



# FOUR CORNERS GEOLOGICAL SOCIETY NEWSLETTER

February 2008

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# Four Corners Geological Society

## February Meeting and Presentation

**DATE:** Friday, February 22, 2007

**SPEAKER:** William A. Ambrose, Bureau of Economic Geology, University of Texas at Austin

**TOPIC:** Transgressive-Regressive Cycles in the Upper Pictured Cliffs Sandstone and Controls on Fruitland Coal Depocenters, Northwestern San Juan Basin

**PLACE:** Best Western Riverwalk, 700 Scott Ave, Farmington, NM, 87401 (505) 327-5221

### AGENDA:

5:30 PM- Social Hour – Riverwalk Restaurant

6:30 PM- Dinner – Choice of: **Gorgonzola Chicken or Pepper Steak & Please indicate choice when dinner reservation is made.**

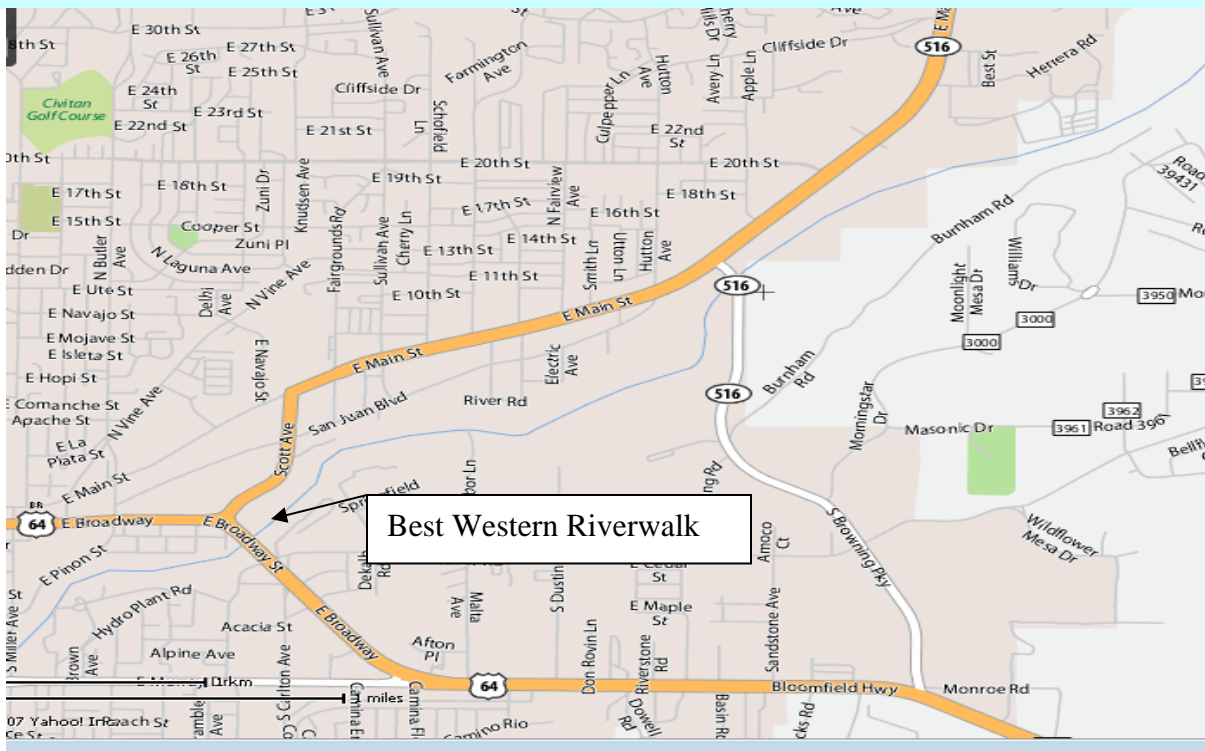
7:30 PM- Presentation

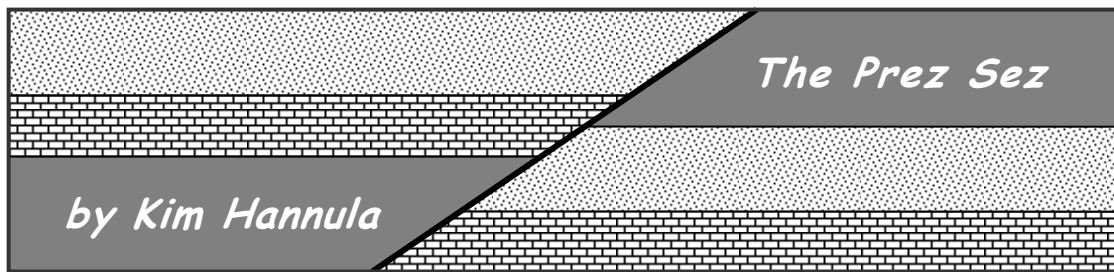
**COSTS:** \$20.00 per person (dinner and talk), \$2.00 per person (talk only), student's free (talk only)

