Overthrust Belt

Oil and Gas Geology, Production, and Future Development

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Basin geology

The Overthrust Belt is not part of the Laramide basin system, but was instead created by the Cretaceous-age Sevier Orogeny approximately 150 to 55 million years ago. The Sevier Orogeny was a shortening event that resulted in "thin-skinned" thrusting, or generally north-south oriented thrust faults that do not involve the Precambrian basement rocks.

Folded and fractured Madison Limestone. Photo by R. O'Donnell.

Often termed the Thrust Belt or Sevier Belt, the Overthrust Belt contains a series of anticlinal traps that can store hydrocarbons. These potential traps can be seen on cross sections of the Overthrust Belt. The complexity of the Overthrust Belt's geology, including highly folded and faulted strata, has contributed, and continues to contribute, to the difficulty of exploring for oil and gas in this area.

The Jurassic Nugget Sandstone and the Mississippian Madison Limestone have been the most prolific oil and gas producing formations in Wyoming's Overthrust Belt. From 1978 through 2013, over 165 million barrels of crude and nearly 9.7 trillion cubic feet of gas were produced from these two formations (WOGCC, 2014). Other, mostly gas-producing, formations in the Overthrust Belt include the Ordovician Big Horn Dolomite, the Pennsylvanian Amsden Formation, the Permian Phosphoria Formation and Weber Sandstone, the Triassic Thaynes Limestone, the Jurassic Twin Creek Limestone, the Cretaceous Baxter, Mesaverde, Muddy, and Bear River formations, and the Eocene Almy Formation.

The main source rock in the Overthrust Belt is presumed to be the Cretaceous Mowry Shale. The Permian Phosphoria Formation and other Cretaceous organic-rich formations, such as the Bear River and Frontier formations, may also be minor sources of oil and gas in the region. (USGS Wyoming Thrust Belt Province Assessment Team, 2003)

Oil source rock facies (dark gray) of the Phosphoria Formation. Photo by R. O'Donnell.

Production

Exploration began in the late 1800s and early 1900s in the Overthrust Belt region, primarily in shallow fields associated with oil seeps. These small fields were not successful. Despite the discovery of the large La Barge and Dry Piney fields in the mid-1900s in the transition zone between the Greater Green River Basin and the Overthrust Belt, intensive exploratory efforts did not commence until the discovery of several fields during the mid-1970s (Ver Ploeg, 1979).

As of 2013, 35 fields within the Overthrust Belt were reported to the Wyoming Oil and Gas Conservation Commission as having produced oil or natural gas (WOGCC, 2014). 1978–2013 production totaled 187.9 million barrels of oil and 11.6 trillion cubic feet of gas (WOGCC, 2014). The bulk of the gas production, which is significant, is from the Fogarty Creek, Painted Reservoir East, Lake Ridge, and Whitney Canyon-Carter Creek fields. In 2013, only one well had an active permit to drill in the Overthrust Belt region (WOGCC, 2014).

Future development

Although there have been rumors of an emerging Phosphoria Formation horizontal play in the Overthrust Belt, there are no data on the WOGCC (2014) website validating this rumor. One confidential well in Lincoln County is re-entering a conventional well and horizontally targeting the Weber Sandstone and Meade Peak Member of the Phosphoria Formation. It remains to be seen if this strategy will prove economic. At this point, there are no new large oil and gas projects in the Overthrust Belt.

References

USGS Wyoming Thrust Belt Province Assessment Team, 2003, Assessment of Undiscovered Oil and Gas Resources of the Wyoming Thrust Belt Province: U.S. Geological Survey World Energy Assessment Project Fact Sheet.

Ver Ploeg, A.J., 1979, The Overthrust Belt—An overview of an important new oil and gas province: Geological Survey of Wyoming [Wyoming State Geological Survey] Public Information Circular no. 11, 15 p.

WOGCC, 2014, Wyoming Oil and Gas Conservation Commission website, at http://wogcc.state.wy.us/, accessed May 1, 2014.