



StreamLines

Quarterly Newsletter of the Office of the State Engineer

Coalbed Methane Stream Depletion Assessment Study Northern San Juan Basin, Colorado

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The material in this article is based on the study report prepared by S.S. Papadopoulos and Associates, Inc. (SSPA), 2006, entitled "Coalbed Methane Stream Depletion Assessment Study – Northern San Juan Basin, Colorado". A copy of the study is available for viewing at the Division of Water Resources website at: www.water.state.co.us. This study was a joint effort by the Colorado Oil and Gas Conservation Commission (COGCC), the Colorado Geological Survey (CGS), the Colorado Division of Water Resources (DWR) and SSPA.

The purpose of this study was to develop a quantitative assessment of the levels of stream depletion or reduction in formation outflows (spring flows or flowing stream systems gaining from contact with formations) that may be occurring as

a result of the removal of water by coalbed methane (CBM) wells. This water historically has been disposed by one or more methods, including re-injection into deep formations, discharge to the surface stream system, and ponding/evaporation. The concern has been raised that the removal of ground water from aquifers that may be tributary to the surface stream system could be resulting in stream depletions or a reduction in spring flows and/or formation outflows (accretions) that are of a magnitude sufficient to cause injury to senior water rights holders on over-appropriated stream systems.

This study sought to develop a reliable assessment as to the levels of depletion, definition of the areas where CBM is ongoing that might be classified as non-tributary, definition of any potential correlations of water quality, geology, aquifer geometry, or formation/well depth that could lead to general guidelines about the potential for stream depletion that would be useful in either prompting or avoiding more detailed studies, and development of recommendations for further data collection or investigations.

tive source of CBM. In conjunction with the production of CBM, is the production of water. A COGCC database of monthly CBM gas and water production for all wells in the basin from 1985 indicates that, through July 2005, more than 4.2 trillion cubic feet of gas and 400 million barrels (52,000 acre-feet) of water have been produced from CBM wells in the San Juan Basin in Colorado. The annual rate of gas production is continuing to rise and is projected to be above 450 billion cubic feet in 2005. Annual water production peaked in 1993 at nearly 34 million barrels (4,300 acre-feet) and has been relatively steady at close to 23 million barrels (3,000 acre-feet) since.

CBM in the San Juan Basin is produced primarily from the coals in the late Cretaceous Fruitland Formation. The Fruitland Formation and the adjacent Pictured Cliffs Sandstone, informally referred to as the Fruitland-Pictured Cliffs aquifer, are the source of the CBM produced water. The Fruitland-Pictured Cliffs aquifer is bounded to the north by a well-delineated outcrop of its component formations.

(Continued on page 2)



CBM well in La Plata County

The San Juan Basin is a produc-

Coalbed Methane Stream Depletion Assessment Study (cont.)

Along much of its outcrop reach in Colorado, Fruitland-Pictured Cliffs strata dip steeply southward towards the central portion of the San Juan Basin.

Within the Fruitland Formation, porosity and permeability are greatest within the cleats of the coal seams. In addition to the coal seam permeability, fractures in the shales and sandstones that are adjacent to the coal seams are believed to provide local pathways for ground water. Permeabilities within the Fruitland-Pictured Cliffs aquifer are low, but greatly exceed those of overlying and underlying shale. Several streams cross the outcrop of the Fruitland Formation, including the Animas River, the Florida River, the Los Pinos River and the Piedra River. Alluvial deposits associated with these streams, and enhanced permeability of the Fruitland along the outcrop, support the occurrence of recharge along the outcrop and a shallow flow system from recharge areas to the streams.

SSPA was directed to apply the Glover-Balmer analytical method and also to comment at the conclusion of the analysis on method utility and limitations. Given the geologic configuration of the basin and the fluid withdrawal characteristics, the question was also posed as to whether this methodology, given its simplicity, could be reasonably applied to assess the general magnitude of stream depletion within a regulatory framework.

Using the optimized values of transmissivity and storativity obtained from the parameter estimation analysis, the Glover analysis was applied to CBM

wells within the Colorado portion of the San Juan Basin to identify the area where stream depletions exceed one-tenth of one percent of pumping within 100 years, and to quantify current and future depletions at the streams/outcrop. The method was not applied to the highly productive Fairway region where the Fruitland-Pictured Cliffs aquifer may not be water saturated. To estimate depletion in this area, a different methodology would be required. The area where stream depletions exceed one-tenth of one percent of pumping within 100 years generally includes the area within about 10 miles of the outcrop (Figure 1). It is recognized that most CBM wells have a production life significantly less than 100 years, a factor that is expected to be given some consideration in regulation, should the CBM-produced water be put to beneficial use.