**Reservations** for this months meeting and presentation should be made by Wednesday, Feb. 20.

**Farmington Contact:** Chip Head – email: [chip.f.head@conocophillips.com](mailto:chip.f.head@conocophillips.com) phone: (505) 326.9772

**Durango Contact:** Kim Hannula – email: [hannula\\_k@fortlewis.edu](mailto:hannula_k@fortlewis.edu) phone: (970) 247-7463





I hope everyone is enjoying the snow we've been having this month. It was great to see so many people in Durango for Tanya Atwater's talk last month, during that little window between the storms.

February's talk, by William Ambrose of UT-Austin, will discuss the three-dimensional architecture of the Fruitland Formation/Pictured Cliffs system. I know there are a lot of people interested in that topic around here, so I hope to see a lot of you in Farmington!

It's also time to start thinking about attending this year's AAPG Rocky Mountain Section meeting, to be held in Denver on July 9-11, 2008. The meeting will be co-hosted by the Colorado Oil and Gas Association. More information about the meeting can be found on their web site, <http://www.rms-aapg.org/>

Finally, the Grand Canyon Association has just sent me a lovely new geologic map of the eastern Grand Canyon, compiled by J. Michael Timmons and Karl Karlstrom. The map and cross-section are accompanied by an interpretative stratigraphic column, which puts the Grand Canyon rocks into a global geologic history. For people who teach, it would be a great accompaniment to the classic Bright Angel Quad, and for people who are planning raft trips, the map is labeled with river miles as well as with the geology. My students have already drooled on my copy, so if you want one, you can order it from the Grand Canyon Association at [www.grandcanyon.org](http://www.grandcanyon.org)

Kim



## **Transgressive-Regressive Cycles in the Upper Pictured Cliffs Sandstone and Controls on Fruitland Coal Depocenters, Northwestern San Juan Basin**

**William. A. Ambrose<sup>1</sup> and Walter B. Ayers, Jr.<sup>2</sup>**

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**<sup>2</sup>Texas A&M University Department of Petroleum Engineering, 3116 Tamu, College Station, Texas 77843**

### **ABSTRACT**

Upper Pictured Cliffs Sandstone tongues in the northern part of the San Juan Basin record high-frequency, late Cretaceous transgressive episodes, and are inferred to have been caused by eustatic sea level rise coincident with differential subsidence. Outcrop and subsurface studies show that each tongue is an amalgamated barrier-strandplain unit up to 100 ft (30 m) thick. Successive Upper Pictured Cliffs tongues display an imbricate relation and are offset basinward, reflecting northeastward shoreline progradation. Upper Pictured Cliffs barrier-strandplain sandstones underlie and bound thickest Fruitland coal seams on the seaward side.

Lithofacies maps of the undivided Upper Pictured Cliffs tongues display both dip-elongate and strike-elongate trends (northeast- and northwest-oriented, respectively) in La Plata County, Colorado, within a northeast-prograding, wave-dominated delta system (Cedar Hill Deltaic Complex). Dip-elongate sandstone bodies in the Cedar Hill Deltaic Complex project landward (southwestward) into the Cedar Hill area in San Juan County, New Mexico where they tie with Fruitland fluvial/distributary channel-fill sandstones. In contrast, strike-elongate sandbody trends in the northeastern part of the basin reflect a strandplain-barrier system (Navajo Strandplain/Barrier Complex) with a major sediment contribution inferred from the Cedar Hill Deltaic Complex via longshore drift. Subordinate dip-elongate sand-body trends in Navajo Strandplain/Barrier Complex are interpreted to reflect relatively minor sediment input from Fruitland fluvial systems.

Depocenters for Fruitland coal beds in the Cedar Hill Deltaic Complex are inferred to have shifted northwestward with time. Fruitland coal beds vary considerably in thickness in this area, and although they collectively form an integrated, regional reservoir, individual beds may be in poor hydraulic communication locally. For example, many Fruitland coal-thickness trends exhibit reciprocal isopach relationships with respect to those of underlying and overlying fluvial- and distributary-channel sandstones. At Cedar

Hill field, middle Fruitland coal seams thin and pinch out over thick (>40 ft [>12 m]) channel-fill sandstones. Conversely, these coal seams are thick southeastward (locally >30 ft [>9 m]) in muddy, interchannel areas with thin (<5 ft [<1.5 m]) sandstones. Coal seams overlying channel-fill sandstones are the result of peat having accumulated over antecedent, abandoned-channel complexes. Coal seams that underlie channel-fill sandstones represent subsequent channel avulsion that redirected streams into swamps. Where they override and underlie lenticular sandstone bodies, coal seams may be folded because of differential compaction of sandstones and adjacent mudstones and coal beds. The significance of continuous coal seams that override and underlie sandstones but are sharply folded at facies boundaries is twofold: (1) coal seams (methane reservoirs) are more laterally extensive than inferred by previous workers, and (2) folding-induced fractures, and therefore enhanced coalbed permeability, may occur where coal seams are associated with sandstone complexes.

