



At the AAPG National Convention in San Antonio this year, think Edwards Limestone while walking the beautiful River Walk. Edwards Aquifer springs just north of the city provide much of this water.

## Tight Gas Play – and Water for Millions

The Edwards Limestone is a hot gas play in south Texas, while 110 km to the north, it is the primary water source for nearly 2 million people including the City of San Antonio, the site of this year's AAPG Annual Convention.

Production from tight formations now account for 19% of the U.S. gas production and, according to the U.S. Geological Survey, over 135 Tcf (3.8 Tm<sup>3</sup>; 24 Bboe) is technically recoverable. Imaging the subsurface through 3-D seismic programs has helped locate many of these hidden plays. Horizontal drilling and multi-stage fracturing programs are combining to unlock the gas from these tight reservoirs. One of

these tight reservoirs, the Barnett Shale, was featured in GEO ExPro v. 4, no. 2, pp.48-52.

Some of the most prolific reservoir facies in the Gulf of Mexico basin are Lower Cretaceous carbonates. Production from these carbonates is from the vast reserves of east-central Mexico, across southern Texas, and into Louisiana. The Edwards Limestone is part of this system of carbonates and runs 400 km across south and south central Texas. The tight gas production is from a reef trend that runs roughly parallel to the present day coastline.

### First loading – then uplift

The Edwards Limestone was deposited in a shallow sea environment during the Cretaceous about 100 million years ago. Exposures of the limestone consist of coarsely grained rocks such as sandbars, spits, and beaches. The sand consists of broken fragments of calcareous algae, foraminifera, and shells. Cross bedding that formed from wave action and currents is common along outcrops and even dinosaur tracks have

been found along the ancient shoreline.

Further offshore, reef trends formed in slightly deeper water near the shelf margin. The progradational package consists of a carbonate reef and the associated detritus from that reef. Carbonate bank complexes, back-reef lagoonal, and distal slope deposits are also found along the shelf margin. These facies are repeated several times as the margin prograded seaward.

The entire area was deeply buried by Late Cretaceous and Tertiary sediments. The sediment loading caused normal faulting to occur throughout the section. This faulting is important to both the Edwards Aquifer and the Edwards gas play by providing pathways for fluid movement to enhance porosity. In the case of the gas play, the faults are critical for hydrocarbon migration and emplacement as well.

The Edwards is exposed in south central Texas and gradually becomes deeper to the south east with most of the gas play found at depths from 2,700 m to 4,300+ m.



The Edwards shelf trend parallels the Texas coast between San Antonio and Houston.

# GEO ExPro

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## Main events 2008 where GEO ExPro will be present:

- No 1. GEO 2008**, Manama, Bahrain, March 3-5  
**APPEX**, London, March 5-7  
*Focus on The Middle East and Carbonate Reservoirs*
- No 2. AAPG Annual Meeting**,  
San Antonio, USA, April 20-23  
*Focus on Geoscience explained*
- No 3. EAGE 70<sup>th</sup> Conference and Exhibition**,  
Rome, Italy, June 9-12  
*Focus on Geoscience and Technology Explained and  
Northwest Europe*
- No 4. SPE Annual Technical Conference and Exhibition**,  
Denver, USA, September 21-24  
*Focus on Reservoir Management and  
Reservoir Geophysics*
- No 5. SEG 78<sup>th</sup> Annual Meeting**,  
Las Vegas, USA, November 9-14  
**Petex 2008**, London, UK, November 25-27  
*Focus on Technology Explained and North America*
- No 6. North American Prospects Expo (NAPE)**  
Houston, USA, February 5-6 2009  
*Focus on Exploration and  
North America*



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The plan is liable to change without notice.

## HOT spot

Water enters the Edwards Limestone through porous beds and large sink holes such as this one.



Photo: Edwards Aquifer Authority

### The Aquifer

The Edwards Plateau, or more commonly known as Texas Hill Country, is the catchment basin or drainage area for the aquifer. Slightly down dip a faulted and porous Edwards Limestone is exposed at the surface in an area known as the Balcones Fault Zone. It is here where water enters the system. Farther down dip where this moving water is trapped inside the limestone, the water can be tapped either by wells or flowing springs and is used throughout this area.

### The Gas Play

Much farther down dip is the gas play. Originally drilled in the 1960's with vertical wells, some produced gas but most were uneconomic. Horizontal drilling, complex, multi-stage fracturing, and many kilometers of new 3-D seismic data are expanding this play daily.

"The Edwards shelf-edge reef play contains seismically identifiable mounds, complexly intermingled grainstone beaches (higher perm) and boundstone reefs (low perm), thick gas columns (30-150 m) stratigraphically trapped in the mounds, and fractures parallel to the coast." says Lee Billingsley, Vice President/Exploration at Abraxas Petroleum Corporation and last year's AAPG President. "All these attributes have caused exploitation to evolve to today's more efficient, horizontal wells with multiple stage sand fracs. Not unlike shale gas resource plays, statistical success in the Edwards shelf-edge reef play depends on maximum exposure of each wellbore and its frac surfaces to the tite carbonate."

Tom Smith  
Associate Editor

### Several new discoveries

Pioneer Natural Resources, a large independent exploration and production company, is one company gaining significant reserves along this 400 km trend. They have announced nine new Edwards discoveries and a 2007 production growth of 38%. Their gross discovered gas resource has increased from 400 Bcf (11 m<sup>3</sup>, 72 MMboe) to 600 Bcf (17 m<sup>3</sup>, 108 MMboe) within that year. They have also tied up over 690 km<sup>2</sup> of prospective Edwards leases.