To estimate the current magnitude of depletions, the Glover analysis was run using records of monthly water production rates to solve for basin-

wide depletions at the Fruitland outcrop/stream location. The composite rate of depletion for all Colorado wells was calculated at 156 acre-feet per year as of August 2005 (Figure 2). Various projections of future impacts were made, considering a continuation of historical pumping until the end of production cycles, additional infill drilling, and additional infill drilling excluding drilling in a buffer zone within 1.5 miles of the outcrop. These projections provide a general indication of the degree of stream/outcrop depletions occurring or likely to occur, from CBM-produced water.

The results of this study indicate that depletion estimates are relatively low compared to flows in the rivers. The combined mean yearly base flows for the Animas, Florida and Pine Rivers average nearly 227,000 acre-feet per year. Even though the current amount of depletion estimated by this study occurs year-round, the amount of depletion that occurs during a time of surface water administration (i.e.,

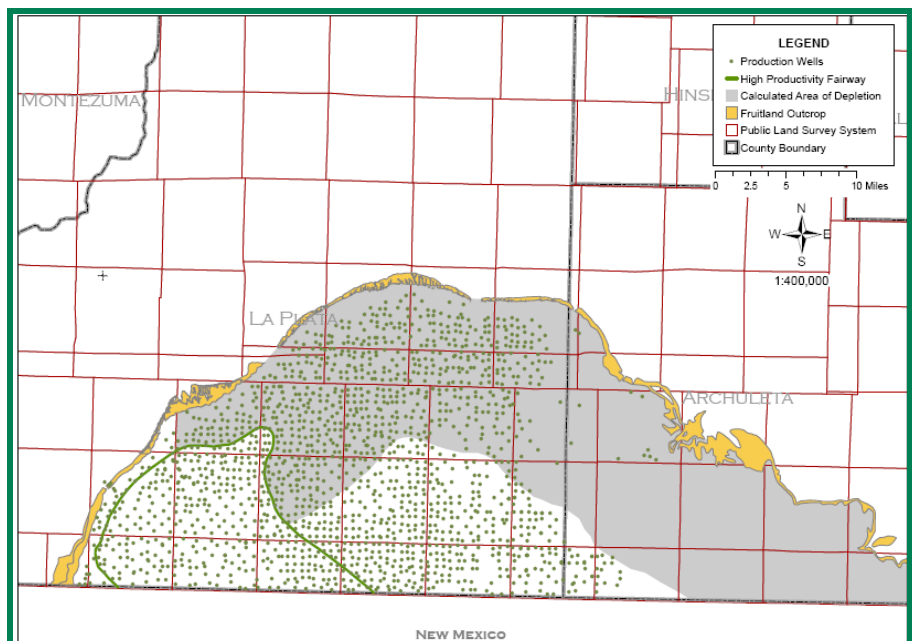


Figure 1. Delineation of area with 1000-year stream depletion exceeding 0.1% of pumping

Coalbed Methane Stream Depletion Assessment Study (cont.)

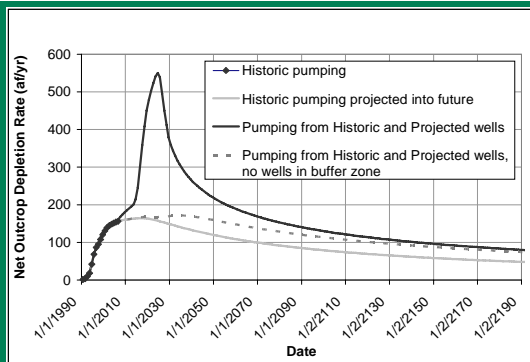


Figure 2. Calculated depletions to outcrop/stream boundary from CBM water production

senior water right placing call on a stream system) is less since active surface administration only occurs on average 110 days. Additionally, some of the streams within the San Juan Basin are not currently over appropriated (i.e., Animas River) and, therefore, not under administration. When these conditions are considered, the amount of depletion from CBM production that occurs during

these conditions is less than 50 acre-feet per year.

