



FOUR CORNERS GEOLOGICAL SOCIETY NEWSLETTER

October 2005

Since 1950

Next Meeting and Presentation

October FCGS Meeting and Presentation in Farmington – p. 2
Speaker abstract and bio. – p. 4-7

The Prez Sez – p. 3

General Announcements

Advertising – p. 8
Around the Corner – p. 9

Four Corners Geological Society

October Meeting and Presentation

DATE:

Friday, October 21, 2005

SPEAKER:

James E. Fassett, Scientist Emeritus, USGS/ Independent Geologist, Santa Fe, New Mexico (see bio on page 5)

TOPIC:

"Fractured-Sandstone Gas Reservoirs, San Juan Basin, New Mexico & Colorado: Stratigraphic Traps, Not Basin Centered Gas Deposits"
(see abstract on page 4)

PLACE:

Courtyard Marriott, PINE ROOM, 560 Scott Ave, Farmington, New Mexico, (505) 325-5111

AGENDA:

5:30 PM Social Hour

6:30 PM Dinner-----Choice of: **Pollo Relleno or Pork Madeira**

7:30 PM Presentation

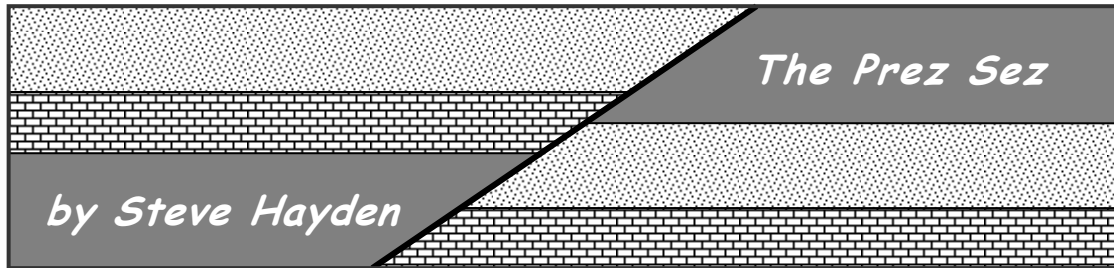
COSTS:

\$15.00 per person (dinner and talk), \$2.00 per person (talk only), students free (talk only)

Reservations! for the meeting and presentation should be made by Wednesday, Oct. 19.

Contact: Mike Dawson – email: mdawson@br-inc.com, phone: (505) 326-9770





October 2005

Greetings. Our meeting this month will be in the Marriott in Farmington on October 21st. Jim Fassett will present a talk based on his work analyzing the data classifying the production from tight sand reservoirs of the San Juan basin as basin-centered gas. This will be a very interesting and important talk for those of us working in the basin and in the industry in general.

This month Ed Heath and Tom Ann Casey represented the FCGS at the AAPG Meeting in Jackson Wyoming. Plans are being made to have the Section meeting here in 2010. I will ask Ed to address this at the Meeting.

The Treasurer's position is still vacant and I am once again requesting that someone volunteer to serve for this year.

I hope to see everyone at the Marriott on the 21st.

Steve

October 21, 2005 Presentation



FRACTURED-SANDSTONE GAS RESERVOIRS, SAN JUAN BASIN, NEW MEXICO AND COLORADO: STRATIGRAPHIC TRAPS, NOT BASIN CENTERED GAS DEPOSITS

by

James E. Fassett
Scientist Emeritus, USGS/
Independent Consulting Geologist
jimgeology@qwest.net

ABSTRACT

The San Juan Basin of northwestern New Mexico and southwestern Colorado contains the second largest gas accumulation in North America. Cumulative production to date is 34 trillion cubic ft of gas (TCFG). Fractured-sandstone reservoirs in the basin have produced 22.6 TCFG and coal beds of the Fruitland Formation have produced 11.4 TCFG (to end-October 2004). The Upper Cretaceous sandstone reservoirs in the basin are in the Dakota Sandstone, Mesaverde Group, Chacra Sandstone producing interval, and the Pictured Cliffs Sandstone. The main gas-productive trends are on the southwest structural limb of the San Juan Basin bounded to the southwest by stratigraphic pinchouts of the sandstones into impermeable mudstones, up dip to the southwest. The sandstones are all tightly cemented with little to no intergranular permeability but they are all highly fractured (fractures trend northerly) and the fractures create the reservoirs.

