FOREWORD

The Bureau of Economic Geology, established in 1909 as the successor to the Texas Geological Survey and the Texas Mineral Survey, is a research unit of The University of Texas at Austin. It also functions as the State Geological Survey, the Bureau Director representing Texas in the Association of American State Geologists.

Extensive advisory, technical, and informational services relating to the resources and geology of Texas are provided by the Bureau. In addition, the Bureau conducts basic and applied research projects in energy resources, mineral resources and statistics, coastal and environmental studies, land resources, geologic mapping, and a variety of other research programs in areas such as hydrogeology, basin analysis, and geochemistry. Some projects are conducted jointly with other units of the University, as well as with industry and with State, Federal, and local agencies.

The Bureau provides ongoing services to governmental agencies, including reviews of (1) environmental impact statements that are submitted to the Office of the Governor of Texas and (2) permit applications that are submitted to the Surface Mining and Reclamation Division of the Railroad Commission of Texas.

Major reports of the Bureau are published in The University of Texas Publication series; its own series include Reports of Investigations, Geologic Quadrangle Maps, Geologic Atlas Sheets, Environmental Geologic Atlases, Guidebooks, Handbooks, Geological Circulars, Mineral Resource Circulars, and other publications. Publications are sold for a nominal price to recover printing costs. A complete list of publications is available on request.

The Comprehensive Report of the Bureau of Economic Geology outlines the scope and status of current research projects, publications, personnel activities, and services in the area of Texas resources and geology that are available to governmental agencies, industry, and the public.

ON THE WEB

A wealth of information regarding the Bureau of Economic Geology can be found at our Website, http://www.beg.utexas.edu. Here you can learn about every aspect of the Bureau’s mission, its research, public services, and staff. Download what you need.

When you visit our Website, you can check upcoming events, read about recent research awards and honors, learn about the Bureau’s large collection of rock cores and well cuttings, and contact any Bureau researcher or staff member by using his or her office e-mail address or telephone or fax number. You can review titles and authors of past and present Bureau publications—and then place an order.

Teachers and students can view earth science projects, print directions and then follow them in a Do-It-Yourself Aquifer Demonstration, determine whether Dirt Is Just Dirt, or study the Texas Rock Cycle. The Bureau’s Website also contains links to State, Federal, and industry organizations, as well as geologic and earth science resources.

Visit us at www.beg.utexas.edu.
RESEARCH AT THE BUREAU

ENERGY

BASIC ENERGY RESEARCH

Applied Geodynamics Laboratory (AGL)

Martin P. A. Jackson and Michael R. Hudiec, co-principal investigators;
Bruno C. Vendeville, laboratory manager;
Daniel D. Schultz-Ela and David C. Jennette;
assisted by Xuejiao Liu and Nanda Sukhavasi

AGL research on salt tectonics continued to expand in scope during 2002, including our generating new models of a digital atlas, fundamental geologic research on a large, 3-D seismic volume, and ongoing tectonic modeling.

The Salt Mine, a browser-based, interactive atlas of salt tectonics, features a comprehensive collection of salt-structure images and the best models produced during the lab’s 15-year history. Four new salt modules were produced, completing the topic of contractional salt tectonics. The atlas is available only to AGL sponsors at present. Four animations illustrating fundamental interactions of salt tectonics and sedimentation were also produced.

Integrated structural-stratigraphic research was carried out on proprietary 3-D seismic data from the deepwater Lower Congo Basin in offshore Gabon. AGL researchers investigated syn-sedimentary thrusting, compressional diapiric rejuvenation, allochthonous salt extrusion, and inversion of extensional faults and turtle structures. The study included extensive seismic interpretation, tectonic syntheses, restorations, facies mapping, and development of new concepts.

Modeling research continued into salt tectonics associated with hydrocarbon traps. Researchers use computer-controlled devices to simulate various structural styles, whereas overhead photographs, serial sections, time-lapse videos, and CT scans assist in our reconstructing and analyzing structural evolution. Pilot experiments were carried out on physical models incorporating high fluid pressure and on laser scanning of evolving model topographies.

Deep-Marine Depositional Margins

Industrial Alliance (DM2)

Lesli J. Wood and Paul Mann (The University of Texas at Austin Institute for Geophysics [UTIG]), co-principal investigators

The offshore margins of Trinidad and Venezuela, leading sources of oil and natural gas for the U.S. market, are expected to remain so for the first part of the 21st century. Researchers have begun a 3-year study, funded by a group of companies interested in deep-marine hydrocarbon exploration and development in mobile shale basins. The marine margin off eastern Trinidad offers a unique opportunity to for us gain enormous insight into the structural and stratigraphic development of these margin types through an extensive database. The team is currently interpreting as much as 2.5 seconds of 10,000 km² of contiguous 3-D seismic data and hundreds of shallow drop-core descriptions, as well as conventional hazards, seismic, sonar, and core.

The primary goal of the project is to characterize the upper Pleistocene and Holocene stratigraphy, structure, and depositional processes in this tectonically active, deep-marine mobile shale basin. Gas hydrates, mud volcanoes, seafloor and subseafloor structure, slope, and 3-D stratigraphic architecture are some of the phenomena being examined to explain the processes involved in margin evolution and the potential for resource development in deep-marine settings. Data will be processed, synthesized into mosaics, and interpreted by UTIG and Bureau researchers. Data will be delivered to sponsors in GIS form.

Fracture Research and Application Consortium (FRAC)

Stephen E. Laubach, Randall A. Marrett (Department of Geological Sciences, The University of Texas at Austin), Jon E. Olson (Department of Petroleum and Geosystems Engineering, The University of Texas at Austin), co-principal investigators; Julia F. W. Gale, Jon Holder (Department of Petroleum and Geosystems Engineering), Kitty L. Milliken (Department of Geological Sciences, The University of Texas at Austin), Robert K. Goldhammer (Department of Geological Sciences, The University of Texas at Austin), and Robert M. Reed; assisted by John Hooker and Leonel Gomez

Recent results include linked geomechanical and structural-diagenetic models that make accurate predictions of fracture architecture that can be verified using limited subsurface samples. Predictions of interwell fracture patterns from these models have been used to design drilling and stimulation programs and to serve as input in fluid-flow simulators. We are currently exploring new fracture characterization methods, which overcome the sampling limitations that plague conventional methods, to calibrate seismic fracture detection methods. Scientists on the project are now conducting studies in deep sandstone targets in Texas, the Rocky Mountain region, and Venezuela, as well as analyzing fractures in carbonate rocks in Texas, the eastern United States, and Mexico.

The FRAC group conducts research to better understand fractures and faults that influence the successful extraction of resources. Many fractures are difficult or impossible to characterize adequately using currently available technology. Consequently, fractured reservoirs have been difficult to describe and interpret, posing serious challenges to successful exploration or development. The methods under development by FRAC can be used for evaluating individual wells or, using data from many wells, identifying field-or regional-scale fracture patterns and drilling fairways.

Exploration Geophysics Laboratory (EGL)

Bob A. Hardage, principal investigator; Milo M. Backus, Michael V. DeAngelo, Sergey B. Fomel, Robert J. Graebner, and Paul E. Murray

Joint studies with industry sponsors give EGL access to several onshore multicomponent seismic data sets and to multicomponent marine data across the Gulf of Mexico. In
2002, EGL demonstrated that four-component ocean-bottom cable (4-C OBC) seismic data should be used to improve the understanding and characterization of gas-hydrate systems across the northern Gulf of Mexico. An advantage of 4-C OBC data is that C waves can image the internal architecture of those parts of gas-hydrate areas that lie inside gas-charged sediment. Time-warped C data have better spatial resolution in shallow seafloor strata than do compressional-wave (P-wave) data. Consequently, EGL researchers recommend that 4-C data be incorporated into gas-hydrate studies whenever possible.

The EGL develops technologies, such as seismic field-recording techniques and data-processing and data-interpretation procedures, to image reservoirs using all components of the seismic wavefield. The goal is to determine the value of independent (P-wave) and shear-wave (S-wave) images of stratigraphic systems. As these images are combined, researchers are gaining insight into petrophysical rock properties, pore structure, pore-fluid properties, sequence-stratigraphic relationships, and spatial distributions of lithologies, fractures, and anisotropic properties of complex reservoirs. Joining the staff this year was geophysicist Sergey B. Fomel, previously with Stanford University and Lawrence Berkeley National Laboratory.

Reservoir Characterization Research Laboratory (RCRL)

Charles Kerans and F. Jerry Lucia, co-principal investigators; James W. Jennings, Jr., and Jerome A. Bellian;

assisted by Ted E. Playton and Jesse Kimball

In 2002 RCRL completed the first 3-D outcrop imaging, using the outcrop-surveying tool called ILIRS 3D; completed an in-depth outcrop and subsurface-reservoir study of South Wasson Clear Fork field (Permian), West Texas; constructed a reservoir model of the Sacroc reservoir (Pennsylvanian); conducted small-scale simulation studies using high-resolution CT scans; and prepared an initial database of rock-fabric and petrophysical information.

Two reservoir studies were also completed in 2002. A final report was submitted to the U.S. Department of Energy on an integrated subsurface and outcrop study of the Clear Fork outcrops in Apache Canyon, Sierra Diablo, and South Wasson Clear Fork field, West Texas. This report describes a method of constructing a reservoir model that has been developed by the RCRL over a number of years. The Sacroc reservoir study was completed and submitted to the operator, Kinder-Morgan. A porosity and permeability model of the northern platform was constructed using a stratigraphic framework based on core descriptions and 3-D seismic interpretation. Permeability profiles for 450 wells were calculated on the basis of rock-fabric porosity-permeability transforms specific to stratigraphic horizons.

In addition to these reservoir studies, we continued work in characterizing plug-scale heterogeneity using high-resolution CT scans, developing a database, and distributing research results through workshops. Simulation studies at the plug scale demonstrated the effect of scattered anhydrite on flow properties. Results support previous conclusions that anhydrite is not as detrimental to permeability as previously thought.

In 2002 RCRL distributed an initial copy of its rock-fabric/petrophysical database containing photomicrographs, rock-fabric descriptions, and petrophysical data from 156 samples selected from 8 carbonate reservoirs and 1 outcrop. This database will be useful to geologists and petrophysicists conducting rock-fabric and rock-typing studies. In addition, in a continuing effort to inform RCRL sponsors of our research results, researchers presented a workshop on reservoir modeling specifically aimed at engineers.

The RCRL industrial research consortium has run continuously since 1987. Its mission is to use outcrop and subsurface geologic and petrophysical data from carbonate reservoir strata as the basis for developing new and integrated methodologies to better understand and describe the 3-D reservoir environment. Membership has held steady at 13 to 18 companies per year having strong interests in Permian and Alberta Basins, as well as Middle Eastern carbonate reservoirs.

Integrated Outcrop and Subsurface Studies of the Interwell Environment of Carbonate Reservoirs: Clear Fork (Leonardian Age) Reservoirs, West Texas and New Mexico

F. Jerry Lucia and Charles Kerans, principal investigators;

Stephen C. Ruppel, James W. Jennings, Jr., and Stephen E. Laubach;

assisted by Yong-Joon Park and Zeno G. Philip

This project was completed in January 2002, and a final report was submitted to the U.S. Department of Energy. The report, "Integrated Outcrop and Subsurface Studies of the Interwell Environment of Carbonate Reservoirs: Clear Fork (Leonardian-Age) Reservoirs, West Texas and New Mexico," contains the folowing chapters: Integrated Geological and Petrophysical Studies of Clear Fork Reservoir Analog Outcrops: Sierra Diablo Mountains, Texas; Cycle and Sequence Stratigraphy of the Clear Fork Reservoir at South Wasson Field: Gaines County, Texas; Calculation and Distribution of Petrophysical Properties in the South Wasson Clear Fork Field; 3-D Modeling of Stratigraphically Controlled Petrophysical Variability in the South Wasson Clear Fork Reservoir; Fracture Analysis of Clear Fork Outcrops in Apache Canyon and Cores from South Wasson Clear Fork Field; and Modeling Coupled Fracture-Matrix Fluid Flow in Geomechanically Simulated Fracture Patterns.

Refining the Geologic Time Scale: Integrated Biostratigraphy, Chemostratigraphy, and Sequence Stratigraphy

Stephen C. Ruppel, principal investigator; Eric W. James;

assisted by Lance N. Christian

This project, whose ultimate goal is to develop a high-resolution temporal framework for the Leonardian (Lower Permian) using a synthesis of conodont and fusulinid biostratigraphy, strontium isotope chemostratigraphy, and sequence stratigraphy, was completed in 2002. The sequence stratigraphy of the Leonardian was worked out through integrated studies of outcrops in the Sierra Diablo Mountains of West Texas and subsurface data from the Permian Basin. Primary focus during the past year was the collection of additional samples from outcrops and subsurface cores within this sequence-stratigraphic framework for processing and recovery of conodonts. Outcrop samples were collected from platform margin sections where the likelihood of recovery of conodonts appears greatest. Additional samples were collected from a subsurface core that spans a large part of the
Leonardian section. Conodonts recovered from these samples and from whole rock samples likely to preserve original seawater chemistry were analyzed for $^{87}\text{Sr}/^{86}\text{Sr}$ to provide a secular record of seawater variations in $^{87}\text{Sr}/^{86}\text{Sr}$ during the Leonardian. Diagenetic mineral phases (anhydrite and dolomite) were also sampled from subsurface cores and analyzed for $^{87}\text{Sr}/^{86}\text{Sr}$ to investigate the history and timing of carbonate diagenesis. The $^{87}\text{Sr}/^{86}\text{Sr}$ data provided from conodonts and nondiagenetic phases will serve as a primary reference standard for comparison, correlation, and dating of equivalent successions worldwide. Data from diagenetic phases will provide important insights into the process of reflux diagenesis.

The project was funded by the Texas Higher Education Coordinating Board as part of the Advanced Research Program.

**Advanced Technology for Predicting the Fluid-Flow Attributes of Naturally Fractured Reservoirs from Quantitative Geologic Data and Modeling**

Jon E. Olson, Larry W. Lake (Department of Petroleum and Geosystems Engineering, The University of Texas at Austin), and Stephen E. Laubach, principal investigators; assisted by Myeong-Hwan Noh

Microstructural analysis of fractures has established key processes that lead to fracture sealing. These results are being compared with a mathematical model that has been developed to simulate hydrodynamics and fluid-mineral reactions in permeable media. Fluid convection, diffusion, and precipitation/dissolution (PD) reaction inside a finite space are solved in the model as a simplified representation of natural fracture mineralization. The problem involves mass transfer within the fluid, accompanied by chemical reaction at the fracture surface. Mass-conservation equations for components in fluid are solved in this problem, and these are coupled with chemical reaction at the fracture surface. The model shows time evolution of fracture-aperture shrinkage patterns from PD reactions. Partly cemented fractures are created if cementation fails to fill the fracture completely or if subsequent dissolution leaches out some of the mineral. Certain sets of boundary conditions show how the fractures are completely filled by precipitation.

Successful extraction of hydrocarbons from many remaining domestic exploration and development targets depends on the creation of new approaches to predicting natural fracture attributes. This research, supported by the U.S. Department of Energy, is to develop new understanding and new technology for prediction of fracture-pattern attributes related to subsurface fluid flow. In recent years interest has increased considerably on flow and transport in low-permeability fractured rock. Groundwater flow frequently induces dissolution and cementation processes, and it is the latter with which we are concerned because the mechanisms for fracture closure are not well defined. The crux of the problem is that fractures are closed by fluid flow even when there are no flow paths apparent in the surrounding medium. In many reservoir engineering applications and field performance studies, characterization of fractures is an important issue and a useful parameter for the studies of well productivity and breakthrough behavior. The focus of the study is predicting connectivity, clustering, and aperture, fracture pattern attributes that are exceedingly difficult to measure but that can be controlling fractures for fluid movement. The diagenetic process of dissolution and partial cementation is a key control on the creation and distribution of natural fractures in hydrocarbon reservoirs. Even with extensive data collection, fracture permeability still creates uncertainty in reservoir description and the prediction of well performance. Data on the timing and stages of diageneric events can provide an explanation as to why, when, and where natural fractures will be open and permeable.

**Combining a New 3-D Seismic S-Wave Propagation Analysis for Remote Fracture Detection with a Robust Subsurface Microfracture-Based Verification Technique**

Bob A. Hardage and Stephen E. Laubach, principal investigators; Milo M. Backus, Julia F. W. Gale, Robert J. Graebner, Randall A. Marrett (Department of Geological Sciences, The University of Texas at Austin), Paul E. Murray, and Jon E. Olson (Department of Petroleum and Geosystems Engineering, The University of Texas at Austin)

Three-component 3-D (3C3D) seismic data were analyzed in this study to determine whether P or C wavefields exhibit azimuthal variations that allow the principal axis of anisotropy to be determined across a fractured interval of McElroy field, West Texas. Preliminary data interpretation implies that any azimuth-dependent seismic properties will be modest, but additional analyses will be done before the study period ends. An extensive subsurface database was compiled to support the seismic interpretation.

The study is conducted over that part of McElroy field in West Texas that is operated by Chevron/Texaco, using data and co-funding provided by the operator. This study is funded by the U.S. Department of Energy.

**Integrating P-Wave and S-Wave Seismic Data to Improve Characterization of Oil Reservoirs**

Bob A. Hardage and I. J. Aluka (Prairie View A&M University), principal investigators; Michael V. DeAngelo

As a subcontract to Prairie View A&M University (PVAMU) in this project funded by the U.S. Department of Energy (DOE), the Bureau has given PVAMU an extensive database of multicomponent seismic data and digitized well log curves, assisted PVAMU in acquiring interpretation software from Seismic MicroTechnology, and provided regular technical advice and consultation to PVAMU faculty. The objective is to introduce seismic stratigraphy and sequence stratigraphy concepts into the Earth Sciences curriculum at Prairie View A&M.

