone. 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

- Dyman, T.S., and Condon, S.M., 2007, 2005 geologic assessment of undiscovered oil and gas resources, Hanna, Laramie, and Shirley basins Province, Wyoming and Colorado, *in* U.S. Geological Survey Hanna, Laramie, and Shirley Basins Province Assessment Team, Petroleum systems and geologic assessment of undiscovered oil and gas, Hanna, Laramie, and Shirley basins Province, Wyoming and Colorado: U.S. Geological Survey Digital Data Series DDS-69-K, chap. 2, 62 p.
- Flores, R.M., Cavaroc, V.V., Jr., and Bader, L.R., 1999, Ferris and Hanna coal in the Hanna and Carbon basins, Wyoming—A synthesis: U.S. Geological Survey Professional Paper 1625-A, chap. HS, 49 p.
- Pierce, B.S., 1996, Quality and petrographic characteristics of Paleocene coals from the Hanna Basin, Wyoming: Jackson, Wy., 12th Annual Meeting of the Society of Organic Petrology, Organic Geochemistry, v. 24, no. 2, p. 181–187.
- WOGCC, 2014, Wyoming Oil and Gas Conservation Commission website, at <http://wogcc.state.wy.us/>, accessed May 1, 2014.