Controls on Fruitland coal-seam thickness and continuity in the San Juan Basin are a function of local facies distribution in a coastal-plain setting, shoreline positions related to transgressive-regressive cycles and basin subsidence. During periods of relative sea-level rise, the Pictured Cliffs shoreline was temporarily stabilized, allowing thick, coastal-plain peats to accumulate. Although some coal seams in the Lower Fruitland Tongue override abandoned Pictured Cliffs shoreline deposits, many pinch out against them. Differences in the degree of continuity of these coal seams relative to coeval shoreline sandstones are attributed to either differential subsidence in the northern part of the basin, multiple episodes of sea-level rise, local variations in accommodation and progradation, stabilization of the shoreline by aggrading peat deposits, or a combination of these factors. Fruitland coalbed methane resources and productivity are partly controlled by coal-seam thickness; other important factors include thermal maturity, fracturing, and overpressuring. The dominant production trend occurs in the northern part of the basin and is oriented northwestward, coinciding with greatest Fruitland net-coal thickness. Similar relationships between trends of thick coal seams of coeval origin with stacked shoreface sandstones exist in other Western Interior basins in the U. S., and serve as models for coalbed methane exploration in other basins of the world.

### **SPEAKER BIO**

William A. Ambrose is a research scientist at the Bureau of Economic Geology. He received his Master of Arts in Geological Sciences from the University of Texas at Austin in 1983. His diverse research interests include clastic sedimentology and stratigraphy, unconventional energy resources, CO<sub>2</sub> sequestration, and planetary geology. Ambrose was with the Research Planning Institute in Austin, Texas from 1984 to 1986, where he participated in regional stratigraphic and subsurface mapping studies of the Wilcox Group, Yegua and Vicksburg Formations in the Gulf Coast. In 1987 he joined the Bureau of Economic Geology (BEG), where he worked on a variety of projects, including in oil and gas reservoir characterization, co-production of methane in geopressured reservoirs in the Gulf Coast, coalbed methane in western U.S. basins (with an emphasis on the San Juan Basin), and CO<sub>2</sub> sequestration. Ambrose also worked on a number of basin analysis and reservoir characterization projects in Venezuela, Mexico,

and Australia while at BEG. His research in planetary geology is focused on lunar cratering processes and stratigraphy. He is a Past President of the Energy Minerals Division of the American Association of Petroleum Geologists and is currently the Co-Chair of the AAPG Astrogeology Committee.

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Walter Ayers is Visiting Professor of Geoscience at Texas A&M University. He teaches courses in reservoir studies, unconventional reservoirs, and petroleum geology. His ongoing research includes CO2 sequestration and enhanced methane production from coal beds, tight sand reservoirs and production optimization from stripper wells. Ayers holds a Ph.D. from The University of Texas at Austin and M.S. and B.S. degrees from West Virginia University.



## General Announcements/News from other Geo-Societies



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**AAPG Winter Education Conference** will be held February 11-15, 2008, in Houston, Texas. Hosted by the Norris Conference Center, 9999 Richmond Ave., Suite 102, Houston, Texas 77042, 713-780-9300; Fax: 713-780-9490. Special AAPG Group Rates at nearby hotels. For registration and information: Toll-free (US and Canada) 888-338-3387, or 918-560-2650; Fax: 918-560-2678; e-mail: [educate@aapg.org](mailto:educate@aapg.org). Download a registration form at: <http://www.aapg.org/education/wec.cfm>

**The 2008 AAPG Annual Convention and Exhibition** will be held in San Antonio, Texas April 20-23, 2008. This will include oral and poster presentations, exhibiting companies, daily networking events, and focused pre- and post-conference workshops, courses, and field trips. For information go to: [www.aapg.org/sanantonio](http://www.aapg.org/sanantonio)

**NAPE** is pleased to bring to NAPE EXPO 2008 the International Pavilion. "Visit the World" and make contacts with energy ministers, state licensing authorities, national oil company executives and key players from international oil companies. February 7-9, 2008. For more information go to: [www.internationalpavilion.com](http://www.internationalpavilion.com)

**AAPG** announces the global forum to buy, sell and promote international upstream deals at the London 2008 APPEX prospect and property expo, March 5-7, at the Business Design Centre, London. Register at [www.aapg.org/appex](http://www.aapg.org/appex)