**Devine Test Site**

Bob A. Hardage, principal investigator; Milo M. Backus, Robert J. Graebner, and Paul E. Murray; James A. Doss, Jr., and George T. Bush, site managers

The Devine Test Site, managed by the Bureau’s Exploration Geophysics Laboratory, continues to gain recognition within the geophysical community. The low level of cultural noise at the site and the efficient seismic transmission properties of the strata beneath the 100-acre property provide ideal conditions for seismic demonstrations. Information about the Devine Test Site, including an inventory of publicly available data acquired by previous owner, British Petroleum, and conditions for use by nonuniversity individuals, can be found on the Bureau’s Website at www.beg.utexas.edu/indassoc/egl.

Bob A. Hardage, principal investigator; Milo M. Backus, Michael V. DeAngelo, Robert J. Graebner, Paul E. Murray, and Lesli J. Wood

This U.S. Department of Energy study demonstrated how elastic constraints and unique petrophysical parameters can be estimated for shallow seafloor strata using four-component, ocean-bottom-sensor (4-C OBS) seismic data. Maps of shear moduli, bulk moduli, and facies-sensitive Vp/ Vs velocity ratios were created across a large, 400-m² area of the Gulf of Mexico to illustrate how seafloor strength and facies distributions can be determined across gas-hydrate trends. This study documented the important principle that P waves and C waves often image different stratigraphic surfaces and provide two independent, complimentary views of sequence stratigraphy.

A large number of 4-C OBS data were provided by the Caltech Data to support this research. Shallow subsurface geologic and engineering data across the study site were collected by Devon Energy and Rice University.

Linking the Mexico and U.S. Gulf Coast: Geologic Framework and Play Definition Research in the Laguna Madre-Tuxpan Area

William A. Ambrose, principal investigator; Khaled Fouda, Shinichi Sakurai, L. Frank Brown, Jr., Edgar H. Guevara, Daniel D. Schultz-Ela, Timothy F. Wawrzyniec, Suhas Talukdar, Dallas B. Dunlap, Luis Sánchez-Barreda, Alfredo Guzmán, Mario Aranda, Ulises Hernández, Ramon Cárdenas, Héctor Ruiz, Juan Alvarado, Santiago Sarmiento, and Eduardo Macias (PEMEX)

A new, 18-month evaluation of basin-scale oil and gas systems in the Laguna Madre-Tuxpan area, located north of the Veracruz Basin, Mexico, demonstrates that a variety of plays and exploration opportunities exist in down dip areas in basin-floor and slope systems. Other areas of the basin in major fault-bounded depocenters contain numerous three-way fault-seal opportunities at many stratigraphic intervals. Identification and mapping of these plays will yield a structural and stratigraphic framework for existing prospects and help identify a spectrum of additional opportunities in the basin.

This study, conducted by Bureau and PEMEX teams in Poza Rica and Tampico, will define major Miocene and Pliocene plays in the offshore Gulf of Mexico between the Veracruz and Burgos Basins offshore to a water depth of 500 m. The study area covers six 3-D surveys and intervening 2-D seismic lines and links the Veracruz and Burgos Basins.

Plays in the Laguna Madre-Tuxpan study are defined from mappable geologic attributes. This study uses a threefold definition for plays based on (1) sequence-stratigraphic occurrence and age, (2) facies association, and (3) trap. Examples of Laguna Madre-Tuxpan plays defined in this study are the Upper Miocene Slope Channel/Levees and Upper Miocene Canyon, Stratigraphic Trap, plays.

Laguna Madre-Tuxpan plays are structurally and stratigraphically complex, affording us a unique opportunity to examine a complete coast-to-basin succession from valley fill to basin floor over a distance of less than 25 km. A dynamic, tectonically active setting, coupled with an abundant sediment supply, has resulted in a greatly telescoped system. Narrow shelf margins in the Laguna Madre-Tuxpan area represent an end member in the spectrum of shelf-margin types and should be of significant worldwide interest.

Integrated Reservoir Characterization of Poza Rica Field within a Sequence Stratigraphic Framework: Phase 1—Data, Sequence Framework, and Petrophysics

Robert G. Loucks and Charles Kerans, co-principal investigators; Xavier Janson, Shinichi Sakurai, Michael V. DeAngelo, and Mark H. Holtz

This two-phase project for PEMEX Exploración y Producción (PEP) will provide a state-of-the-art 3-D reservoir characterization model for giant Poza Rica field in the offshore Gulf of Mexico. Phase 1, begun in 2002, included data preparation, stratigraphic framework analysis, and initial petrophysical analysis. Phase 2 (2003) will include in-field stratigraphic and structural analysis. Giant Poza Rica field produces from carbonate turbidites and debris flows from the adjacent Tuxpan Platform (Golden Lane field). To date, extensive sedimentological and petrophysical studies have been carried out on the field, but an integrated study comprising detailed sedimentologic descriptions of core material through core-, log-, and seismic-based sequence stratigraphic analysis through 3-D property modeling and upscaling has not been undertaken. This project will incorporate the Bureau’s special talents in carbonate sequence stratigraphy, reservoir characterization, and 3-D modeling, which will allow this comprehensive study to be undertaken by a single, integrated group. The researchers will apply the latest sequence stratigraphic and seismic facies techniques to define the distribution of flow units within this giant, complex reservoir.

Definition of the Geological Framework and Exploration Plays of the Miocene of the Burgos Basin, Northern Mexico

Tucker F. Hentz, principal investigator; Michael V. DeAngelo, Shinichi Sakurai, and Dallas B. Dunlap; assisted by Cem O. Kiliç

The Burgos Miocene project, started in mid-December 2002, is funded by PEMEX Exploración y Producción. The study is a continuation of collaborative Bureau-PEMEX investigations of the geologic framework, petroleum systems, and hydrocarbon plays of Neogene strata in southeastern, eastern, and northern Mexico (Veracruz and Macuspana Basins, and the Laguna Madre-Tuxpan area), which have been conducted from 2000 through the present time. This new study extends the analysis to the onshore and offshore Burgos Basin of northeastern Mexico. The primary objectives of the project are to define the sequence-stratigraphic, structural, petrophysical, geochemical, and petroleum-engineering characteristics of the Miocene succession in the Burgos Basin. The project will emphasize guiding PEMEX exploration efforts in the virtually unexplored offshore Miocene strata.

Information on, as well as understanding of, Miocene geology and hydrocarbon habit in the study area, especially the offshore, is limited. Except for Matamoros, Santa Fe, and La Luz fields in northeastern Mexico, and approximately 10 fields in southernmost Texas, including the offshore, hydrocarbon production has not been established in the Miocene of this region. Hydrocarbon accumulations in equivalent stratigraphic intervals in the central and eastern Texas part of the Gulf Coast Basin north of the study area, however, offer tantalizing indications that the Burgos area is an important
hydrocarbon exploration frontier. Similar to the situation in the Macuspana, Veracruz, and Laguna Madre-Tuxpan areas, hydrocarbon exploration in Tertiary siliciclastics in the Burgos Basin substantially diminished after the 1970’s discovery of the giant Mesozoic carbonate reservoirs in the Chiapas-Tabasco region and subsequent discoveries in the Cantarell area. As a result, comprehensive geological studies are not available to support exploration at the play level in the Burgos study area.

**Multidisciplinary Imaging of Rock Properties in Carbonate Reservoirs for Flow Unit Targeting**

Stephen C. Ruppel, principal investigator; Fred P. Wang, Jeffery A. Kane, Hongliu Zeng, F. Jerry Lucia, James W. Jennings, Jr., Rebecca H. Jones, Charles Kerans, Mark H. Holtz, Dallas B. Dunlap, and Joseph S. Yeh; assisted by Yong-Joon Park, Erin Dorn, and Liying Xu.

The objectives of this research, which is funded by the U.S. Department of Energy, are to develop and test new methodologies for improving imaging, measuring, modeling, and predicting reservoir properties in carbonate oil and gas reservoirs. The focus of these studies is the Permian-age Fullerton Clear Fork reservoir in the Permian Basin of West Texas and analogous outcrops in the Sierra Diablo Mountains of West Texas. Primary focus in 2002 was (1) the interpretation and modeling of 3-D seismic attributes within a high-resolution, cycle-stratigraphic reservoir framework on the basis of outcrop analogs; (2) the characterization, correlation, and modeling of reservoir rock fabrics; and (3) the construction of a 3-D reservoir model that incorporates, as critical constraints, the sequence stratigraphic architecture of the field and petrophysical relationships defined by rock fabric studies. This model will serve as a foundation for renewed field exploration and recovery of the large volumes of oil remaining in the reservoir. We expect that the results of the study will be tested by operator deployment of appropriate exploitation strategies such as horizontal wells, CO₂ injection, profile modification, and infill drilling. The ultimate goal of the project is to find new, more cost effective ways to locate and recover the oil remaining in existing carbonate reservoirs in the Permian Basin and in the United States.

**BASIN AND FIELD STUDIES**

**STARR: Technology Center for Oil and Gas Recovery Optimization on Texas State Lands**


During the past 7 years, the State of Texas Advanced Resource Recovery (STARR) project researchers have been applying the latest geological concepts and geophysical techniques to mature fields on State Lands. The goal of the project is to enhance ultimate hydrocarbon recovery on State leases by working jointly with oil and gas operators who are producing from or exploring these leases. This goal is accomplished through reservoir characterization studies and extended development, including drilling new wells, recompleting old wells, developing enhanced recovery programs, and defining deeper targets.

Project STARR has been involved in 16 oil and gas fields over a 6-year period. We are now concentrating on the Red Fish Bay field area in the lowstand, prograding-wedge section of the Oligocene Frio Formation, where we are working to delineate new compartments for gas production. Lowstand basin-floor fans and slope fans are also being investigated as deeper production targets. Landmark Graphics Corporation software is used extensively to analyze 3-D seismic data, model seismic attributes, and correlate wireline logs.

STARR is a State of Texas program designed to increase royalty payments—a result of drilling or recompleting oil and gas wells—for the benefit of the Permanent School Fund. Texas State Lands operators are invited to participate in STARR, which provides free, expert, technical advice on developing their fields.

**Targeting Reserve Growth Opportunities in the Northern Gulf of Mexico Basin: Transferring Secondary Gas Recovery Technology to the Offshore Environment**

Lesli J. Wood, principal investigator; Tucker F. Hentz, Hongliu Zeng, Michael V. DeAngelo, Shirley P. Dutton, Mark H. Holtz, and Eugene M. Kim; assisted by Cem O. Kılıç, Claudia Bassi, Adrian C. Badescu, Ke-Sheng Chan, Dingshan Zhou, and Ayanna S. Redwood

The Offshore Secondary Gas Recovery (Offshore SGR) project was completed in 2002. Detailed architectural frameworks have been developed to model reservoir flow patterns and target bypassed zones. Stratigraphic and saddle-perched structural traps have been defined to extend traditional field boundaries and open up new targets. Stratral slicing (or proportional slicing) was used to create more coherent amplitude maps for initial identification of several low-sinuosity, high-amplitude features throughout the data volume. One of two prospect ideas developed by the team and successfully drilled by industry partner Texaco contained probable recoverable reserves of 5.7 Bcf.

Offshore SGR, a joint venture between the Bureau and the U.S. Department of Energy begun in 1998, was charged with identifying new technologies and processes to aid in the recovery of hydrocarbons from known fields. The completed project extended investigations into the northern, offshore Gulf of Mexico (GOM) Federal Outer Continental Shelf, where nearly 10,000 gas- and oil-producing reservoirs are found in more than 1,000 fields. The research focused on the Miocene-age reservoirs that comprise 42 percent of original proven reserves in the GOM. Because of the stratigraphic and structural complexity of the Tertiary-age section in this region, there is potential for significant gas resources to have been bypassed even in densely drilled fields.

**Application and Transfer of Advanced Geological and Engineering Technologies for Incremental Production Opportunities**

Shirley P. Dutton and Eugene M. Kim, co-principal investigators; Caroline L. Breton

A new project focused on play analysis, and preferred management practices of oil reservoirs in the Permian Basin began this year. A total of 25 oil plays were defined for the Texas part of the Permian Basin. Approximately 1,300 major oil reservoirs (reservoirs having cumulative production greater than 1 MMbbl of oil through December 31, 2000) were
identified in the Permian Basin. The process of assigning each of these reservoirs to a play and mapping the reservoirs in Geographic Information Systems (GIS) format began this year.

Researchers at the Bureau of Economic Geology and the New Mexico Bureau of Geology and Mineral Resources have teamed up to conduct this project, which has been designed to increase reserves and improve recovery of oil from existing reservoirs in the basin. The Permian Basin of West Texas and southeast New Mexico contains 29 percent of estimated U.S. future oil reserve growth and has the biggest potential for additional oil production in the country. The project is part of the U.S. Department of Energy Identification and Demonstration of Preferred Upstream Management Practices (PUMP II) for the Oil Industry Program. Workers on the project are (1) developing an up-to-date portfolio of oil plays in the Permian Basin of West Texas and southeast New Mexico and (2) studying key reservoirs from some of the largest or most active plays to incorporate information on improved practices in reservoir development in the portfolio. At the end of the project a CD-ROM containing the database of reservoirs within each play, maps in GIS format showing play outlines and reservoir locations, and summary information on reservoir heterogeneity and development practices will be made available to the public.

**ULARI: Integrated Geological and Engineering Characterization of Fullerton Clear Fork Field in Andrews County, Texas**

Stephen C. Ruppel, principal investigator; Fred P. Wang, Jeffery A. Kane, Hongliu Zeng, F. Jerry Lucia, James W. Jennings, Jr., Rebecca H. Jones, Charles Kerans, Mark H. Holtz, Dallas B. Dunlap, and Joseph S. Yeh; assisted by Yong-Joon Park, Erin Dorn, and Liying Xu.

Leonardian reservoirs rank last in oil recovery efficiency among Permian Basin carbonate oil reservoirs. Accordingly, they contain large volumes of remaining mobile oil. The goal of this new project under the University Lands Advanced Recovery Initiative (ULARI) program is to apply Bureau approaches to reservoir characterization to define additional opportunities for the recovery of this oil resource in Fullerton Clear Fork field, which, having original oil in place of about 1.5 billion barrels and cumulative production of more than 300 million barrels, is the largest Leonardian reservoir in West Texas and the largest reservoir in University Lands.

The Fullerton study, a collaborative effort between the Bureau, ExxonMobil, and Oxy Permian, is jointly funded by The University of Texas System, ExxonMobil, and the U.S. Department of Energy. Among key issues to be addressed in the study are (1) stratigraphic architecture and flow-unit continuity, (2) rock-fabric character and its effect on distribution of porosity and permeability, (3) volume and distribution of original and remaining oil, and (4) value of 3-D seismic in defining stratigraphic architecture and porosity distribution.

The first year of the project, which involves a multidisciplinary team of Bureau geologists, petrophysicists, geophysicists, and petroleum engineers, has been focused on creating a reservoir model that can serve as a basis for simulation of reservoir performance and on defining the controls of underlying structure on reservoir architecture and rock properties using 3-D and 2-D seismic data. When completed, Bureau characterization and modeling studies at Fullerton field will serve as a basis for designing advanced recovery programs in Leonardian reservoirs throughout the Permian Basin—a target resource of more than 2.5 billion barrels of oil.

**RESOURCES EVALUATION**

**Pennsylvanian Bituminous Coal, North-Central Texas: Potential for Coalbed Methane Resource Development**

Eugene Kim, principal investigator

The objective of this cooperative project between the Bureau of Economic Geology and the U.S. Geological Survey is to provide digital data for inclusion in the Survey's National Coal Resources Data System (NCRDS) and a preliminary assessment of the coalbed methane potential of the coal-bearing seams of the Pennsylvanian bituminous coals of North-Central Texas. Major accomplishments for FY02 included digital compilation of major background regional data for Pennsylvanian depositional systems and major coal resources, such as the Strawn (Thurber) coals, as well as a comparison with current coalbed methane production from Olmos bituminous coals in the Maverick Basin. FY03 tasks yet to be completed include analysis of other coal resources, such as the Canyon (Bridgeport) and Cisco (Newcastle) coals and subsequent data, as well as an overall future assessment of the coalbed methane potential of North-Central Pennsylvanian bituminous coals. Deliverables for FY03 include detailed and updated information on the coal resource in this region, in which digital spreadsheets of available data will be utilized, as well as digitized maps compiled for Geographic Information System (GIS) use. A comprehensive report in pdf document format will also be included in the FY03 Annual Report.

The first commercial coalbed methane field in Texas, Sacatosa coalbed methane field in Maverick County, was announced in 2001 by The Exploration Company. This field is currently being produced from bituminous coal and carbonaceous shale of the Upper Cretaceous Olmos Formation in the Maverick Basin. Although the Pennsylvanian bituminous coals of North-Central Texas are of higher rank than the Texas Gulf Coast lignites and are comparable to the Olmos bituminous coals, little current information exists on their occurrence, distribution, geological setting, or future potential for coalbed methane development. More detailed and updated information of the coal resource in this region is essential for inclusion in the NCRDS.