Dakota reservoirs are multi-faceted consisting of off-shore, shelf-sandstone lenses; shoreface-marine sandstone bodies; and continental fluvial sandstones. The Dakota producing area contains multiple, disconnected, complex, stratigraphic traps. The Point Lookout Sandstone of the Mesaverde Group and the Pictured Cliffs Sandstone are regressive shoreface-marine deposits laid down in two separate episodes of shoreline regression. These formations consist of multiple sandstone benches that rise stratigraphically to the northeast; many of these benches are separated by impermeable mudstones. The transgressive Cliff House Sandstone, the uppermost formation in the Mesaverde Group, produces gas from a series of offshore shelf-sandstone beds. These beds are lenses of sandstone encased in impermeable marine shales above and impermeable continental mudstones below. The middle formation of the Mesaverde Group, the Menefee Formation, produces lesser amounts of gas from disconnected fluvial sandstones. The Chacra Sandstone producing interval produces gas from a series of offshore shelf sandstones deposited by southeast-flowing subsea currents some distance

seaward of a large sandstone tongue (La Ventana Sandstone Tongue) of the Cliff House Sandstone. Chacra reservoirs are in sandstone lenses encased in impermeable marine mudstones.

The fractured-sandstone reservoirs of the San Juan Basin have for decades been considered by many geologists to be perfect models for “basin-centered” gas deposits. Such deposits have been characterized by various authors as being in the centers of basins; in very tight, impermeable, sandstone beds; and with little water in the reservoirs. The sandstones are thought to be sheet-like with interconnected permeability from basin center to outcrop; the gas is contained in the reservoirs by up-dip hydrostatic water seals.

At the up-dip boundary of such deposits there is a theoretical, impermeable interface (in the otherwise permeable strata) between the gas-saturated reservoir and water-saturated rocks. Because the fractured-sandstone gas reservoirs of the San Juan Basin are all stratigraphic traps, they cannot be thought of as models for “basin-centered” gas deposits.

The coal beds of the Fruitland Formation constitute the largest gas reservoir in the San Juan Basin in terms of resources and ultimate production potential. The Fruitland, most certainly, will ultimately produce more gas (coal-bed methane) than all of the fractured-sandstone reservoirs combined. The Fruitland coal-bed methane field is the world’s largest coal-bed methane deposit. Fruitland gas is trapped in hundreds to thousands of individual coal beds in the Fruitland; each coal bed is a separate, discrete reservoir encased in impermeable continental mudstones. Fruitland coals were deposited in backshore swamps on top of and adjacent to the Pictured Cliffs Sandstone during the 2.8 m.y. it took for the Pictured Cliffs shoreline to retreat northeastward across the San Juan Basin area. Fruitland coal thicknesses were controlled by the rate of regression of the Pictured Cliffs shoreline: coals are thinner in areas where the regression was rapid and thicker in areas where regression slowed or stopped, allowing for vertical build-ups of the Pictured Cliffs and concomitant vertical stacking of Fruitland coal beds shoreward of the shoreface-sandstone build-ups.