**PTTC Technology Connections** of the Rocky Mountain Region presents the following upcoming workshops:

**-Petra Basics:** Main Module, Mapping Module, and Cross Section Module, Friday, February 29, 2008.

**-Seismic Imaging of Carbonate Reservoirs and Seals – Exploration and Production Applications,** March 20 and 21, 2008.

**-Crash Course in Log Analysis,** April 4, 2008.

To register online, go to [www.pttcrockies.org](http://www.pttcrockies.org). For more information, contact Mary Carr, 303-273-3107, [mcarr@mines.edu](mailto:mcarr@mines.edu)

**RMAG/Denver Geophysical Society 3D Seismic Symposium** will be held March 17, 2008 at the Marriott Hotel, Denver.

More information will be posted on the RMAG website at [www.rmag.org](http://www.rmag.org)

**RMAG** is pleased to announce the launch of a PUBLIC ISSUES web site in January 2008. You will access the new site through a link found on the RMAG web site home page. There are three categories for navigating the site: 1) Time sensitive for current material that needs immediate response or action; 2) General information; and 3) Links for additional information on key issues. Authors who are interested should submit a title and short description or abstract by January 31, 2008. Submit an electronic copy and contact information to any of the following editors: Donna Anderson (EOG Resources and CSM; [dsanders@mines.edu](mailto:dsanders@mines.edu)), Edmund R. Gustason (El Paso E & P Company;

[edmund.gustason@elpaso.com](mailto:edmund.gustason@elpaso.com)), and Mark Longman (Questar E & P; [mark.longman@questar.com](mailto:mark.longman@questar.com)). The UGA co-editor is Craig Morgan with the Utah Geological Survey ([craigmorgan@utah.gov](mailto:craigmorgan@utah.gov)).

The **RMAG/DGS Geoland Ski Trip** will be held March 7, 2008 in Beaver Creek, Colorado. Registration forms can be found on the RMAG web site.

The **WYOMING GEOLOGICAL ASSOCIATION** invites you to meet in the Gem City of Laramie, Wyoming for the 2008 Annual Field Conference, September 3-7, 2008, “Black Gold, Diamonds in the Rough, and Other Gems.” The WGA is soliciting presentations on topics relevant to the conference for presentation September 4 and 5, 2008. Deadline for abstracts is April 15, 2008. The range of subjects includes economic and general geology of southeastern Wyoming. Abstracts should be e-mailed to Alan Thompson at [alan@goolsbyfinley.com](mailto:alan@goolsbyfinley.com). Phone 307-266-3199. The WGA website is [www.wyogeo.org](http://www.wyogeo.org).

The **YELLOWSTONE INSTITUTE** is an educational program offering short courses, 1 to 5 days long, taught by experts in their respective fields. Courses are offered the year around. The Institute is headquartered at the old Buffalo ranger station in the Lamar River Valley.

David V. Grey  
Geologist/Geophysicist

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**Rocky Mountain Section AAPG** is teaming up with the Colorado Oil and Gas Association (COGA) to present “Rocky Mountain Energy Epicenter” at the Colorado Convention Center, July 9-11, 2008. This is the third time RMS-AAPG has joined forces to bring together a “Who’s Who” of Rocky Mountain explorers, producers, and marketers in one location. Energy Epicenter recognizes the fact that the Rocky Mountains combine all critical aspects of unconventional oil and gas plays within a background of intense land-use and marketing issues that influence the economy of our country.

Please come join us for this exciting and informative meeting!

# ROCKY MOUNTAIN **Energy Epicenter** 2008

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Presented by Rocky Mountain Section AAPG

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**Contact:**

Speakers: Mark Sonnenfeld [sonnenfeld@whiting.com](mailto:sonnenfeld@whiting.com)

Sponsors: Jim Emme [jim\\_emme@yahoo.com](mailto:jim_emme@yahoo.com)

Exhibitors: Brian Richter [berichter@aol.com](mailto:berichter@aol.com)



### FOR MORE INFORMATION

Colorado Oil & Gas Association: [www.coga.org](http://www.coga.org)



ROCKY MOUNTAIN SECTION  
[www.rms-aapg.org](http://www.rms-aapg.org)

Rocky Mountain Section AAPG: [www.rms-aapg.org](http://www.rms-aapg.org)

### **List of upcoming speakers and dates:**

-March 19 @ FLC: Lukas Baumgartner (MGS) Mineralogy

-March 21 in Farmington: TBD

-April 25 @ FLC: Senior dissertations

-May 16 @ TBD: Ron Blakey (UNA) Global Paleogeology



# Four Corners Geological Society

## MEMBERSHIP RENEWAL or APPLICATION for 2008

PAGE 1

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# Four Corners Geological Society

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## MEMBERSHIP RENEWAL or APPLICATION for 2008 PAGE 2

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

**For more information, please contact the FCGS Treasurer. 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

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