**ENVIRONMENT**

**WATER RESOURCES**

**Groundwater Availability Model of the Central Part of the Carrizo-Wilcox Aquifer in Texas**

Alan R. Dutton, principal investigator; Jean-Philippe Nicot, Bridget R. Scanlon, and Robert C. Beedly; assisted by Katherine S. Kier and Thandar Phyu

A quasi-three-dimensional, numerical model of the occurrence and movement of groundwater in the central part of the Carrizo-Wilcox aquifer in Texas was developed to help us...
estimate groundwater availability and water levels in response to potential droughts and future pumping, including new well fields. Formations of the Paleocene-Eocene-age Wilcox Group, along with the overlying Carrizo Formation, make up a major aquifer system in Texas. This six-layer model is based on data on geological structure and depositional setting of the aquifer, hydrological properties, water-use survey estimates of historical groundwater withdrawals, and base flow of rivers and streams. New insights into how the downdip circulation of freshwater is affected by fault zones and a deep-basin geopressed zone are based on maps of total dissolved solids and equivalent water levels from the outcrop to depths of more than 10,000 ft. In addition, results of field studies using “environmental” tracers yielded regional estimates of recharge rates that broadly match estimates from previous models.

A steady-state model representing “predevelopment” (no pumping) conditions was calibrated against water levels measured before 1950 and historical low-flow measurements in streams. A transient version of the model was calibrated against water-level hydrographs and stream-flow data for the period from 1950 through 1990 and verified by comparison with water levels recorded between 1991 and 2000. Recharge rates, vertical hydraulic conductivity, specific storage, specific yield, and boundary-flux properties were calibrated using the model. Horizontal hydraulic conductivity is one of the better-known attributes of the aquifer, given the number of pumping- and specific-capacity tests and the quality of regional mapping of the distribution and thickness of sandstones that make up the permeable architecture of the aquifer.

To demonstrate the use of the groundwater model as an evaluative and predictive tool, simulations were made of future water-level changes with assumed periods of normal and drought-of-record precipitation. Pumping rate is expected to continue to increase between 2000 and 2050, but at a rate slower than that of the past decade. Overall, total pumping from the Carrizo-Wilcox aquifer in the study area is expected to increase from 197,000 acre-feet per year in 2000 to 320,500 acre-feet per year in 2050. The simulated decline of water level related to groundwater pumping will occur mainly through a decrease in artesian storage. The model also suggests that the major rivers will continue to flow even with increased pumping and under drought conditions. The project is funded by the Texas Water Development Board as part of their Groundwater Availability Modeling (GAM) program.

Identification of Geographic Areas Suitable for Groundwater Banking

Bridget R. Scanlon, principal investigator; Robert C. Reedy

The Bureau of Economic Geology is a subcontractor to D. B. Stephens & Associates on a project designed to identify suitable parts of the state for storing excess surface water in groundwater systems. The population of Texas is expected to double in the next 50 years, and water demand is projected to increase by 18 percent. With the decline in development of new surface-water reservoirs because of adverse impacts on the environment, groundwater managers are turning to artificial recharge of groundwater, using excess surface water to meet water needs during times of drought. In this project suitable sites were evaluated for artificially recharging groundwater using spreading basins adjacent to streams. A statewide screening was conducted that included water quality, regional water demand, aquifer characteristics (recharge area, depth to groundwater), distance from surface water, and slope. A total of 48 counties passed the statewide screening. Within six regions of the state, more detailed analysis permitted evaluation of water resources, water storage and conveyance systems, and infiltration rate, area, and time period for infiltration. A successful site should be high in soil permeability and located in topographically flat areas, close to a stream. The results of this study provide important information to water managers in the state on the potential for groundwater banking.


Susan D. Hovorka, principal investigator; Alan R. Dutton, Joseph S. Yeh, and John R. Andrews; assisted by Thandar Phyu

This study is developing an aquifer database for an improved computer model of groundwater flow in the San Antonio segment of the Edwards aquifer. The Edwards aquifer, the major source of water for more than 1.5 million people in the San Antonio area, provides nearly all of the water used in the region for industrial, military, irrigational, and public supplies. If withdrawals of groundwater are accelerated, furthermore, spring flow at Comal and San Marcos Springs will be threatened. Both springs supply water to meet downstream needs, sustain Federally listed endangered species, and support local economies by attracting tourists. The U.S. Geological Survey and the Bureau are collaborating to develop the database and computer model on behalf of the Edwards Aquifer Authority. The study, which began late in 2000, will be completed in 2003. The model being developed will enable water managers to test the effects of alternative, potentially costly management scenarios before enactment. Input simplifications and output enhancements will make the model user-friendly for trained personnel, as well as ensure that the graphics-rich output is understandable to nonscientists.

Edwards Aquifer Fracture/Conduit Study

Susan D. Hovorka, principal investigator; Bridget R. Scanlon and Robert C. Reedy; assisted by Adrien L. Lindley and Thandar Phyu

The Edwards aquifer of South Texas has a complex and highly heterogeneous flow system. Integration of multiple data sets has the best chance of providing an adequate glimpse of the nature of the heterogeneities and their impact on aquifer performance. Karst has developed in this carbonate aquifer in response to the interaction of structure and gradient. Karst capture, favored by fractures of the Balcones Fault Zone, has diverted surface-water flow from toward the Gulf of Mexico into the subsurface and caused it to flow eastward and discharge at Comal and San Marcos Springs. We mapped large troughs in the potentiometric surface by grouping the large volume of historic-water-level data according to aquifer stage. Cave orientations confirm a history of karst capture at a smaller scale.

We are examining the implications of these karst trends for interpreting natural chemistry and introduced-contaminant distribution, as well as high-frequency water-level records.
ENVIRONMENTAL QUALITY

Environmental Quality Research (EQR)
Bridget R. Scanlon, principal investigator

This year investigators used data sets developed as part of the EQR program or related projects to evaluate the applicability of various codes to accurately describe water flux in the vadose zone. The results of this study, which have been described in various publications and presentations, will assist industries and regulators in assessing modeling results that predict the fate and transport of contaminants.

The EQR group provides research to support decision-making concerned with petroleum-related contaminants; evaluates the latest technology for characterizing contaminated sites (direct and remote sensing measurements); leverages existing contracts funded by the U.S. Department of Energy, the U.S. Environmental Protection Agency, and other agencies to address petroleum issues; and interfaces with regulators to ensure that regulations are based on technically reliable data. Applications for EQR research are wide ranging and encompass unsaturated-zone hydrologic studies, including monitoring and modeling approaches to evaluate aquifer vulnerability to contamination, guiding environmental regulation, and remediating and closing contaminated sites; airborne geophysical studies to locate contamination resulting from oil wells; and studies identifying suitable subsurface sites for carbon dioxide sequestration.

Optimal Geological Environments for Carbon Dioxide Disposal in Brine-Bearing Formations in the United States—Phase III, Pilot Sequestration in Brine in the Frio Formation

Susan D. Hovorka, principal investigator; Paul R. Knox, Mark H. Holtz, Khaled Fouda, Shinichi Sakurai, Jeffrey G. Paine, and Joseph S. Yeh; assisted by Thet Naing

Brine formations that are separated from and lie below potable water provide a large volume of widely available resource for storage of carbon dioxide (CO₂)—an alternative to releasing this by-product of combustion into the atmosphere. We are conducting a short-term, small-scale injection into a small compartment of a brine aquifer to collect data that will demonstrate the validity of conceptual models of this sequestration method. We have completed characterization and numerical modeling of the pilot site and are preparing to conduct the experimental injection. The project goal is to create an early success for U.S. geologic sequestration in high-permeability, high-volume sandstone, which is analogous to a broad area that is an ultimate target for large-volume sequestration.

The project’s monitoring and modeling are designed to demonstrate that CO₂ can be injected into a brine formation without adverse health, safety, or environmental effects; determine the subsurface distribution of injected CO₂; demonstrate the validity of conceptual models; and develop the experience necessary to achieve success in future large-scale CO₂ injection projects. The upper Texas Gulf Coast is an area in high need of CO₂ sequestration because of the presence of large volumes of CO₂ produced from diverse sources and because of its large volumes of well-characterized, high-porosity, high-permeability sandstone and abundant reservoir seals. Injection into a reservoir compartment away from the complications resulting from concentration of oil and gas phases in the pore system and without the pressure perturbation resulting from production history will help us better characterize this environment and provide basic data about the performance of CO₂ in the subsurface.

CO₂ Sequestration in Saline Formations

Susan D. Hovorka, principal investigator; Paul R. Knox and Mark H. Holtz

If significant volumes of carbon dioxide (CO₂) derived from combustion of fossil fuels were to be injected into the subsurface below (and isolated from) potable water in order that impact on the atmosphere be avoided, how long would they be retained and sequestered? Two mechanisms appear to have the potential of retaining a high percentage of the injected CO₂: (1) residual saturation and (2) structural trapping. Residual saturation will trap CO₂ on a pore scale as it migrates updip. Statistical assessment of flow-path length in regionally dipping, compartmentalized Gulf Coast formations using formation-specific Srī measurements of 20 to 40 percent demonstrates that large volumes of CO₂ will be retained. This dispersed CO₂ has the potential of interacting with pore water and dissolving. The amount of CO₂ that can be retained in structural closure increases as stratigraphic complexity increases, resulting in more rock being contacted by CO₂.

This collaborative project with Lawrence Berkeley National Laboratory supports the Frig brine pilot study by providing an experimental field site where monitoring and modeling techniques can be applied to validate conceptual and numerical models.

Ecological Resource Assessment of the Rio Grande Riparian Corridor

Jay A. Raney, co-principal investigator; William A. White and Thomas A. Tremblay; Melba M. Crawford (co-principal investigator) and Amy Neenschwander (Center for Space Research, The University of Texas at Austin); Frank Judd (co-principal investigator) and Robert Lomard (The University of Texas-Pan American); Gene Paul (co-principal investigator) (The University of Texas at Brownsville)

During 2002, significant progress was made in current land-use mapping, vegetation surveys, remote data classification, data acquisition, geographic information system (GIS) development, and analysis/modeling in the GIS environment. The land-use maps graphically indicate how growth in population has impacted natural vegetation. Analysis of 1995 and 1960 land-use data shows an explosive growth of residential urban parcels, particularly in the McAllen-Pharr-Edinburg area. Mapping of woodlands shows very little of this category left in Hidalgo County. Climate data indicate “heat islands” encircling both the McAllen and Brownsville urban areas. We continued using large-scale photography with 1-m resolution in conjunction with field surveys and high-resolution (4 to 7 m), spectrally calibrated hyperspectral data to train classification algorithms for analysis of riparian vegetation in the Santa Ana National Wildlife Refuge. These analyses were used to scale upward using medium-resolution Landsat 7 Thematic Mapper (TM) data that cover the entire Lower Rio Grande Valley. One element of the methodology is to use the interpretative capabilities of a GIS to examine linkages between
riparian ecology and parameters such as geology, topography, soils, water quality, hydrology, and land cover/land use.

This ongoing assessment of southwestern U.S. riparian ecosystems along the Lower Rio Grande Valley of Texas and Mexico is supported by a grant from the U.S. Environmental Protection Agency’s Science to Achieve Results program. Riparian ecosystems of the southwestern United States are among the most productive ecosystems of North America, but these ecosystems are generally in decline. In this project, researchers are working to collect and analyze high-resolution, remotely sensed data from multiple sensors; integrate existing and new field data and remotely sensed data into a GIS; determine whether native vegetation communities are maintaining themselves and identify the factors that perpetuate these communities; interpret spatial and temporal variations in riparian habitats; and develop a foundation for future analysis of riparian floodplain communities by linking local and remotely sensed regional data using GIS.

In 2003 we will continue acquiring additional data, classifying and ground-truthing remotely sensed data, completing vegetation transects, entering data into our GIS, analyzing and applying models to define riparian relationships with other mapped characteristics, and presenting results in publications and at conferences.

**Evaluation of Recharge on the Southern High Plains**
Bridget R. Scanlon, principal investigator; Robert C. Reedy

Field studies were conducted to evaluate recharge beneath irrigated and nonirrigated sites in the Southern High Plains in Texas. This work was done in collaboration with the U.S. Geological Survey, National Water Quality Assessment (NAWQA) program and provided input to recharge estimates for the Groundwater Availability Model developed by D. B. Stephens & Associates for the Texas Water Development Board. The NAWQA program involved the drilling and sampling of two boreholes in irrigated sites and one borehole in a nonirrigated site. Samples were collected for tritium analysis to evaluate recharge rates. Pressure-monitoring devices were also installed to evaluate infiltration beneath irrigated and nonirrigated sites. Results of this study indicate that there is no recharge in the nonirrigated site. On the basis of the subsurface distribution of bomb pulse tritium, we found that average recharge rates beneath the irrigated sites range from 0.7 to 1.3 inches/yr. Pressure monitoring shows infiltration of water to a maximum depth of 10 ft during irrigation. The results of this study provide valuable information on recharge from irrigation return flow in the Southern High Plains.

**Support of the State Energy Conservation Office in Environmental Oversight of the U.S. Department of Energy Pantex Plant**
Bridget R. Scanlon, principal investigator; Alan R. Dutton and Robert C. Reedy

During 2002 the Bureau continued hydrological monitoring at the U.S. Department of Energy’s (DOE) Pantex Plant near Amarillo, Texas. The plant lies above part of the Ogallala aquifer. We also provided ongoing review of groundwater-quality reports and participated in discussions on how to improve the groundwater-monitoring program at the Pantex Plant. Since 1995 the Bureau has participated with other State agencies in supporting the State Energy Conservation Office in environmental oversight of the Pantex Plant. The monitoring program is designed to evaluate temporal variability in rates of infiltration and evapotranspiration in the top 1 to 2 m of the subsurface. These data are used to determine the potential for upward water movement below this soil zone in several interplay settings for use in an environmental review and design of an engineered cover for the landfill at the Pantex site. We did detailed numerical simulations to evaluate liquid and vapor fluxes through the unsaturated zone at the Pantex Plant and in other semiarid sites, including Beatty, Nevada, and Sierra Blanca and Fort Hancock in West Texas. Results from the simulations indicate that water has been moving upward through the unsaturated zone in interdrainage settings for long time periods (1,000 to 16,000 yr).

**Kelly Air Force Base**
Susan D. Hovorka, principal investigator; Edward W. Collins and Jeffrey G. Paine; assisted by Adrien L. Lindley and Thandar Phyu

A multidisciplinary evaluation of the potential for cross-contamination of the Edwards aquifer from dissolved contaminants in the shallow alluvial aquifer in the vicinity of Kelly Air Force Base found that although hydrologic heads in the Edwards aquifer are generally above heads in the alluvial aquifer, the volatility of water levels in the Edwards aquifer as compared with those in the alluvial aquifer results in downward gradient during lowest aquifer stages. Hydrologic heads in the highly permeable Edwards aquifer vary.

Cross-contamination at these times therefore depends on the permeability existing between the water-bearing units. Our assessment suggests that incorrectly completed wells have a significant potential of resulting in cross-contamination. The risk of leakage along natural pathways, such as fractures, has been assessed as small because structural evaluation shows that faults beneath the contaminant plume do not completely offset the thick shales of the Navarro Formation and Midway groups. Local data, as well as analogy, suggest that in the absence of opening pressure and below the weathered zone such shale-against-shale fractures are likely to have low permeability.

**Groundwater Recharge**
Bridget R. Scanlon, principal investigator; Robert C. Reedy

During 2002, we conducted several projects related to groundwater recharge in Texas. A detailed numerical modeling study was conducted to evaluate whether recharge occurs in interdrainage areas in arid-semiarid regions in the southwestern United States. Long-term monitoring records from four different sites in Texas and Nevada indicate that infiltration is restricted to the shallow subsurface (0.3- to 2-m depth). Upward water pressure gradients indicate that water flow is upward in these settings. Numerical simulations of liquid and nonisothermal vapor flow used to simulate measured water potential and chloride profiles at several sites indicate that flow has been upward for time periods ranging from 2,000 to 9,000 yr in the Southern High Plains to a maximum of 16,000 yr in the Chihuahuan Desert in West Texas and the Amargosa Desert in Nevada. These results indicate that there has been no recharge in interdrainage arid-semiarid regions since the Pleistocene and that thick unsaturated zones
in these regions have been undergoing long-term drying during the Holocene. These results have important implications for water resources because interdrainage areas constitute substantial portions of alluvial basins in the southwestern United States. The results also indicate that these settings should be suitable for waste disposal because contaminants would be trapped in the shallow subsurface in natural systems. This work was conducted in collaboration with Jirka Simunek at the University of California, Riverside, and Brian Andraski of the U.S. Geological Survey in Nevada.

The Bureau recently began a modeling and field study for the Texas Commission on Environmental Quality to evaluate groundwater recharge in the major aquifers in the state. Estimates of groundwater recharge are critical for estimating both groundwater availability and aquifer vulnerability to contamination. The modeling analysis will provide a screening tool for evaluating relative recharge rates related to different climate, vegetation, and soil types in the major aquifers. The codes UNSAHTH and HYDRUS will be used for the simulations. Long-term (30- to 100-yr) climate records will be generated for the simulations. The modeling work will be used to identify areas where field studies should be conducted to further evaluate recharge. Field studies will include the use of soil physics monitoring and environmental tracer analysis to constrain recharge estimates. The results of this study will form the foundation for more comprehensive field studies of groundwater recharge throughout the state.