Two public meetings were held in Durango, including the last one in June 2006 to discuss the results of this study and written comments were received. A written response to all comments will be completed by the end of July 2006. Copies of the presentations can be found on DWR's website at www.water.state.co.us.

Human Resources

New Employees

Paul Schmucker was hired on April 3 as a Water Commissioner for District 40 on the Leroux Creek drainage. Paul has been self-employed for the last 26 years, has served on the Fire Mountain Canal Company board, and lives in Hotchkiss.

Pete Kasper started on April 10 as Water Commissioner for District 40 in the North Fork drainage. Pete has a variety of previous water experience including being past manager of the Overland Ditch and Reservoir Company and current vice-president of the board for the Colorado River Water Conservation District. Pete lives in Hotchkiss and teaches Mathematics and English at Delta High School.

Matt Puccini joined the IT Development team in the Denver office on April 17, 2006, filling the vacant Database Administrator II position. His main focus will be learning HydroBase and supporting application development. Matt's prior experience includes working for CWCB as a consultant and developed several of the applications that they use today.

Nichole Stephens started on May 1, 2006 as Administrative Assistant III in the Division 4 Office in Montrose. Nichole came to us with a diverse background in business and office procedures. She is a graduate of Mesa State College in Grand Junction. She has recently moved to the Montrose area from Nucla and is enjoying getting to know the Uncompahgre Valley.

Lonnie Spady started on June 28, 2006, as Deputy Water Commissioner in Water Districts 17, 66 and 67. Lonnie hails from the City of La Junta where he was a water treatment operator heavily involved in the operation of La Junta's reverse osmosis plant. Lonnie brings an excellent set of skills and knowledge with him, which coupled with a demonstrated interest in our mission and a persistent nature, should prove him to be an asset to DWR.

Jeanette Bryan joined Division 2's Ground Water Operations in Pueblo on June 1 as a Ground Water Enforcement Technician for the upper portion of the Arkansas River Basin. Jeanette had worked with Division 2 as a temporary Enforcement Assistant for three summers, working out of the La Junta Office. During that time, Jeanette proved to be a very knowledgeable, organized and high-energy employee. Prior to working for DWR, Jeanette had been manager for the AGUA Well Users Association.

Retired Employees

Bob Plaska retired on June 30, 2006 after over 21 years with the Division. Bob started working for the Division in December of 1984. After spending two years in the Denver office, he was appointed the Assistant Division Engineer in Alamosa. He held that position for 11 years until he was appointed the Division Engineer for Water Division 6 in Steamboat Springs on February 1, 1998. Bob and his wife, Connie, plan on remaining in Steamboat in the short term, and look forward to travel and lots of fishing time.

John Anderson retired on June 30, 2006 after 18 years working for the Division 1 office. John started his career as a temporary employee in August 1987 and became a permanent part-time Deputy Water Commission in Water District 4 in April 1988. He has been a full-time Deputy Water Commissioner in Water District 1 since 1989. John's strengths are in his customer service skills and the ability to give detailed reports when asked to investigate a water problem. His willingness to help and years of water experience will be missed.

George Sievers retired on April 30, 2006 with over 30 years of service working in Division 1. George worked many years on the key gages of the Poudre River and lower South Platte. The gages on the South Platte are some of the most difficult to maintain an accurate stage/streamflow relationship with the constantly changing flows and shifting sand channels. George was considered the ultimate commissioners' hydrographer. He was always available to make a measurement whenever he was asked whether late Friday evening or very early on a Sunday morning, George's dedication and experience will be greatly missed by our division.



CALENDAR OF EVENTS

- July 24** Recreational In-Channel Diversion meeting in Durango, Colorado; for more information, contact CWCB at 303-866-3441
- July 25-26** Colorado Water Conservation Board Meeting, Durango, Colorado; for more information, contact Dena Crist at 303-866-3441
- August 1** Colorado Board of Examiners of Water Well Construction and Pump Installation Contractors Meeting, Denver, Colorado; for more information, contact Gina DeArcos at 303-866-3581
- August 17-18** Colorado Ground Water Commission Meeting, DoubleTree Hotel, Grand Junction, Colorado; for more information, contact Marta Ahrens at 303-866-3581
- September 19-20** Colorado Water Conservation Board Meeting, Vail, Colorado; for more information, contact Dena Crist at 303-866-3441

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