Bibliography

Jim was born in Dearborn, Michigan in 1933. He served in the U.S Army at Fort Leonard Wood, Missouri and Nellingen, Germany from 1953-55 and following his discharge he enrolled at Wayne State University in Detroit receiving Bs and Ms degrees (in geology) from that institution in 1959 and 1964, respectively. Jim was hired by the Conservation Division of the U. S. Geological Survey in Washington, D.C. in 1960 and was transferred to Farmington, New Mexico in 1961. While in Farmington, through 1989, he was District Geologist and studied the coal- and oil-and-gas-bearing Cretaceous rocks of the San Juan Basin conducting both surface geologic mapping and subsurface geophysical-log studies. During a six-month period in late 1979-early 1980 he was on temporary assignment in Tuscaloosa, Alabama in charge of a USGS team assessing Federal coal resources illegally mined in the Black Warrior Basin. This work resulted in the recovery of more than \$2.5 million in unpaid royalties to the U.S. Treasury. In 1980 he was transferred to Albuquerque, N.M. as the Deputy Minerals Manager for Resource Evaluation. In 1983, following the elimination of the Conservation Division of the USGS by then Department of the Interior Secretary, James Watt, he transferred to Reston, Va. where he served as Chief of the Eastern Technical Reports Branch, Geologic Division of the USGS until 1987 when he returned to field work with the Branch of Sedimentary Processes in Denver. While in Denver, he continued to work on stratigraphic studies of coal- and oil-and-gas bearing rocks of the Western Interior of the U.S. He was also able to intensify his research on the chronostratigraphy of rocks adjacent to the Cretaceous-Tertiary boundary in the San Juan Basin as a recipient of a USGS Gilbert Fellowship in 1988. That work included detailed paleomagnetic, paleontological, stratigraphic, and sedimentological studies of those rocks and the sampling of altered volcanic ash beds for precise argon/argon age determinations.

In 1990 Jim accepted an assignment in Islamabad, Pakistan as the Resident Team Leader of the USAID-funded (United States Agency for International Development) program to strengthen the professional capability of the Pakistan Geological Survey and to evaluate and explore for new coal resources in Pakistan. That project culminated with the discovery and delineation of a newly discovered, giant coal field in the Thar Desert of southeastern Pakistan. This coal field has resources of 80 billion metric tons of coal and has the potential to make Pakistan energy-self-sufficient for the first time in Pakistan's history.

Jim returned from Pakistan to his USGS office in Denver in 1993. His work then focused on an evaluation of the coal resources of the San Juan Basin for the USGS National Coal Assessment program. That work concluded with the publication in 2000 of a USGS Professional Paper chapter on the geology and coal resources of the Fruitland Formation in the San Juan Basin (USGS PP 1625-B, Chapter Q). During that time Jim was also able to continue his work on the K-T boundary rocks in the San Juan Basin, mostly as an unfunded, spare-time study. In June 2000, Jim retired from the USGS and moved to Santa Fe, New Mexico where he continues to work on the coal-bed methane resources of the San Juan Basin and the K-T boundary problem as a USGS Scientist Emeritus. In

addition, since his retirement, he has also been doing geologic consulting work for Oso Energy Resources, in Durango, Colorado.

Jim has been active in professional geological society activities over his career and is a past-President of the New Mexico and Four Corners Geological Societies and is an honorary life member of the FCGS. In addition, he was the principal editor of six multi-chaptered volumes published by the Four Corners Geological Society (Cretaceous and Tertiary rocks of the southern Colorado Plateau, 1973, Canyonlands Country, 1975, and Oil and gas fields of the Four Corners area, volumes I, II, 1978 and volume III, 1983); New Mexico Geological Society (San Juan Basin III, 1977, the all-time best selling guidebook of the NMGS); the Geological Society of America (The Cretaceous and Tertiary boundary in the San Juan and Raton Basins, New Mexico and Colorado, Special Paper 209, 1987), and the Rocky Mountain Association of Geologists (Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico, 1988). In addition Jim has published a USGS Geologic Quadrangle Map, two USGS Professional Papers, several USGS Open-File Reports (including one on the Thar Coal Field of southeast Pakistan), and more than 60 geologic reports published in geologic guidebooks and professional society journals; his latest publication on the tight-gas sandstone reservoirs of the San Juan Basin will be released shortly as a CD publication by the Rocky Mountain Association of Geologists. Jim has presented more than 60 papers at professional society meetings over the years with more than 50 published abstracts. Jim is still actively at work on the timing of the demise of the dinosaurs in the San Juan Basin working with USGS geochemist-colleagues in Denver investigating the chemistry of fossilized dinosaur bone present in Paleocene rocks in the basin. He presented an invited paper at the IMPACT2000 meeting held in Vienna, Austria in July 2000 in which he concluded that the evidence is now compelling that dinosaurs in the San Juan Basin did not become extinct at the end of the Cretaceous but lived on into the Paleocene for another 1 million years. Those findings were published in GSA Special Paper 356 in 2002 and another paper presenting new data on this controversial subject is now in preparation.