**Analysis of Soil Remediation Requirements of Abandoned Centralized and Commercial Drilling-Fluid Disposal Sites**

Alan R. Dutton, principal investigator; Jerry W. Mullican, H. Seay Nance, and Rebecca C. Smyth

Data on the number, acreage, and volume of centralized and commercial drilling-fluid disposal pits and levels of constituents in the drilling waste and adjacent soil and groundwater are being compiled and evaluated for abandoned, offsite drilling-fluid disposal facilities in Louisiana, New Mexico, Oklahoma, and Texas. A database for these four states includes more than 265 active and inactive (including abandoned) sites, with more than 690 pits in a total area of more than 8 km² (86.2 million ft²). Sites contain from 1 to 25 pits per site; aerial pit coverage per site ranges from 13.9 m² (150 ft²) to 0.88 km² (9.48 million ft²). Drilling fluids used in oil and gas exploration and production (E&P) operations may be mixed with drilling additives, cuttings, formation water, and crude oil. Since the mid-1980's there has been both a decrease in drilling activity and more efficient use of drilling fluid, resulting in a decreased need for offsite disposal of spent drilling fluid. At the same time, environmental regulations were becoming more stringent. Cleanup of abandoned sites is generally the jurisdiction of State-funded programs administered by regulatory agencies. Because data on abandoned sites can be sparse, we are also looking at active or recently permitted sites, as well as sites that have been closed under State regulation, to better understand potential composition of waste in the remaining abandoned sites. Results should provide a basis for improving the cost effectiveness of assessment and remediation of abandoned sites in these and other states. The study is sponsored by the U.S. Department of Energy, National Energy Technology Laboratory, with a matching grant from the American Petroleum Institute.

**Monitoring and Modeling Issues Related to Engineered Covers for Waste Containment**

Bridget R. Scanlon, principal investigator; Robert C. Reed, Craig Benson (University of Wisconsin), and Jirka Simunek (U.S. Salinity Laboratory)

During the past year, seven codes were compared for simulating near-surface water balance using data from the project’s site in West Texas and from the Idaho National Environmental and Engineering Laboratory. Simulation results were quite variable and are explained by the way in which various codes handle boundary conditions and hydraulic properties. These results underscore the importance of testing models extensively before using their results because performance of numerical models cannot be evaluated without reliable monitoring data. Various types of instrumentation for monitoring subsurface flow in unsaturated zones, and their reliability, were also evaluated in 2002, with the conclusion that neutron-probe logging and heat-dissipation sensors are much more reliable than time-domain reflectometry and thermocouple psychrometry. Electromagnetic induction was also examined as a noninvasive tool for monitoring water storage rapidly in large areas.

Evapotranspirative (ET) covers are being proposed for many municipal and hazardous waste-disposal facilities to minimize water movement into the waste. These covers rely on transpiration from vegetation to minimize percolation below the shallow subsurface. We are doing detailed modeling studies to assess the impact of vegetation on the water balance of the near surface zone using weighing lysimeter data from the Nevada Test Site. This work is being done in collaboration with DOE researchers in Nevada and will provide valuable data for assessing the performance of ET covers for waste containment.

**Evaluation and Validation of EO-1 and Landsat 7 Imagery through an Analysis of Land Use/Cover and Rates of Deforestation in Belize, Central America**

William A. White, principal investigator; Jay A. Raney, co-principal investigator, and Thomas A. Tremblay; Melba M. Crawford, co-principal investigator, and Sinan Erzurumlu (Center for Space Research, The University of Texas at Austin)

Analysis of imagery of Belize, Central America, recently acquired by the National Aeronautics and Space Administration (NASA) Earth Observing-1 (EO-1) satellite, shows that this experimental imagery can be used effectively to classify a diverse set of land cover/land use types. The Bureau of Economic Geology and Center for Space Research are investigating the new imagery as part of a NASA-sponsored program to evaluate the capabilities of technologically advanced sensors onboard the EO-1 satellite to image the Earth's surface. Classification of land cover/land use using the multispectral Advanced Land Imager (ALI) on the satellite indicates that classifications were similar but superior to those of Landsat 7 Enhanced Thematic Mapper (ETM+) for several difficult classes in test data, such as thicket, regrowth, orchards, and cleared land. In addition, ALI data appear to be superior to Landsat TM data in delineating some coastal land-cover classes, such as mangrove and marshes. New statistical classification methods developed during the study yielded improved discrimination between difficult classes in both ALI and Landsat TM data. ALI data were also effectively used to
determine impacts of Category Four Hurricane Iris, which made landfall in southern Belize on October 8, 2001. Comparison of post-hurricane ALI data with pre-hurricane Landsat 7 data indicated that broadleaf forest had been extensively damaged in the Monkey River area approximately 130 km south of Belize City. On ALI imagery acquired after the hurricane, more than 98 percent of areas previously classified as broadleaf forest using Landsat TM data were classified primarily as savannah and other grasslands, indicating extensive broadleaf destruction and defoliation. A similar analysis in inland mountainous areas that were affected by the hurricane also showed large areas of downed and defoliated broadleaf trees. The ALI data clearly delineated changes in spectral signatures and textures as a result of Hurricane Iris.

Spectral data are being classified using both existing statistical methods and new contextual and multisensor algorithms currently being developed at The University of Texas at Austin for multispectral and hyperspectral data. Classification results are entered into a geographic information system (GIS) for analysis of land-cover and land-use distribution and change. Classified areas are checked for accuracy and consistency using existing maps and previously collected land cover/land use data at Global Positioning System (GPS)-located field survey sites and overflights, supported by additional field verification sites using GPS coordinates. Results include an evaluation and validation of the capabilities of EO-1 and Landsat 7 ETM+ data for classifying a diverse set of land cover/land use types and analyzing trends such as rates of deforestation and regrowth.

COASTAL PROCESSES

The Texas Shoreline Change Project

James C. Gibeaut, principal investigator; Roberto Gutierrez, Rachel L. Waldinger, William A. White, Tiffany L. Hepner, Rebecca C. Smyth, John R. Andrews, and Melba M. Crawford (Center for Space Research, The University of Texas at Austin)

Texas has a variety of shoreline types along its coastal bays and open Gulf of Mexico coast that are constantly shifting and mostly retreating landward. This retreat results in loss of private and public property and important natural habitats such as beaches, dunes, and marshes. To address this problem the Texas Legislature passed the Coastal Erosion Planning and Response Act in 1999. This act authorized the General Land Office to conduct a coastal-erosion response program. In support of the program, Bureau coastal researchers are identifying and studying eroding areas along the Gulf of Mexico and coastal bay shorelines of Texas, quantifying data gleaned from research and creating a comprehensive, digital database of historical shoreline positions and average annual rates of shoreline change that are being made available to the public through the Internet. Funding is provided by the Texas General Land Office, the Texas Coastal Management Program, and the National Aeronautics and Space Administration (NASA).

The goal of the Texas Shoreline Change Project is to develop a modern shoreline-monitoring and shoreline-change analysis program that will help guide coastal-erosion and storm-hazard-mitigation projects along bay and Gulf shorelines. This goal is being accomplished through digital rectification of historical photographs to extract past shoreline positions, airborne topographic lidar surveys for acquiring new and future shoreline data, selection of ground topographic transects, and establishment of Global Positioning System (GPS) reference points to support the monitoring.

Funding from NASA has enabled the Bureau to develop the application of lidar and geodetic GPS surveys for tracking coastal change. The Bureau owns and operates an Optech Inc. lidar instrument and is continually developing new and improved coastal survey techniques. During 2002, we conducted lidar surveys of the upper Texas Gulf shoreline and the bay shorelines of West and East Bays in the Galveston Bay System. We have developed processing techniques for extracting shoreline positions from the lidar data, as well as mapping sediment volumes alongshore. Spatial variation in the sand volume and elevation and shape of the beach/dune system are primary controls on the amount of damage to landward structures that can occur during storms. This work involves mapping of these variations and developing new parameters to describe them for use in hazard mitigation.

Selected shoreline-change data collected from various sources are now posted on a newly developed Website (using new Arc/Info Internet Map Server software) at www.beg.utexas.edu/coastal/intro.htm.

GIS for Sand Resources of the Upper and Central Texas Coast

James C. Gibeaut, principal investigator; Thomas A. Tremblay, Rachel L. Waldinger, and Haiyan E. Yang

Shoreline retreat along the Texas southeast coast has prompted a search for sand sources for beach nourishment projects. In 2001 and continuing in 2002, the Bureau renewed the investigation of sand resources in Federal waters of the Texas continental shelf in cooperation with the Division of International Activities and Marine Minerals (INTERMAR) of the U.S. Department of Interior’s Minerals Management Service (MMS). The MMS and the Bureau cooperated from 1993 through 1995 in collecting and analyzing data pertaining to Sabine and Heald Banks. During 2001, the earlier data were incorporated into a geographic information system (GIS). During 2002, extensive core data from the Central Texas coast belonging to Rice University were added to the Web-based GIS site using ArcIMS software. Data and documentation may be viewed and downloaded from the Website http://www.beg.utexas.edu/coastal/sand.htm. In addition to the geological data, GIS layers of obstructions to potential sand mining operations, such as oil platforms, pipelines, shipwrecks, and navigation channels, are available. Shoreline data acquired by the Bureau’s lidar system in 2001 and 2002 were also analyzed during 2002 and integrated with historical shoreline data sets that the Bureau maintains to compute short- and long-term shoreline change rates.

Monitoring and Evaluation of Geotubes

James C. Gibeaut, principal investigator; Tiffany L. Hepner, Rachel L. Waldinger, Rebecca C. Smyth, John R. Andrews, and Haiyan E. Yang

Overall, the southeastern Texas coast is undergoing long-term shoreline retreat. Recently attention increased on how retreat after Tropical Storms Josephine in 1996 and Frances in 1998 caused episodic erosion and the destruction and endangerment of houses and infrastructure. The erosion has prompted residents and government officials to take stopgap
measures, such as geotubes, to mitigate the erosion. Geotubes are tubes that have an oval-shaped cross section made of geotextile fabric. When filled with sand they have a cross section of about 12 ft. They are placed parallel to the shoreline with the intent of protecting property from storm surge and erosion.

Currently, nine geotube projects cover a total of 7.6 mi of shoreline. There is concern that the tubes may eventually cause the fronting beach to narrow and steepen unnaturally and the adjacent shorelines to retreat at a rate higher than they would without the geotubes in place. Even if the geotubes do not cause changes in the dynamics of the environment, they may eventually form an unacceptable landward boundary to the public beach. This study, begun in 2001, is funded by the Texas Coastal Management Program. During 2002, two ground surveys and an airborne topographic lidar survey were conducted. We also analyzed 2001 data and completed a report, both of which are available on the Bureau’s Web page at http://www.beg.utexas.edu/coastal/geotube.htm. The results will be used to develop coastal management policy concerning the use of geotubes and will also aid the design of future erosion control projects, such as beach nourishment and other geotube projects in the area.

**Texas Tidal Inlets Project: Depositional Environments and Morphodynamics of San Luis Pass**

James C. Gibeaut, principal investigator; Tiffany L. Hepner, Rachel Waldinger, William A. White, Rebecca C. Smyth, Roberto Gutierrez, and John R. Andrews; assisted by Shane Valentine

Topographic and bathymetric surveys were conducted in the San Luis Pass area, a natural tidal inlet on the southeast Texas coast. The detailed survey data acquired by lidar and ground and echo sounder systems using geodetic GPS positioning will be combined to create a seamless digital elevation model (DEM). The DEM will serve as the base for a geoenvironmental map describing the various depositional environments and associated habitats of the tidal-inlet system.

The Texas General Land Office is funding this study because tidal inlets play a variety of critical roles. They serve as passageways for commercial and recreational vessels, as well as marine life and nutrients. Tidal inlets affect water quality in the coastal bays, and deposition of sediment near inlets forms foundations for intertidal habitats. Inlet processes are also fundamental controls on the littoral sediment budget and, hence, affect shoreline change. Full understanding of coastal erosion problems along the Texas coast must include examination of processes occurring at the 13 open inlets and several more that are periodically open.

**Patterns of Shoreline Change and Hurricane Washover on Barrier Islands**

James C. Gibeaut, principal investigator; Roberto Gutierrez; Tiffany L. Hepner, Rebecca C. Smyth, John R. Andrews, and Melba M. Crawford (Center for Space Research, The University of Texas at Austin)

This multiyear project is funded by the National Aeronautics and Space Administration’s (NASA’s) Solid Earth and Natural Hazards Program. The goal is to apply advanced terrain mapping technology to improve our understanding of storm hazards and erosion along sandy barrier island coasts. The Bureau is using its airborne topographic lidar instrument to acquire detailed terrain models of beaches and dunes along the southeast Texas coast. With these models we can accurately track the change in position of the shoreline and develop sediment-volume budgets for the beach/dune system. Spatial variation in the sand volume and elevation and shape of the beach/dune system is a primary control on the amount of damage to landward structures during storms. This project is mapping these variations and developing new parameters to describe them.

**Characterization of the Beach Zone via Airborne Lidar and Hyperspectral Remotely Sensed Data**

James C. Gibeaut, Melba M. Crawford (Center for Space Research, The University of Texas at Austin), co-principal investigators; Roberto Gutierrez, Tiffany L. Hepner, Amy Neuenschwander, William A. White, Rebecca C. Smyth, John R. Andrews, and Thomas A. Tremblay

A highly detailed and accurate airborne topographic lidar survey was conducted over a low-lying, barrier island test site on the southwest end of Matagorda Island, Texas. The survey was conducted during a 3-day period and included five separate flights. A GPS ground reference station with the study area, data acquisition only during optimal GPS satellite conditions, surveying a calibration target each flight, overlapping flight lines, and careful postprocessing of the raw data resulted in vertical accuracy of 5 cm and an average data-point spacing of less than 1 m. The 20-km² area is undeveloped and includes an open-ocean sandy beach, multiple dune lines, ridge and swale topography, back-barrier stabilized and active dune fields, relic recurved spits and tidal channels, and a large relic washover/flood tidal delta fan. A manual classification of depositional subenvironments using color infrared photography and field visits is being compared with the lidar DEM. Initial results show that the lidar DEM will significantly enhance environmental mapping of barrier islands. Hyperspectral data acquisition is anticipated next year.

This project is funded by a grant from the Army and Navy through the Center for Space Research of The University of Texas at Austin. The goal of the work is to develop applications of new remote sensing technology for the mapping of sandy barrier island coasts. The lidar program at The University of Texas at Austin is a leader in coastal applications of airborne topographic lidar.

**Status and Trends of Wetlands on Barrier Islands, Central Texas Coast**

William A. White, principal investigator; Thomas A. Tremblay, Rachel L. Waldinger, and Thomas R. Calnan (Texas General Land Office)

Wetlands and aquatic habitats on Central Texas Gulf coast barrier and delta complexes (Matagorda Island, Matagorda Peninsula, and Colorado River Delta) are dominated by estuarine emergent wetlands (salt and brackish marshes), which in 2001 encompassed 11,257 ha in the study area and represented 67 percent of the vegetated wetland and aquatic classes (marshes, mangroves, and seagrass beds). Among other mapped classes, seagrass beds are most abundant at 4,607 ha, followed by tidal flats (2,289 ha), Gulf beaches (1,124 ha), palustrine marshes (857 ha), and mangroves (112 ha). Historically, losses and gains in habitats have occurred throughout the study area, but the overall trend in vegetated wetlands is one of net gain, as revealed by slight
increases in estuarine marshes of about 500 ha from the 1950’s through 2001. However, the total area of tidal flats decreased by about 1,840 ha since the 1950’s.

Analysis of habitat distribution by geographic subarea reveals local differences in historical trends. There were systematic net losses of estuarine marshes on east Matagorda Peninsula but net gains on the Colorado River Delta, west Matagorda Peninsula, and Matagorda Island. Losses on east Matagorda Peninsula were due primarily to submergence of marsh vegetation on the downthrown side of active faults that intersect marshes and to erosion of the Gulf and bay shorelines. Movement along active faults has apparently accelerated rates of relative sea-level rise, which have exceeded rates of marsh vertical accretion. As a result, several hundred acres of marsh has been submerged and replaced by open water on the downthrown side of faults. Net marsh gains on the Colorado River Delta were due to delta progradation on its west side, although marshes were lost because of erosion on its east side. A net increase of estuarine marshes on west Matagorda Peninsula was due largely to deposition of washover fans by Hurricane Carla in 1961 that became the sites on which new marshes had developed by 1979. Losses in tidal flats might be explained partly by a rise in relative sea level, causing the flats to be replaced by other habitats, such as open water, seagrass beds, and marshes.

The object of this research, funded by the National Oceanic and Atmospheric Administration through the Coastal Management Program and administered by the General Land Office of Texas, was to determine wetland status and trends and probable causes of trends along the Central Texas coast, using recent and historical aerial photographs supported by field surveys. Current wetland distribution (status) was determined by interpreting and digitizing wetlands on color infrared (CIR) photographs taken in 2001. Historical distribution was based on photographs taken in the 1950’s and 1979 and on historical GIS maps obtained from the U.S. Fish and Wildlife Service (USFWS).

Coastal Hazards Atlas of Texas: A Tool for Hurricane Preparedness and Coastal Management

James C. Gibeaut, principal investigator; Thomas A. Tremblay and William A. White; assisted by Haiyan E. Yang

The Texas Coastal Management Program is funding this project to develop a Coastal Hazards Atlas. During 2002, data on coastal hazards were compiled for the South Texas coast. The rest of the Texas coast was covered in earlier years. The information provided by the atlas is needed by local governments, State agencies, the general public, and others concerned about responsible development, environmental protection, and emergency preparedness. An atlas published by the Bureau in 1974 titled *Natural Hazards of the Texas Coastal Zone* inspired the current work. We are completely revising and updating the earlier atlas to include current transportation routes (needed for evacuation planning), hurricane flooding areas, the best available data on subsidence and faulting, and new information on shoreline change. The geographic data for the atlas are being made available on the Bureau’s Website in a Web-based geographic information system (GIS) using ArcIMS software (http://www.beg.utexas.edu/coastal/coastal01.htm). Users can make custom maps and data queries online. All GIS data may also be downloaded.

NEAR-SURFACE GEOPHYSICS

Evaluating Potential Groundwater Resources on State Lands in El Paso County, Texas, Using Airborne Geophysics

Jeffrey G. Paine, principal investigator; Edward W. Collins

In this project sponsored by the Texas General Land Office, we combined ground-based and high-resolution airborne geophysical methods with an analysis of available water-well data and geologic information to identify potentially favorable groundwater resources within the Hueco Bolson in eastern El Paso County, Texas. An airborne geophysical survey flown by Fugro Airborne Surveys in August 2001 acquired time-domain electromagnetic and passive magnetic field data over the 372-km² survey area. Magnetic field data correlated well with mapped fault locations. Airborne TDEM data were processed to produce animations and horizontal slices that depict apparent conductivity changes at 10-m depth intervals. Above the zone of water saturation, geologic features such as faults are prominent in the data. Below the water table at about 100 m, apparent conductivity values correlate with existing groundwater quality data. Largely on the basis of airborne survey results, we identified two areas of low conductivity that are favorable locations for groundwater exploration. Although these areas represent the most favorable sites for groundwater exploration in the area, geophysical and available water-well data suggest that these resources are limited and that local, high-volume production would likely be accompanied by significant water-level decline and salinity increase.

Assessing Lacy Creek Salinization Using Airborne Geophysics

Jeffrey G. Paine, principal investigator

The Upper Colorado River Authority and the Texas Water Development Board funded the use of innovative airborne geophysical methods to study salinization of Lacy Creek, a tributary of the North Concho River in Sterling County, Texas. Electromagnetic induction (EM) and magnetic field data were acquired in August 2001 using Fugro Airborne Surveys’ MEGATEM system.

The magnetic field data accurately identified most of the more than 400 oil and gas well locations. Commonly, magnetic anomalies more accurately located wells than did agency records. Some wells equidistant from adjacent flight lines were undetected. Where many wells are clustered, the airborne magnetometer identified a single anomaly for a group of wells. Apparent conductivities calculated from the airborne geophysical data at 10-m intervals between depths of 10 to more than 200 m below the ground surface show that conductivities are generally low. Low conductivities are consistent with the good water quality reported in most of the shallow wells, where water is fresh to slightly saline. Local areas of elevated ground conductivity are associated with oilfields where saline water had been discharged into now-abandoned disposal pits.

Mapping Near-Surface Salinization Using Long Wavelength AIRSAR

Jeffrey G. Paine, principal investigator

In this multiyear study, which ended in July 2002, we explored whether long-wavelength airborne radar (AIRSAR)
data can be used to cost-effectively survey large areas for evidence of salinization of near-surface soil and water. Because radar waves are sensitive to the electrical properties of the ground, and because the electrical conductivity of soil and water greatly increases with salinity, we attempted to use airborne radar as a screening tool to identify salinization. We expected radar reflectance to be influenced by ground conductivity (particularly at the longer wavelengths) and expected some degree of correlation between radar reflectance images at these wavelengths with ground conductivity images recorded during our previous studies of these test areas. In support of this study, the National Aeronautics and Space Administration (NASA) collected and processed AIRSAR data in two test areas: (1) within the Colorado River watershed near San Angelo in West Texas, where a 1996 airborne EM survey revealed the presence of natural, oilfield-related, and agricultural salinity sources, and (2) within the Red River basin of Texas and Oklahoma, where a 1997 airborne geophysical study of salt-impacted agricultural lands revealed oilfield-related salinization extending over many square kilometers. Comparisons of radar reflectance images with aerial photographs and detailed ground conductivity maps revealed that AIRSAR can reliably identify areas where salinization has resulted in loss of vegetation but cannot delineate larger areas of subsurface salinization that have not significantly affected surface vegetation.

Training for Seismic Refraction Instrument to Determine Bedrock Depth beneath Roads
Jeffrey G. Paine, principal investigator

The Texas Department of Transportation (TxDOT) uses many instruments to monitor the condition of the extensive network of Texas highways. Depth to bedrock beneath roads is one of the more important parameters in assessing pavement condition. In this project, funded by TxDOT, we trained TxDOT staff to use the Seismic Refraction Bedrock Analyzer (SRBA), an instrument we developed and built to determine bedrock depth and material properties beneath pavement using seismic refraction methods. We conducted tests and training sessions at sites around the state, including in the Austin, San Antonio, Midland, Abilene, Brownwood, and Waco districts.

GEOLOGICAL AND TERRAIN MAPPING

Laser Terrain Mapping, Lidar Research
Roberto Gutierrez, principal investigator; James C. Gibaut, Rebecca C. Smyth, Tiffany L. Hepner, John R. Andrews, and Jerome A. Bellian

The Bureau is one of only two university research organizations in the country to own and operate a lidar (Light Detection and Ranging) system, making us a leader in remote sensing research and technology. We use the airborne laser mapping technology of lidar to generate 3-D electronic representations of diverse terrains, employing just one of many specialized types of lidar known as ALTM (Airborne Laser Terrain Mapping). This lidar type allows repeated, precise measurements of a topographic surface whose change reflects a geologic, hydrologic, or human-caused process. Current uses of ALTM include archaeological investigations, land-use planning, flood-hazard mapping, landslide studies, shoreline-change analysis, and water-resource development. Bureau researchers are developing new, nonstandard ALTM data collection and processing procedures to generate state-of-the-art, high-precision terrain maps. These new procedures include flight-calibration procedures and algorithms and vegetation-removal algorithms. Detailed information regarding Bureau lidar research is posted on the Bureau’s Website at www.beg.utexas.edu/coastal.

Lidar Research and Commercial Applications
Collaboration between UT Austin and Airborne 1
Roberto Gutierrez, principal investigator

This collaboration seeks to increase the use of airborne lidar systems in scientific, environmental, and engineering applications. This agreement allows Airborne1, a commercial lidar firm, and the Bureau to interact in order to develop methods that improve both research and commercial lidar applications. The partners can investigate how, for example, efficiencies in commercial practice can be adapted to enhance lidar research at the university. Likewise, research applications can be examined to see whether they can be adapted to commercial applications.

Airborne Lidar Survey for the Southern California Beach Processes Study: Point La Jolla to Dana Point
Roberto Gutierrez, principal investigator

The goal of this joint program between the University of California, Scripps Institution of Oceanography, and the Bureau is to understand beach processes in Southern California, especially the relationship between ocean waves and changes in beach sand level. The specific objective of the Bureau is to collect topographic data along the coast from Point La Jolla to Dana Point and develop new methods of shoreline mapping using airborne lidar technology. Lidar surveys were conducted in May, September, and December of 2002 during periods of low tide. Besides mapping the shoreline and beach, we flew lidar passes offshore to map the sea-surface topography for comparison with computer model estimates of wave and swell heights. All these data are being analyzed at Scripps and at The University of Texas at Austin.

Geologic Mapping of Critical Aquifers and Urban Corridors of Texas
Jay A. Raney, principal investigator; Edward W. Collins

During 2002, geologic mapping included completion of (1) digital compilation (1:100,000) of geology of the west half of the Taylor, Texas, 30 × 60 minute quadrangle, which includes the northern segment of the Edwards aquifer recharge zone; (2) geologic mapping (1:24,000) of selected quadrangles within the Hill Country Trinity aquifer recharge zone west and southwest of Austin, Texas; (3) geologic mapping (1:24,000) of the San Marcos-Seguin corridor, Central Texas; and (4) digital compilation of geology of two Central Texas quadrangles within the San Antonio segment of the Edwards aquifer and west San Antonio corridor. New mapping (1:100,000) of the Seymour aquifer deposits began within
the Vernon, Texas, 30 × 60 minute quadrangle. Study of these areas has improved the understanding of units that host the groundwater resources in Texas. The maps are used by scientists and the public to address issues related to urban growth, land use and Earth resources, water quality, groundwater management, construction practices, and engineering properties of near-surface materials. This mapping is supported by the STATEMAP program, part of the National Cooperative Geologic Mapping program administered by the U.S. Geological Survey for the production of geologic maps to augment the Texas and national geologic database, and is in collaboration with the Texas Water Development Board.

**Austin Lidar Project**

Roberto Gutierrez, Rebecca C. Smyth, Tiffany L. Hepner, and Christopher Weed (Center for Space Research, The University of Texas at Austin)

Because of recurring flooding, Austin, Texas, needs new flood-hazard rate maps for the south part of the municipality. The City of Austin asked the Bureau to collect elevation data over the Williamson and Onion Creek watersheds using the Bureau’s airborne lidar mapping system. Airborne lidar mapping uses a powerful laser scanning system and Global Positioning System (GPS) to measure the Earth’s topography with great precision from a fixed- or rotary-winged aircraft.

In May 2002, researchers, working with the Texas State Aircraft Pooling Board, collected approximately 260 million lidar measurements over 92 mi² of the city. Flood-hazard analysis requires an accurate representation of the ground surface and the stream network free of trees and buildings and necessitates classification of lidar topographic points. Using computer algorithms developed by the Center for Space Research, we identified the Austin lidar data as reflections from the ground, buildings, or vegetation. Classified lidar data thus provide detailed information for hydrologic, geologic, and environmental investigations.

**Airborne Lidar Survey of Resaca Restoration Area, Brownsville, Texas**

Roberto Gutierrez, principal investigator

The Bureau of Economic Geology and the Center for Space Research, The University of Texas at Austin (UT), are using airborne lidar to provide elevation data over the Brownsville Resaca Restoration project area. This research results from a collaboration between UT, the City of Brownsville, NASA, and the U.S. Army Corps of Engineers to understand the effects of lidar data resolution and data collection upon the generation of accurate elevation data. The research contributes to technical advice provided by NASA to FEMA in requirements for map modernization in flood-risk assessment. In January 2003 the Bureau will have begun the project with a lidar survey over Brownsville, the Rio Grande, and adjacent portions of Matamoros, Mexico.

Objectives of this project include developing accurate topographic data to assist in the restoration of the Brownsville resaca system and their associated habitats. Another objective is to determine the optimal post spacing of lidar-derived DEM’s required for different levels of accuracy in the prediction of flood risk from hydrologic models. A third objective is to investigate the utility of lidar in mapping land cover and assess the effect of varying land-cover resolutions on hydrologic model results and predicted flood risk.

**Geomorphic Studies of Archeological Sites**

Jeffrey G. Paine, principal investigator

The Bureau is performing geomorphic studies for the Texas Department of Transportation as needed for archeological investigations. Activities include field investigations and drilling programs for selected locales, analysis of soils data, and short reports of geological observations and conclusions. The geomorphic studies are conducted to determine the geomorphologic character of the locales, the influences on past human activities, and the effects of natural processes on cultural deposits.
PUBLIC OUTREACH

EDUCATION

Web-Based Educational Modules
Scott D. Rodgers, principal investigator; Bob A. Hardage, Susan D. Hovorka, Charles Kerans, F. Jerry Lucia, Scott W. Tinker, and Hongliu Zeng

In 2002, in collaboration with the American Geological Institute (AGI) and the American Association of Petroleum Geologists (AAPG), the Bureau began work on the next generation of educational, Web-based reservoir characterization modules. The new series, distributed by AAPG through the Interactive Online Learning program, focuses on carbonate reservoir characterization with contributions from Bureau researchers. The new modules are structured around real data sets and complement the first series, already online, which illustrates the principles of reservoir characterization for fluvial depositional environments. These interactive, game-theory-based modules allow students to interact with geological, geophysical, and engineering data; make data interpretations; and then test their answers against the instructor’s. The modules also feature an evolved instructional model and user interface.

Austin Earth Science Week
Sigrid J. Clift

Earth Science Week (ESW) was observed nationwide October 13–19, and the Bureau, a member of the Austin ESW Consortium, celebrated by sponsoring a Book Drive that collected $1,700 for the Austin Public Library and by hosting the third Career Day Fair. The Austin ESW Career Day Fair, organized by Bureau researcher and Austin ESW Chair-person Sigrid J. Clift and members of the Austin area ESW Consortium, treated 300 Austin-area middle school students to a day of learning about careers from earth science professionals. Dr. Mary Ann Rankin, Dean of The University of Texas at Austin College of Natural Sciences, gave the opening ceremony presentation and read Governor Perry’s Texas Earth Science Week 2002 proclamation.

Presenters included Bureau researchers Dallas B. Dunlap and John R. Andrews, who staged a 3-D view of the Earth using the Bureau’s virtual reality theater. To find out more about ESW in Austin and other cities throughout Texas, visit the Texas ESW Website at www.beg.utexas.edu/esw.

Cataclysms and Catastrophes—The Role of Science
Roberto Gutierrez, principal investigator

The Cataclysms and Catastrophes project seeks to create an innovative program of professional development for secondary science teachers centered on teachers’ interacting with scientists that use technology in science learning. The proposal is a collaborative effort involving The University of Texas Institute for Geophysics (UTIG), the Bureau of Economic Geology (BEG), and 4empowerment, an Austin-based private education company.

We are developing and will field-test curricular materials based on the role of science in causing and/or understanding catastrophes to help high school teachers incorporate the geosciences into the teaching of physics, mathematics, chemistry and biology. Events such as the devastation caused by Hurricane Mitch in Honduras, the Chixculub asteroid impact event, and the Oklahoma City bombing will serve as the basis for inquiry-based, hands-on learning activities using data collected by UTIG and BEG scientists. Activities will be designed to expand familiarity with technologies such as lidar (light detection and ranging), drilling, seismic reflection and refraction, geophysical logging, and the Internet.

Down to Earth at Mustang Island
Jay A. Raney, principal investigator; William A. White

The Mustang Island project produced a public guide to Mustang Island, Texas, Down to Earth at Mustang Island. Years of coastal research by Bureau scientists provide the basis for this addition to the Bureau’s popular “Down to Earth” series of publications that are
designed to provide good science to the general public in an easily read and amply illustrated format. Mustang Island is a frequent destination on the Texas coast. Whether people come to swim, fish, sunbathe, watch birds, collect seashells, or simply relax, this guide will provide them with interesting information on the geologic evolution of Mustang Island and the relationship between physical setting and biologic environments. What people learn about Mustang Island can be applied to other parts of the Texas coast. Public understanding of this dynamic environment is essential for wise management of the Texas coastal zone. Support for this effort was provided by the National Oceanic and Atmospheric Administration under a Texas Coastal Management Program grant administered by the Texas General Land Office.

**Petroleum Technology Transfer Council (PTTC)**

Scott W. Tinker, Sigrid J. Clift, Sylvia J. Jennette, and Eric C. Potter; Jessica Blackshear and Melanie McCammon, Student Assistants; Bob Kiker, PTTC Permian Basin Program Manager; A. Scott Anderson, Texas Independent Producers and Royalty Owners Association

The PTTC Texas Region, for which the Bureau serves as Regional Lead Organization, sponsored a variety of workshops for Texas independent producers during 2002: Well-Bore Management, Field-Oriented Projects for Independents, Coalbed Methane Potential in the Gulf of Mexico, Revitalizing Gas Exploration and Production in the Gulf of Mexico Province, Interpreting 3-D Carbonate Stratigraphy Using 1-D Data, and software training workshops. In addition to workshops, the Texas Region PTTC co-sponsors the annual Permian Basin CO2 conference in Midland, Texas. Members receive updates and technology transfer news through the PTTC quarterly newsletter, *ProducerNews*, which is distributed by mail to more than 1,000 independent oil and gas producers.

Visit the PTTC Texas Region website at www.energyconnect.com/pttc/ for more information.

**National Geoscience Data Repository System (NGDRS)**

Douglas C. Ratliff, principal investigator

The Bureau provides assistance to the American Geological Institute (AGI) for work related to the National Geoscience Data Repository System (NGDRS). Through NGDRS AGI is aiming at properly storing and archiving geologic materials that range from rocks to digital data. The Bureau’s Core Research Center and Geophysical Log Facility have been primary focal points for the NGDRS, and data from these entities have been used to establish an on-line information system known as GeoTrek. During 2002, with assistance from AGI, the Geophysical Log Facility added 18,950 geophysical logs to the database. AGI provided financial support between January 2000 and February 2002 that resulted in the entering of more than 75,000 backlogged records into the database.

**Texas High School Coastal Monitoring Program: A Project in Education, Public Awareness, and Coastal Management**

James C. Gibeaut, principal investigator; Tiffany L. Hepner and Rachel L. Waldinger

The Texas Coastal Monitoring Program (TCMP) is designed to help coastal residents develop a better understanding of dune and beach dynamics on the Texas coast. Bureau researchers work with high school students and teachers, teaching them to measure the topography, map the vegetation line and shoreline, and observe weather and wave conditions. As participants in an actual research project, the students enhance their science education and provide coastal communities with valuable data on their changing shoreline.

TCMP, in its sixth year of operation, receives funding from the Texas Coastal Management Program, Conoco, the Exxon Foundation, and the Wray Family Trust. The participating schools are Ball (6 years in the program), Port Isabel, and Port Aransas (4 years in the program) High Schools. During the 2001-2002 school year, Bureau researchers and students made three field trips to survey sites in the nearby coastal regions. The Bureau envisions a network of coastal high schools conducting scientific beach studies and then using the Internet to share their observations with other students, schools, and the public. For more information, visit the program’s Website at inet1.beg.utexas.edu/thscmp/.
CONTRACT AND GRANT SUPPORT

The Bureau maintains formal and informal cooperative arrangements with several governmental entities. Parts of the Bureau’s research program are conducted under The University of Texas at Austin contracts and grants with Federal, State, and private organizations.