General Announcements/News from other Geo-Societies



How much gas will I get? When will I get gas?

Gas Content! **Critical Desorption Pressure!**

To find out how our **Critical Gas Content Service** can help you achieve profitable coalbed development please call (307)721-8875 ext. 1, or e-mail gascontent@welldog.com.



**THE GRAND JUNCTION GEOLOGICAL SOCIETY
PUBLISHES FIELD GUIDES**

The Grand Junction Geological Society now has for sale a CD containing field guides for the GSA Rocky Mountain Section meeting recently held in Grand Junction. Field trips include: Cactus Park-Bridgeport Fault, Unaweep Canyon, Jurassic and Lower Cretaceous Dinosaurs, Debeque Canyon Landslide, Uravan Mineral Belt, and Energy Resources of the Book Cliffs.

Cost of the CD is \$12.00 plus \$1.50 for postage. Mail checks to the GJGS at P O Box 4045 Grand Junction, CO 81502.

Around the Corner

Our own FCGS Member David Gonzales will be speaking about our local diatremes on Friday November 18th (pretty sure in Durango) to the society. Then on Saturday, Nov 19th, we are scheduled with the Utes to go into Ute Mountain Tribal Park. We will look at 1) petroglyphs on the Point Lookout sandstone, 2) the diatreme exposure in the switchback, 3) the facies change in the Cliff House Sandstone as seen from the overlook (shoreface sands into coaly shale), and finally, 4) the Lion House cliff dwelling. Brian and Michael will lead the diatreme discussion and Gary and Kim will lead the Cliff House discussion.

If we get 12 or more participants it will cost \$20/each. If less than 12, then I think it goes up to \$25. This is still a good deal because the Utes usually charge \$40/person for their tours back to Lion House. If people want to ride in the Ute vans instead of using their own cars, it will cost an additional \$8. Given the trend in gas prices and the distance to Towac from Durango and Farmington, this is looking like a more attractive option now! More to come....



Advertising rates for the Four Corners Geological Society newsletter:

Full Page Ad (7½" x 9½") \$100/mo. or \$1000/yr. Half Page Ad (7½" x 4½") \$50/mo. or \$500/yr.
¼ Page Ad (3½" x 4½") \$25/mo. or \$250/yr. Business Card (3½" x 2") \$10/mo. or 100/yr.

Odd sizes are \$3.50 per column inch per month, minimum \$10.00

For more information, please contact the FCGS Treasurer, (vacant). Proceeds will go toward the further development of the Society (i.e., offset meeting costs, publications, etc.).

Four Corners Geological Society

P.O. Box 1501, Durango, CO 81302

<http://www.canyonwinds.com/FCGS/index.html>

2005-06 Officers

President – Steve Hayden: phone: 505.334.6178, email: Steve.Hayden@state.nm.us

Vice President – Mike Dawson: phone: 505.3269770, email: mdawson@br-inc.com

Secretary – Steve Cossey: phone: 970-385-4800, email: cosseygeo@aol.com

Treasurer – vacant

Book Chairperson – Tom Ann Casey: phone: 970-247-1500, email: mtmassive@frontier.net

Newsletter Editor – Luke Titus: phone: 505.324.6108, email: jtitus@br-inc.com

Past President– Ed Heath: phone: 970-375-1997, email: ewheath@frontier.net

Web Coordinator– Tom Getts email: getts@mindspring.com

Field Trip Coordinator– Kim Gerhardt: Phone: 970.375.2700, e-mail: kd@mydurango.net

Foundation President– Jason Hooten: phone: 970.563.5353, e-mail: jhooten@rwpc.us

Foundation Secretary – Joe Hewitt: phone: 505.599.6365, email: jhewitt@blm.gov

Foundation Treasurer – Jim Hornbeck: phone: 505.325.8874, email: arg@digii.net