Contract-management personnel prepare proposals and budgets, negotiate contracts, and monitor expenditures. During the contract period, technical and financial reports are distributed at monthly, quarterly, and annual intervals. In 2002, the following 95 contracts, each of which had reporting requirements, were active at the Bureau:

FEDERAL

“Advanced Technology for Predicting the Fluid Flow Attributes of Naturally Fractured Reservoirs from Quantitative Geologic Data and Modeling”: supported by the U.S. Department of Energy (joint project with the Center for Petroleum and Geosystems Engineering).

“Analysis of Soil Remediation Requirements of Abandoned Centralized and Commercial Drilling-Fluid Disposal Sites”: supported by the U.S. Department of Energy.

“Cataclysms and Catastrophes – The Role of Science”: supported by the National Science Foundation through the Institute for Geophysics.

“Characterization of the Beach Zone via Airborne LIDAR and Hyperspectral Remotely Sensed Data”: supported by the Army Research Office through the Center for Space Research.


“Combining a New 3-D Seismic S-Wave Propagation Analysis for Remote Fracture Detection with a Robust Subsurface Microfracture-Based Verification Technique”: supported by the U.S. Department of Energy.

“Evaluation and Validation of EO-1 and Landsat 7 Imagery through an Analysis of Land Cover/Land Use and Rates of Deforestation in Belize, Central America”: supported by the National Aeronautics and Space Administration.

“Evaluation of Design, Monitoring, and Modeling Issues Related to Engineered Covers of Waste Containment”: supported by the U.S. Environmental Protection Agency.


“Impact of Reservoir Production Characteristics on Subsidence”: supported by the U.S. Geological Survey, U.S. Department of the Interior.

“Integrated Outcrop and Subsurface Studies of the Interwell Environment of Carbonate Reservoirs: Clear Fork (Leonardian Age) Reservoirs, West Texas and New Mexico”: supported by the U.S. Department of Energy.

“Integrating P-Wave and S-Wave Seismic Data to Improve Characterization of Oil Reservoirs”: supported by the U.S. Department of Energy through Prairie View A&M University.


“Mapping Near-Surface Salinization Using Long-Wavelength AIRSAR”: supported by National Aeronautics and Space Administration.

“Managing Karst Aquifers, Applications of Laser Terrain Mapping and Other Remotely Sensed Data in Central Texas”: supported by National Aeronautics and Space Administration through the California Institute of Technology, Jet Propulsion Laboratory.

“Multidisciplinary Imaging Rock Properties in Carbonate Reservoirs for Flow Unit Targeting”: supported by the U.S. Department of Energy.

“New Geologic Mapping of the Seymour Aquifer of the Vernon, Texas, 30 × 60 Quadrangle (1:100,000)”: supported by the U.S. Geological Survey, U.S. Department of the Interior.

“Optimal Geological Environments for Carbon Dioxide Disposal in Saline Aquifers in the United States”:...
supported by the U.S. Department of Energy.

“Patterns of Shoreline Change and Hurricane Washover on Barrier Islands”: supported by National Aeronautics and Space Administration.


“Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multi-disciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-Arid Environments”: supported by the U.S. Environmental Protection Agency.


“Reviving Abandoned Reservoirs with High Pressure Air Injection: Application in a Fractured and Karsted Dolomite Reservoir”: supported by the U.S. Department of Energy.

“Sequestration in Saline Formations”: supported by the Lawrence Berkeley National Laboratory.

“Startup of a Public Geological Core and Sample Repository in Houston, Texas”: supported by the U.S. Department of Energy.


“A Technology Transfer Program, Texas Region of the Petroleum Technology Transfer Council”: supported by Petroleum Technology Transfer Council.


“Geotube Presentation to the Texas Coastal Coordination Council Using Emersive 3-D Visualization Technology”: supported by the Texas General Land Office.

“Groundwater Availability Model of Central Part of the Carrizo-Wilcox Aquifer in Texas”: supported by the Texas Water Development Board.

“Groundwater Recharge in Texas”: supported by the Texas Water Development Board.

“Identification of Geographic Areas Suitable for Groundwater Banking”: supported by the Texas Water Development Board through Daniel B. Stephens & Associates, Inc.

“Improve the Conceptual Model of Fracture/Conduit Flow in the Recharge Zone of the Edwards Aquifer”: supported by the Edwards Aquifer Authority.

“Monitoring and Evaluation of Geotubes during 2002/2003”: supported by the Texas General Land Office.

“Ogallala GAM Model”: supported by the Texas Water Development Board through Daniel B. Stephens & Associates, Inc.

“Quantification of Recharge for Evaluation of Groundwater Availability and Vulnerability to Contamination and Short Course on Groundwater and Surface Water Interactions”: supported by the Texas Commission on Environmental Quality (formerly the Texas Natural Resources Conservation Commission).

“Refining the Geologic Time Scale: Integrated Biostratigraphy, Chronostratigraphy, and Sequence Stratigraphy”: supported by the Texas Higher Education Coordinating Board.

“Shoreline Change in West and Christmas Bays”: supported by the Texas General Land Office.

“Sierra Blanca Ranch Project”: supported by the Texas General Land Office.

STATE AND LOCAL

“Archeological Projects—Assistance to the Texas Department of Transportation”: supported by the Texas Department of Transportation.

“Assessing Lacy Creek Salinization Using Airborne Geophysics”: supported by the Upper Colorado River Authority.

“Coastal Hazards Atlas of Texas Vol. 4: A Tool for Hurricane Preparedness and Coastal Management”: supported by the Texas General Land Office.

“Comparing Ground Motion at the TDA Metrology Laboratory and Proposed Laboratory Sites”: supported by the Texas Department of Agriculture.

“Down to Earth at Mustang Island”: supported by the Texas General Land Office.

“Evaluating Potential Ground-Water Resources on State Lands in El Paso County, Texas Using Airborne Geophysics”: supported by the Texas General Land Office.

“Evaluation of Beach Nourishment Sand Resources along the Central Texas Coast: Follets Island North Padre Island”: supported by the Texas General Land Office.

2002 Comprehensive Report
“Status and Trends of Wetlands on Texas Barrier Islands”: supported by the Texas General Land Office.

“Technical Editing for the TWDB”: supported by the Texas Water Development Board.

“Technical Support to the Texas Water Development Board”: supported by the Texas Water Development Board.

“Technology Center for Oil and Gas Recovery Optimization on Texas State Lands”: supported by the State of Texas.

“Texas High School Coastal Monitoring Program: Ball High School, Galveston, Years 4 and 5”: supported by the Texas General Land Office through Galveston Independent School District (two contracts).

“Texas High School Coastal Monitoring Program: Port Aransas High School, Years 2 and 3”: supported by the Texas General Land Office through the Port Aransas Independent School District (two contracts).

“Texas High School Coastal Monitoring Program: Port Isabel High School, Years 2 and 3”: supported by the Texas General Land Office through the Point Isabel Independent School District (two contracts).

“The Texas Shoreline Change Project: Coastal Mapping of West and East Bays in the Galveston Bay System Using Airborne LIDAR”: supported by the Texas General Land Office.

“The Texas Shoreline Change Project—Gulf of Mexico Shoreline from Sabine Pass to the Brazos River, Pass Cavallo to Aransas Pass and the Padre Island National Seashore”: supported by the Texas General Land Office.

“The Texas Shoreline Change Project—Gulf of Mexico Shoreline from Mansfield Channel to Rio Grande and Shorelines in Matagorda, Copano/Aransas, and Corpus Christi Bays”: supported by the Texas General Land Office.

“Texas Tidal Inlets Project: Depositional Environments and Morphodynamics of San Luis Pass”: supported by the Texas General Land Office.

“Training for Seismic Refraction Instrument to Determine Bedrock Depth”: supported by the Texas Department of Transportation.

“University Lands Advanced Recovery Initiative”: supported by The University of Texas System.

“Vadose Zone Hydrogeology FY2002”: supported by the Texas Commission on Environmental Quality (formerly the Texas Natural Resources Conservation Commission).

PRIVATE

“Airborne LIDAR Survey for the Southern California Beach Processes Study: Point La Jolla to Dana Point”: supported by the University of California, San Diego.

“Airborne LIDAR Survey of Onion and Williamson Creek Area, Austin, Texas”: supported by the City of Austin.

“Airborne LIDAR Survey of Resaca Restoration Area, Brownsville, Texas”: supported by the Brownsville Public Utilities Board.


“BP Azerbijan Outcrop Study”: supported by the Azerbaijan International Operating Company.

“Definition of the Geologic Framework of the Neogene in the Southern Laguna Madre-Tuxpan Continental Shelf of Eastern Mexico”: supported by PEMEX. Additional support under this contract also funded the project titled


“Detailed Architectural Analysis of Late Cretaceous Channel Complexes in the Magallanes Basin, Chile”: supported by Shell International Exploration and Production Inc.

“ExxonMobil Rocky Mountain Outcrop Study”: supported by ExxonMobil Upstream Research Company.

“Feasibility Study for the Establishment of a National Geoscience Data System”: supported by the American Geological Institute. Additional support under this contract also funded “Web-Based Educational Modules Describing Reservoir Characterization Technology,” “GeoTrek Integration Project,” “Virtual Oil Well,” and “Energy Posters for High School Earth Science Curricula.”

“Fracture Research and Application Consortium”: supported by ChevronTexaco, Marathon Oil Company, PDVSA Exploracion y Produccion, Petrobras, Tom Brown, Inc., and Shell International E&P, Inc.

“Groundwater Analysis for Panhandle Groundwater Conservation District”: supported by the Panhandle Groundwater Conservation District.

“Integrated Geological and Engineering Characterization of the Fullerton Clear Fork Field in Andrews County, Texas”: supported by ExxonMobil Production Company.

“Integrated Reservoir Characterization of the Tamabra Reservoir of the Poza Rica Field in a Sequence Stratigraphic Framework, Phase I”: supported by PEMEX.

“LIDAR Research and Commercial Applications Collaboration between UT Austin and Airborne 1”: supported by Airborne 1 Corporation.

“Plume Research Group: Integrated Regional, Site-Specific, and Theoretical Studies of Ground-Water Contaminant Plumes”: supported by the ExxonMobil Foundation.
“Recent Shoreline Change along the Southeast Texas Coast”: supported by Galveston County.


“Research Assistance in Geology, Engineering, and Other Earth Science Disciplines”: supported by Aramco Services Company.


“Resurvey of Lower Texas Coast and Lower Rio Grande Valley”: supported by Optech Incorporated.

“Seismic Vector-Wavefield Characterization of Complex Reservoirs”: supported by Devon Energy Production Company, Pemex Exploracion y Produccion, and Vecta Technology L.P.

“Seismic Vector-Wavefield Imaging”: supported by Vecta Technologies, L.P.

“Spatial and Temporal Variability of Benzene Plumes in Texas”: supported by the American Petroleum Institute.

“Support of EarthView Texas by the Shell Foundation.”

“Support of the Texas High School Coastal Monitoring Program”: supported by the Margaret Cullinan Wray Trust.

“Workshop on Detailed Architectural Analysis of a Miocene Channel Complex Tabernas Basin, Spain”: supported by ChevronTexaco Exploration and Technology Company, ExxonMobil Upstream Research Company, and Shell International Exploration and Production, Inc.
BUREAU RESEARCH AND SUPPORT STAFF ACTIVITIES

LECTURES AND PUBLIC ADDRESSES

William A. Ambrose
“Integrated study of the geologic framework and play assessment of the Macuspana Basin and Laguna Madre-Tuxpan projects”: presented to Ing. Raul Muñoz-Leos and Pemex delegation, Austin, Texas

“BEG and Pemex basin- and play-analysis research”: presented to Landmark Graphics Corporation, Austin, Texas


“Upper Miocene and Pliocene shallow-marine and deepwater, gas-producing systems in the Macuspana Basin, southeastern México”: presented at the Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

“Play assessment of Pliocene and upper Miocene gas and oil reservoirs, Macuspana and Veracruz Basins, southeastern México”: presented to El Paso Production Company, Austin, Texas

“Study of evaluation of the Pliocene and upper Miocene plays of the Macuspana Basin”: presented to Pemex Exploración y Producción, Poza Rica, Mexico and Pemex Exploración y Producción, Tampico, Mexico


“Gas reserves growth study of middle Frio fluvial gas reservoirs in La Gloria field, South Texas”: presented to Katsumi Nakasuka (Teikoku Oil Co., Ltd.), Austin, Texas

Edward W. Collins
“Faults in the Austin, Texas, area—defining aspects of local structural grain”: presented to field trip participants, Gulf Coast Association of Geological Societies Annual Meeting Field Trip, Austin, Texas, and Beyond—Geology and Environment, Austin, Texas

“Geologic mapping in Texas—summary of the Texas STATEMAP Program”: presented to the Texas GIS Work Group, Austin, Texas

Dallas B. Dunlap
“New resources from old fields: revitalizing gas exploration and production in the Gulf of Mexico Shelf Province”: short course presented to PTTC/NETL (with Lesli Wood and Mark Holtz), Houston, Texas

Alan R. Dutton
Discussion of SAF comments on the review of the Central Carrizo-Wilcox Aquifer GAM Model: presented at Stakeholder Advisory Forum for the Central Carrizo-Wilcox Model, Elgin, Texas

“Forensic hydrogeology applied to a half-century-old crude-oil seep, Colorado River, Wharton County, Texas”: presented at the Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

“E & P drilling fluid disposal facilities in Texas and Louisiana: analogs for environmental assessments of abandoned sites”: presented at the Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

“Effect of Pleistocene depositional heterogeneity on movement of a subsurface crude-oil spill, San Patricio County, South Texas”: presented at the Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

“Hydrogeology of the Ogallala aquifer in the Texas Panhandle”: presented at Central States Cluster Meeting, Austin, Texas

“Evaluation of hydrogeologic investigation techniques for tracking subsurface contaminant plumes of crude oil—case studies”: presented to Short Course on Regulation, Assessment, and Remediation of Oil Field Exploration and Production Sites, Texas and Louisiana, Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

“Convergence between hydropresured and geopressured zones in the Wilcox Group, Central Texas Gulf Coast”: presented at the Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

“Predictive modeling results of the Central Carrizo-Wilcox Aquifer GAM Model”: presented at Stakeholder Advisory Forum for the Central Carrizo-Wilcox Model, Bastrop, Texas, and to the Texas Water Development Board, Austin, Texas

“Use of virtual reality modeling tools for visualization of aquifer geometry”: presented at the Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

“Historical calibration of the Central Carrizo-Wilcox Aquifer GAM Model”: presented to the Texas Water Development Board, Austin, Texas, and at Stakeholder Advisory Forum for the Central Carrizo-Wilcox Model, Hearne, Texas

“Recharge rates and calibration of the Central Carrizo-Wilcox Aquifer GAM Model”: presented at Stakeholder Advisory Forum for the Central Carrizo-Wilcox Model, Bastrop, Texas
“Hydrogeology of the Ogallala aquifer in the Texas Panhandle”: presented to Bureau of Economic Geology Advisory Panel, Austin, Texas


“Calibration of the Central Carrizo-Wilcox Aquifer GAM Model”: presented at Stakeholder Advisory Forum for the Central Carrizo-Wilcox Model, Bastrop, Texas

**Shirley P. Dutton**

“Petrography and reservoir quality of tertiary deepwater sandstones in the Veracruz Basin, Mexico”: presented at the Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

“Reservoir quality of lower Miocene sandstones in lowstand prograding wedge successions, Vermilion Block 31, offshore Louisiana”: presented at the Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas


**William L. Fisher**

“Energy for the next 100 years: the challenge of ingenuity and technology”: presented at John W. Storrow Lectures, Victoria College, Victoria, Texas


“Modern-day challenge in teaching petroleum geology”: keynote address: presented at Special Symposium, American Association of Petroleum Geologists, Annual Meeting, Houston, Texas

“The future of natural gas in the Gulf Coast Basin”: keynote address: presented to Society of Independent Professional Earth Scientists, Annual Meeting, Lafayette, Louisiana

“Natural gas in the new world of energy”: presented to Offshore/Onshore Technologies Association of Nova Scotia (TANS), Canadian Offshore Resources Conference, Halifax, Nova Scotia


“Transitions in energy use and demand”: presented to Desk & Derrick Club, San Antonio, Texas

“The coming methane economy”: presented at Landmark Luncheon Seminars, Austin, Texas

**Sergey B. Fomel**


“Rays, fronts, and waves: travel-times in seismic imaging”: presented at Mathematical Geophysics Summer School, Stanford, California

“Fast computation of multiple arrivals and their use in seismic imaging”: presented at BP seminar and at WesternGeco seminar, Houston, Texas

“Fast multiple-arrival traveltime computation for seismic imaging”: presented at The University of Texas at Austin Institute for Geophysics Seminar, Austin, Texas

“Regular noise attenuation with plane-wave destruction filters”: presented at the XI Venezuelan Geo-physical Congress, Caracas, Venezuela

**Roberto Gutiérrez**

“Forensic hydrogeology applied to a half-century-old crude-oil seep, Colorado River, Wharton County, Texas”: presented at the Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

**Bob A. Hardage**

“S-wave evaluation of fractured reservoirs”: presented at the American Association of Petroleum Geologists Southwest Section Meeting, Ruidoso, New Mexico

“Evaluating marine gas hydrates with 4-C OBC seismic data”: presented at DOE Gas Hydrates workshop, Washington, D.C., and Houston, Texas

“Applications of multicomponent seismic data”: presented to Petroleum Technology Transfer Council workshop, Tyler, Texas

**Tucker F. Hentz**

“Exploring nontraditional hydrocarbon traps for resource additions in the shallow Gulf of Mexico shelf, U.S.A.”: presented at the Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

“Sequence stratigraphy and hydrocarbon distribution of Miocene plays: a case study from Starfak and Tiger Shoal fields, offshore Louisiana”: presented at American Association of Petroleum Geologists Annual Convention, Houston, Texas

**M. H. Holtz**


**Susan D. Hovorka**

“Examples from the Edwards aquifer: using hydrocarbon resource assessment to understand an aquifer/using aquifer tests to understand hydrocarbon resources and Revision to TNRCC Guidance for Geologists Doing Geologic Assessments of the Edwards Aquifer Recharge Zone”: presented to South Texas Geological Society

“Revision to TNRCC Guidance for Geologists Doing Geologic Assessments of the Edwards Aquifer Recharge Zone”: presented to San Antonio College and Government Canyon

“Geologic sequestration—case studies in the onshore U.S.”: presented at IBC Workshop on Carbon Sequestration, Houston, Texas

“Recharge to the BFZ Edwards aquifer—the issues and the unknowns”: presented at the Department of Geological Sciences Hydro Brown Bag Seminar, The University of Texas at Austin
Michael R. Hudec

“The Salt Mine status report”: presented at the Applied Geodynamics Laboratory Industrial Associates Meeting, The University of Texas at Austin

“The new AGL website: now worth looking at!”: presented at the Applied Geodynamics Laboratory Industrial Associates Meeting, The University of Texas at Austin

“Restorations of seismic data over contractual structures in the deepwater Lower Congo Basin, Gabon”: presented at the Applied Geodynamics Laboratory Industrial Associates Meeting, The University of Texas at Austin

“Animations of simple salt structures”: presented at the Applied Geodynamics Laboratory Industrial Associates Meeting, The University of Texas at Austin

“The Applied Geodynamics Laboratory”: presented to BEG Advisory Committee, The University of Texas at Austin

“Using EarthVision to analyze normal fault relays”: technical brief presented to Dynamic Graphics, Inc., Alameda, California

“Strained neighbors: independent tectonic evolution of the onshore and offshore Kwanza Salt Basins, Angola”: presented at the American Association of Petroleum Geologists Annual Convention, Houston, Texas


Martin P. A. Jackson

“Synthesis of new tectonic ideas on the Kwanza Basin, Angola”: presented at Applied Geodynamics Laboratory Annual Review Meeting for Industrial Associates, Austin, Texas

“Introduction and AGL overview”: presented at Applied Geodynamics Laboratory Annual Review Meeting for Industrial Associates, Austin, Texas


“Preliminary analysis of contractual and extensional salt tectonics in Lower Congo Basin, deepwater Gabon”: presented to TotalFinaElf, Pau, France; TotalFinaElf Angola, Luanda, Angola; and Total Gabon and TotalFinaElf, Paris, France

“Applied Geodynamics Laboratory Program”: presented to TotalFinaElf, Pau, France

“Summary of new findings on Block 32, Lower Congo Basin”: presented to TotalFinaElf Angola, Luanda, Angola

“Stratigraphic response to translation across a stepped salt detachment”: presented to TotalFinaElf, Pau, France

David C. Jennette

“Methods and results from the Veracruz Basin gas play study: PEMEX, Coatzacoalcos, Mexico: an integrated approach to deepwater-reservoir prediction using seismic, well, core, and outcrop”: presented to ChevronTexaco, San Ramon, California

“Geology, play analysis and gas resource assessment of the Miocene and Pliocene in the Veracruz Basin, Mexico”: presented at Chevron Texaco Geology Forum, Galveston, Texas

“Joint PEMEX/BEG study of Miocene and Pliocene gas plays, Veracruz Basin”: presented to the Pemex Board of Directors, Austin, Texas

“A revolution on the outcrop: new laser technology for the 3-D digital capture and analysis of field geology”: presented as Distinguished Lecture Program in Geology, University of Wyoming, Laramie

“Interaction of shelf accommodation, sediment supply and sea level in controlling the facies, architecture and sequence stacking patterns of the Paleogene fans, Central North Sea”: presented to the Geology Department, Colorado University, Boulder, Colorado

“New laser technology for the 3-D digital capture and analysis of field geology,” invited talk: presented to the Geology Department, Colorado University, Boulder, Colorado

Martin P. A. Jackson

“Contrasting modes and magnitudes of shortening in salt and sediment on the African Atlantic passive margin: in northwest African Atlantic margin and analogs”: presented at the First Marrakech International Oil and Gas Conferences and Exhibition, Marrakech, Morocco

“3-D visualization and fault-slip analysis of physical models of normal-fault relays above evaporites”: presented at the American Association of Petroleum Geologists Annual Convention, Houston, Texas

“Gulf of Mexico allochthonous salt tectonics”: presented to TotalFinaElf, Pau, France

“Early tectonics and segmentation of Inner Kwanza Basin, Angola”: presented to TotalFinaElf, Pau, France

“The Salt Mine”: presented to TotalFinaElf, Pau, France

“Restoration of regional profile from Angolan Craton to abyssal plain, Kwanza Basin”: presented to TotalFinaElf, Pau, France

“Salt tectonics”: short course presented to E&P Methods and Technologies School: American Association of Petroleum Geologists, Houston, Texas

“Advanced salt tectonics”: short course presented to TotalFinaElf, Houston, Texas; TotalFinaElf, Luanda, Angola; and ONAREP Rabat, Morocco
James W. Jennings, Jr.
“3-D modeling of stratigraphically controlled petrophysical variability in the South Wasson Clear Fork reservoir”: presented at the Annual Fall Meeting of the Carbonate Reservoir Characterization Research Laboratory Industrial Associates, Austin, Texas and the Society of Petroleum Engineers Annual Technical Conference and Exhibition, San Antonio, Texas

“Modeling coupled fracture-matrix fluid flow in geomechanically simulated fracture networks”: presented at the Annual Fall Meeting of the Reservoir Characterization Research Laboratory Industrial Associates, Austin, Texas

“CT scanning and flow modeling to evaluate permeability reduction by patchy anhydrite cementation”: presented at the Annual Fall Meeting of the Reservoir Characterization Research Laboratory Industrial Associates, Austin, Texas

“The effects of measurement scale on petrophysical properties in carbonates”: presented to Shell International Exploration and Production, Rijswijk, Netherlands

“Introduction to geostatistics for reservoir characterization and modeling”: presented to Shell International Exploration and Production, Rijswijk, Netherlands

“Building numerical models for shallow-water carbonate reservoirs”: presented to Shell International Exploration and Production, Rijswijk, Netherlands

“Introduction to scaleup for fluid-flow modeling in carbonates: presented to Shell International Exploration and Production, Rijswijk, Netherlands

“Spatial permeability patterns in carbonates and their effects on fluid flow”: presented to Shell International Exploration and Production, Rijswijk, Netherlands

“Spatial permeability patterns in carbonates and their effects on fluid flow (continued)”: presented to Shell International Exploration and Production, Rijswijk, Netherlands

“3-D modeling of stratigraphically controlled petrophysical variability in carbonate reservoirs,” invited talk: presented at PTTC Reservoir Characterization Workshop, Shreveport, Louisiana

“Modeling fluid flow through vuggy pore space using X-ray CT imaging”: presented to ExxonMobil, Houston, Texas

“3-D modeling of stratigraphically controlled petrophysical variability in carbonate reservoirs”: presented to ExxonMobil, Houston, Texas

“Predicting permeability from well logs in carbonates with a link to geology for interwell permeability mapping,” invited talk: presented at American Association of Petroleum Geologists Annual Convention, Houston, Texas

“Statistical analysis, spatial statistics, scaleup, and model construction in carbonate reservoirs,” Workshop Section: Carbonate Reservoir Characterization and Modeling: presented to the Reservoir Characterization Research Laboratory Industrial Associates, Austin, Texas

Charles Kerans
“New developments in carbonate sequence stratigraphy and reservoir characterization”: presented to South Texas Geological Society

“Three-dimensional modeling of carbonate outcrop analogs for enhanced reservoir characterization”: presented to Saudi Aramco, Dhahran, Saudi Arabia

“The value of 3-D seismic for interpretation of icehouse reservoir frameworks—Sacroc and selected examples”: presented at the Annual Fall Meeting of the Reservoir Characterization Research Laboratory Industrial Associates, Austin, Texas

“Integrating Ilris data to construct a 3-D model—carbonate toe-of-slope fan-channel complexes, Early Permian, Victorio Canyon”: presented at the Annual Fall Meeting of the Reservoir Characterization Research Laboratory Industrial Associates, Austin, Texas

“Upper Shuaiba reservoirs of North Oman”: presented at the Annual Fall Meeting of the Reservoir Characterization Research Laboratory Industrial Associates, Austin, Texas

“Internal anatomy and lateral facies variability of a Cretaceous (lower Alban) caprised buildup—Pipe Creek, Texas, a preview”: presented at the Annual Fall Meeting of the Reservoir Characterization Research Laboratory Industrial Associates, Austin, Texas

“Seismic and sequence stratigraphy in carbonate reservoir characterization”: presented at Permian Basin Geophysical Society Exploration Symposium, Midland, Texas

“New developments in the application of sequence stratigraphic concepts to analysis of carbonate reservoir characterization for ExxonMobil U.S. West division”: presented to Greenspoint, Houston, Texas

“The evolving role of carbonate sequence stratigraphy in reservoir characterization”: presented at Vailfest, a Symposium in Honor of Peter Vail, Rice University, Houston, Texas

“Sequence framework and depositional models of Middle Eastern Cretaceous reservoirs”: presented to the Dhahran Geological Society, Kobar, Saudi Arabia; the Oman Geological Society, Muscat, Oman; and the Society of Petroleum Engineers, Kuwait City, Kuwait

“Evolving technologies and opportunities in carbonate systems”: presented at King Faad University, Dhahran, Saudi Arabia; Petroleum Development Oman, Muscat, Oman; and the Emirates Geological Society, Abu Dhabi, United Arab Emirates

“Sacroc reservoir model and implications for construction of reservoir models along the Horseshoe Atoll trend”: presented to OXY Permian, Austin, Texas

“Construction of a static reservoir model for the Sacroc Unit”: presented to Kinder Morgan, Austin, Texas

“Evolving role of sequence stratigraphy in carbonate reservoir characterization,” invited talk: presented to Vail Symposium on Sequence Stratigraphy, Geology Department, Rice University, Houston, Texas

Eugene M. Kim
“Fractures, salt, seismic, and ice: vital research components of America’s natural gas energy future”: presented at
Robert G. Loucks


Project Starr: State of Texas Advance Resource Recovery Program: presented to the Deck and Derrick Club, Austin, Texas

F. Jerry Lucia

“Origin and petrophysics of touching-vug pore space”: presented at the Annual Fall Meeting of the Reservoir Characterization Research Laboratory Industrial Associates, Austin, Texas

“Sacro permeability model—the case for unique icehouse rock fabrics”: presented at the Annual Fall Meeting of the Reservoir Charac-terization Research Laboratory Industrial Associates, Austin, Texas

“Rock-fabric approach to reservoir characterization”: presented to Exxon Mobil, Houston, Texas

“Young carbonate fabrics as early stages in the development history of Permian Basin reservoirs”: presented to the Permian Basin SEPM, Midland, Texas


Paul Murray

“Determination of Vs and Vp/Vs ratios from OBC seismic data”: presented at Exploration Geophysics Laboratory 2002 Spring Sponsor Meeting, Austin, Texas

Jeffrey G. Paine

“Geophysics applied to oil field environmental assessment: instruments, platforms, and applications”: presented at Gulf Coast Association of Geological Societies Annual Meeting as part of short course titled Regulation, Assessment, and Remediation of Oil Field Exploration and Production Sites, Texas and Louisiana, Austin, Texas

“Assessing Lacy Creek salinization using airborne geophysics”: presented to Railroad Commission of Texas, Upper Colorado River Authority, and Sterling County Underground Water Conservation District, Sterling City, Texas

“Applications of airborne electromagnetic induction in identifying groundwater resources and assessing salinization”: presented to International Boundary and Water Commission and Mexican Federal and State officials, El Paso, Texas

“Hydrogeochemical applications of airborne electromagnetic induction imaging”: presented to World Bank, Austin, Texas

“Comparing ground motion at the current and proposed sites of the Metrology Laboratory”: presented to General Services Commission, Austin, Texas

Eric C. Potter

“Proposed statewide assessment of low-pressure gas resources in Texas: a valuable resource to be captured and produced”: presented to Texas Alliance of Energy Producers, Abilene, Texas

“BEG update”: presented to West Texas Geological Society, Midland, Texas

Robert C. Reedy


Bridget R. Scanlon

“Unsaturated zone hydrology”: short course presented to Texas Natural Resources Conservation Commission, Austin, Texas

“Variations in flow and transport in thick desert vadose zones in response to paleoclimatic forcing (0–90 kyr)”: presented to Department of Geological Sciences, The University of Texas at Austin

“Unsaturated zone studies related to natural systems and evapotranspiration covers”: presented to Pantex AIP, Austin, Texas

“Groundwater fluxes across interfaces”: presented to National Academy of Sciences, Door County, Wisconsin, WI

“Aquifer demonstration”: presented to Cedar Creek Elementary School, Austin, Texas

“Groundwater modeling in the Barton Springs segment of the Edwards aquifer, Texas”: presented to Austin Geological Society, Austin, Texas

“Groundwater recharge in Texas”: presented to Texas Water Development Board, Austin, Texas

“Comparison of various techniques for evaluating unsaturated flow in the
Chihuahuan Desert of Texas”: presented to Department of Hydrology, University of Arizona, U.S. Geological Society, Tucson, Arizona

“Overview of unsaturated flow studies in semi-arid regions”: presented to Texas A&M University, College Station, Texas

“Groundwater recharge in the Texas High Plains”: presented at the Geological Society of America Annual Meeting, Denver, Colorado

“Monitoring and modeling of engineered covers”: presented to the Environmental Protection Agency, Cincinnati, Ohio

**Rebecca C. Smyth**

“Forensic hydrogeology applied to a half-century-old crude-oil seep, Colorado River, Wharton County, Texas”: presented at the Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

“Lidar at U.T. Austin”: presented at Texas Water Development Board Brown Bag Lunch Lecture Series, Austin, Texas

**Scott W. Tinker**

“Interpreting 3-D carbonate stratigraphy using 1-D data”: 1-1/2-day short course presented at Permian Basin Graduate Center, Midland, Texas

“Carbonate sequence stratigraphy and reservoir characterization: concepts and applications”: 2-day short course presented to BEG staff, Austin, Texas (with Charles Kerans)

“Carbonate sequence stratigraphy and reservoir characterization: concepts and applications”: 4-day short course presented to PEMEX staff, Poza Rica, Mexico (with Charles Kerans)


“Upstream technology for the coming gas economy,” keynote address: presented at 11th Venezuelan Geophysical Congress, Caracas, Venezuela

“A rock revival: core thoughts from the BEG,” invited talk: presented at West Texas Geological Society Fall Symposium, Midland, Texas

“A decade of 3-D reservoir modeling…and a brief glimpse at the future,” keynote address: presented at ChevronTexaco Geology Forum, Galveston, Texas

“Fossil energy in Texas and the Bureau of Economic Geology,” luncheon address: presented at 21st Annual Advanced Oil, Gas and Energy Resources Law Seminar, Texas State Bar, Dallas, Texas

“Associated oil: upstream technology to support the natural gas energy future”: presented at West Texas Geological Society Fall Symposium, poster session, Midland, Texas

“There’s gas in them thar hills,” all-convention luncheon address: presented at Rocky Mountain Section/American Association of Petroleum Geologists meeting, Laramie, Wyoming

“Investment in technology for an unconventional natural gas future,” invited talk: presented at World Energy Policy in the 21st Century, College Park, Maryland

“Oil and gas technology for the coming gas economy,” invited talk: presented at 17th World Petroleum Congress, Rio de Janeiro, Brazil

Press conference announcing the donation of BP core research facility in Houston to The University of Texas at Austin: presented at request of U.T. President Larry R. Faulkner, Austin, Texas

“Oil, water, lasers, and more: today’s Bureau of Economic Geology,” invited talk: presented to Lakeway Men’s Breakfast Club, Austin, Texas

“Upstream technology for the coming natural gas economy,” invited talk: presented at Lawrence Livermore National Laboratory, Livermore, California

“3-D and 4-D modeling of reservoirs and aquifers: adding new dimensions to your data,” invited talk: presented at SIPES San Antonio Chapter lunch meeting, San Antonio, Texas


“Fractures, salt, seismic, and ice: vital research components of America’s natural gas energy future”: presented at the American Association of Petroleum Geologists Convention, Houston, Texas (with Eugene M. Kim)


“Are those extra dimensions worth it? 3-D and 4-D modeling of oil reservoirs and aquifers”: presented at the SIPES lunch meeting, Austin, Texas

“Gassing up the car and turning on the lights: plate tectonics, sedimentary basins, and hydrocarbon reservoirs,” invited talk: presented to North Houston Landman’s Association, Houston, Texas

“Oil and water: rocks and models improve resource understanding,” invited talk: presented at Houston Geological Society dinner meeting, Houston, Texas

“Plates, rocks, volcanoes, meteoroids and other very cool stuff”: presented to 3rd grade class, Burnet Elementary School, Burnet, Texas

“A multidimensional Bureau of Economic Geology: 3-D models, 3-D seismic, lidar, and other neat technology,” invited talk: presented to the East Texas Geological Society, Tyler, Texas

“Getting the word out: linking EarthScope public and K-12 outreach to state geologic surveys,” invited talk: presented at EarthScope Education and Outreach workshop, Boulder, Colorado

**Bruno C. Vendeville**

“Deformation associated with fluid overpressure: theoretical considerations and experimental examples”: presented at the Applied Geodynamics Laboratory Industrial Associates Meeting, The University of Texas at Austin
Fred P. Wang
“3-D reservoir modeling using Petrel”: short course presented to Conoco Inc. and El Paso Production Inc., Houston, Texas

William A. White
“Wetland losses associated with faulting and subsidence, Texas Gulf Coast”: presented to visiting science and math teachers from Houston’s Aldine Independent School District, Austin, Texas
“Coastal zone studies”: presented to visiting representatives of the World Bank at the Bureau of Economic Geology, Austin, Texas

Lesli J. Wood
“New resources from old fields: revitalizing gas exploration and production in the Gulf of Mexico shelf province”: presented to the Petroleum Technology Transfer Council and Houston Geological Society, Houston, Texas
“Sequence stratigraphy and structural framework of southeast Caribbean margin: offshore Orinoco Delta, Venezuela”: presented at the XI Venezuelan Geophysical Congress, Caracas, Venezuela

Hongliu Zeng
“From seismic stratigraphy to seismic seismology: a sensible transition”: presented to the technical session, Department of Geological Sciences, The University of Texas at Austin

BUREAU OF ECONOMIC GEOLOGY SEMINARS

William A. Ambrose
“Play assessment of Pliocene and upper Miocene gas and oil reservoirs, Macuspana Basin, southeastern Mexico”

Alan R. Dutton
“Hydrogeology of the Carrizo-Wilcox aquifer in Central Texas”

Susan D. Hovorka
“Climate change—issues and answers for Texas”
“Introducing the Jackson School Geoscience Alliance”

Michael R. Hudec
“Introducing ‘The Salt Mine’”

Martin P. A. Jackson
“Orogenic telescoping of a Gulf-of-Mexico-type allochthonous salt complex in the Neoproterozoic Katanga Basin, Congo”

Randy L. Remington
“Identifying fault compartmentalization in the middle Frio sandstones, Redfish Bay, South Texas”

Bridget R. Scanlon
“Hydrologic processes in thick vadose zones in interdrainage semi-arid regions: monitoring and modeling analysis”

Bruno C. Vendeville
“Examples of late shortening of minibasins and salt in the Gulf of Mexico (SE Mississippi Canyon) and in experiments”

Hongliu Zeng
“Neural networks and seismic reservoir characterization”
**COMMITTEE SERVICES, OFFICES, AND OTHER PROFESSIONAL RESPONSIBILITIES**

**Sigrid J. Clift**
Chair, Texas Environmental Awareness Network
Chair, Austin Earth Science Week Consortium
Co-Chair, Short Course Committee, Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

Co-lead, field trip, Austin, Texas, and Beyond—Geology and Environment, Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas
Member, Austin Geological Society Field Trip Committee (2002-2003)
Mentor, Roy J. Shlemon Mentor Program in Applied Geology, Geological Society of America, South-Central Section, Shlemon Workshop, Alpine, Texas

**Edward W. Collins**
Chairman, Field Trip Committee, Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas
Co-leader, field trip, Austin, Texas, and Beyond—Geology and Environment, Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas
Member, Austin Geological Society Field Trip Committee (2002-2003)
Mentor, Roy J. Shlemon Mentor Program in Applied Geology, Geological Society of America, South-Central Section, Shlemon Workshop, Alpine, Texas

**William L. Fisher**
Member, Science and Technology Committee, Gas Research Institute Director, John A. and Katherine G. Jackson School of Geosciences, The University of Texas at Austin
Chairman, Steering Committee, John A. and Katherine G. Jackson School of Geosciences, The University of Texas at Austin
Member, Energy and Mineral Resources Graduate Studies Committee, The University of Texas at Austin
Director, Geology Foundation, The University of Texas at Austin
Chair, Executive Committee, Geology Foundation, The University of Texas at Austin
Foundation Trustee, American Geological Institute
Trustee, Southwest Research Institute
Trustee, American Association of Petroleum Geologists Foundation
Member, Research Committee, Interstate Oil and Gas Compact Commission
Member, Hedberg Award Committee, Institute for the Study of Earth and Man

**Dallas B. Dunlap**
Chairman, Audio Visual Committee, Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

**Alan R. Dutton**
Associate Editor, *Hydrogeology Journal*
Member, Ground-Water Protection Committee, representing Bureau of Economic Geology, Texas Natural Resource Conservation Commission
Editor, *The Hydrogeologist*

**Shirley P. Dutton**
Co-Editor, Gulf Coast Association of Geological Societies *Transactions*
Convenor, Tight Gas Reservoirs Poster Session, American Association of Petroleum Geologists Annual Convention, Houston, Texas
Judge, poster session, American Association of Petroleum Geologists Annual Convention, Houston, Texas
Member, Graduate Student Recruitment Committee, Department of Geological Sciences, The University of Texas at Austin
Member, Admissions and Support Committee, Department of Geological Sciences, The University of Texas at Austin
Member, Dissertation Committee, Tarek ElShayeb, Department of Geological Sciences, The University of Texas at Austin
Member, Dissertation Committee, Astrid Makowitz, Department of Geological Sciences, The University of Texas at Austin

**Member, Advisory Council, Gas Technology Institute**
Member, Science and Technology Committee, Gas Technology Institute
Member, Advisory Board, World Energy Update
Member, Committee on Resources, American Association of Petroleum Geologists
Member, Steering Committee, National Geoscience Data Repository System, American Geological Institute
Member, National Petroleum Council
Member, National Academy of Engineering
Member, U.S. National Committee for World Petroleum Congress
Member, Board on Energy and Environmental Systems, National Research Council

Member, Peer Committee, Petroleum, Mining, and Geological Engineering Section, National Academy of Engineering
Member, Energy Resources, Research, and Technology Committee, Interstate Oil and Gas Compact Commission
Member, Task Force on Manpower Needs of the Petroleum Industry, Interstate Oil and Gas Compact Commission
Member of the Corporation, American Association of Petroleum Geologists Foundation
Member, Past President’s Council, American Geological Institute
Member, Honorary Membership Committee, Association of American State Geologists
Chairman, Petroleum, Mining, and Geological Engineering (Section 11), National Academy of Engineering
Member, United States Energy Association
Member, National Academies Workshop on Novel Approaches to the Management of Greenhouse Gases from Energy Systems
Member, National Gas Committee, National Petroleum Council
Theses and Dissertations Supervised

Current

Jorge Barrios-Rivera (Ph.D.)
Macro-fractures and implications in hydrocarbon production in northeastern part of Pilar de Akal, southern Mexico

Hugo Castellanos (Ph.D.)
Suk-Joo Choh (Ph.D.) Geological characterization of the lower to middle Pennsylvanian carbonate bioherms of southwestern U.S.A.

Arturo Conterras (Ph.D.) High-resolution reservoir characterization, Eocene, northeastern Maracaibo Basin, Venezuela

James Corboy (M.S.) Sequence stratigraphy, Apache Canyon, West Texas (co-supervised with Charles Kerans)

Christopher L. Edwards (M.S.)
Mustang Island Block, GOM

Alejandro Escalona (Ph.D.)
Architectural and petrophysical properties, Eocene reservoirs, Lake Maracaibo, Venezuela

Patricia Montoya (Ph.D.)
Mohammad Fakhmi (M.S.) (co-supervised with Lesli Wood)

Pedro T. Gomez-Caberra (Ph.D.)
Sequence stratigraphy of the Isthmus Salina Basin, Southern Gulf of Mexico

Matthew Davis (M.S.)
Shanty Ilona (M.S.)
Alfred Gomez (M.S.)
Martha Jaimies (M.S.)
(co-supervised with Paul Mann)

Hongbo Lu (Ph.D.) Global and local controls on depositional cyclicity: the Canterbury Basin, New Zealand (co-supervised with Craig Fullthorpe)

Cem O. Kilic (Ph.D.)
Characterization and quantification of middle Miocene reservoirs of Louisiana using neural network patterns and statistics

Yong-Joon Park (Ph.D.)
AVO seismic analysis, Edna field, deep Yegua, South Texas

Terry L. Ramsey (Ph.D.)
Evaluating, financing, and managing international applications of technology in natural resources

Ayanna Redwood (M.S.)

Tony J. Troutman (M.S.) Karsting of the Redwall Limestone, Grand Canyon, Arizona (co-supervised with Charles Kerans)

Diego van Berkel (M.S.) Weber Sandstone, Permo-Pennsylvanian deposits at Rangley field, Colorado

Songul Yildiz (M.A.) Plio-Pleistocene sequence stratigraphy, Matagorda Bay, Texas

Completed

2002
Adrian C. Badescu (Ph.D.)
Integrating 3-D seismic imaging, sequence stratigraphy, and reservoir properties to enhance secondary gas recovery of two major Miocene Gulf of Mexico offshore fields

2002
Budiyono (M.S.)
Forel field reservoir characterization in southwest Natuna Sea, Indonesia

2002
Donna Cathro (Ph.D.)
Three-dimensional stratigraphic development of a carbonate-siliciclastic sedimentary regime—northern Carnarvon Basin, Northeast Australia (co-supervised with James Austin)

2002
Robert Koch (M.S.)
Reservoir characterization of southeast Bradley Springer unit, Grady and Garvin Counties, Oklahoma

2002
Patricia Montoya (M.S.)
Seismic detection of fractures, eastern Venezuela

2002
Claudia Rassi (Ph.D.)
Influence of reservoir character and architecture on hydrocarbon distribution and production in the Miocene of Starfak and Tiger Shoa fields, offshore Louisiana

2002
Rinie M. Mekarsari (M.S.)
Seismic stratigraphy of the Green Canyon area, Gulf of Mexico

2002
Hasan Sarikalaya (M.S.)
Forward seismic modeling of a tidal bar-incised valley complex: Sego Sandstone, Eastern Utah

Sergey Fomel

Member, Translations Committee, Society of Exploration Geophysicists
Co-Editor, Gulf Coast Association of Geological Societies Transactions, Austin, Texas

Martin P. A. Jackson

Session Chair, Salt Tectonics:
New Concepts, New Plays, Deep-Water Gulf of Mexico, Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

Session Co-Chair, Pass the Salt,
Please: Recent Advances in Global Salt Tectonics, American Association of Petroleum Geologists Annual Convention, Houston, Texas


Member, Ph.D. Dissertation Committee, Joël Le Calvez, The University of Texas at Austin, Austin

Member, Ph.D. Dissertation Committee, Xinxia Wu, The University of Texas at Austin, Austin

Co- Supervisor, Ph.D. Dissertation Committee, Pedro Gomez, The University of Texas at Austin, Austin

Sylvia J. Jennette

Chairperson, Spouse Committee, Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

James W. Jennings, Jr.

Technical Editor, SPE Reservoir Evaluation and Engineering

Member, Research Committee, American Association of Petroleum Geologists

Chairman, Reprint Committee, Advances in Reservoir Characterization, Society of Petroleum Engineers

Theme Chairman, Reservoir Modeling and Visualization, Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

Session Organizer, Reservoir Modeling, Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

Member, Ph.D. Dissertation Committee, Zeno Philip, The University of Texas at Austin, Austin
Stephen E. Laubach
Member, Distinguished Lecture Committee, American Association of Petroleum Geologists
Member, Academic Liaison Committee, American Association of Petroleum Geologists
Member, Editorial Board, American Association of Petroleum Geologists Bulletin
Lecturer and Member, Visiting Geologists Program, American Association of Petroleum Geologists
Chair, Research Group—Reservoir Deformation Subcommittee, American Association of Petroleum Geologists
Member, Editorial Board, Society of Petroleum Engineers, Formation Evaluation
Vice-Chair, Research Committee, American Association of Petroleum Geologists
Member, Editorial Review Committee, Society of Petroleum Engineers
Instructor, American Association of Petroleum Geologists
Fractured Reservoirs School
Judge, American Association of Petroleum Geologists Annual Meeting
Associate Editor, Society of Petroleum Engineers SPE Reservoir Evaluation & Engineering
Chair, Academic Liaison Subcommittee to Identify AAPG Contacts at Colleges and Universities, American Association of Petroleum Geologists
Member, various dissertation and thesis committees (DGS and P&GSE)
Webmaster, Research Committee, American Association of Petroleum Geologists
Session Chair, Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas
Associate Editor, American Association of Petroleum Geologists Bulletin
Lecturer, Brittle Structure, Randy Marrett’s class, Department of Geological Sciences, The University of Texas at Austin
Member, Ph.D. Dissertation Committee, Orlando Ortega, The University of Texas at Austin, Austin, Texas (completed)
Member, Ph.D. Dissertation Committee, Yuan Qiu, The University of Texas at Austin, Austin, Texas (completed)

Robert G. Loucks
Secretary, Foundation Committee, SEPM (Society for Sedimentary Geologists)
Member, Research Committee, SEPM (Society for Sedimentary Geologists)
Liaison, Research Committee, SEPM (Society for Sedimentary Geologists)
Liaison, Research Committee, American Association of Petroleum Geologists
Member, Research Committee, American Association of Petroleum Geologists
Member, Sandstone Diagenesis Subcommittee, SEPM (Society for Sedimentary Geologists)
Member, Carbonate Rock Subcommittee, SEPM (Society for Sedimentary Geologists)
Session Co-Chair, A New Look at Old Fields: Examples of Reworked Fields Yielding Significant New Reserves, American Association of Petroleum Geologists Annual Convention (with Neil Gaynor)
Session Co-Chair, Reservoir Quality in Gulf of Mexico Siliciclastic and Carbonate Strata, Gulf Coast Association of Geological Societies Annual Meeting, Austin Texas (with Alton Brown)
Member, Editorial Board, American Association of Petroleum Geologists Bulletin
Member, Promotions Advisory Committee, Bureau of Economic Geology, Austin, Texas
Chairman, Contribution Committee, Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas
Co-Chair, M.S. Thesis Committee, Deanna Combs, The University of Texas at Austin
Member, M.S. Thesis Committee, Chris Edwards, The University of Texas at Austin
Co-Chair, M.S. Thesis Committee, Songul Yildiz, The University of Texas at Austin

Murray, Paul
Member, Events Committee, Bureau of Economic Geology, Austin, Texas
Member, Information Distribution System Taskforce, Bureau of Economic Geology, Austin, Texas

Jeffrey G. Paine
Review Panelist, Solid Earth and Natural Hazards Panel, National Aeronautics and Space Administration, Earth Science Enterprise
Associate Editor, Environmental & Engineering Geoscience

Eric C. Potter
Member, Grants-In-Aid Committee, American Association of Petroleum Geologists

Douglas C. Ratcliff
Chairman, Publication Committee, Gulf Coast Association of Geological Societies
General Chairman, Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

Lisa E. Remington
Chair, Registration Committee, Gulf Coast Association of Geological Societies Annual Meeting, Austin, Texas

Stephen C. Ruppel
Chair, Publications Committee, Austin Geological Society
Co-Editor, Gulf Coast Association of Geological Societies, Transactions
Member, M.S. Thesis Committee, Deanna Combs, The University of Texas at Austin

Bridget R. Scanlon
Member, Promotions Advisory Committee, Bureau of Economic Geology
Member, Faculty Hiring Committee, 
Department of Geological Sciences, 
The University of Texas at Austin

Member, Surveillance and 
Monitoring Workgroup, 
Long-Term Stewardship Program, 
U.S. Department of Energy

Member, Surface Water 
Groundwater Interaction, 
LCRA/SAWS

Co-Chair, Texas Groundwater 
Protection Committee, Research 
Subcommittee, Texas Commission 
on Environmental Quality

Workshop Facilitator, Groundwater 
Fluxes across Interfaces, Diffuse vs. 
Focused Fluxes Session, National 
Academy of Sciences, Wisconsin

Member, Long-Term Stewardship, 
U.S. Department of Energy

Member, Texas Groundwater 
Protection Committee

Member, Unsaturated Zone 
Hydrology Committee, 
American Geophysical Union

Member, Ph.D. Dissertation 
Committee, Beth Gross, Department 
of Geotechnical Engineering, 
The University of Texas at Austin

Member, Ph.D. Dissertation 
Committee, Ian Jones, Department 
of Geological Sciences, The 
University of Texas at Austin

Member, M.S. Thesis Committee, 
Amy McCole, Department of 
Geological Sciences, The 
University of Texas at Austin

Stowell, J. F. W.
Co-Chair, Technical Program, 
Gulf Coast Association 
of Geological Societies 
Annual Meeting

Scott W. Tinker
Member, International Steering 
Committee, AMGP (Asociacion 
Mexicana de Geologos Petroleros)/ 
AAAPG International Conference, 
Veracruz, Mexico

Member, Advisory Committee, 
Service to Society Committee 
of the Commission of 125, The 
University of Texas at Austin, 
Austin, Texas, December

Member, Board of Advisors, 
iReservoir.com

Member, Board of Directors, Horse 
Blanket Oil & Gas Corporation

Member, Oil Field Cleanup Fund 
Advisory Committee, appointed 
by Lieutenant Governor 
Bill Ratliff, State of Texas

Trustee, American Geological 
Institute Foundation

Member, International 
Committee, APPEX (Property 
and Prospect Exposition)

Member, Organizing 
Committee, APPEX (Property 
and Prospect Exposition)

President-Elect, 
Austin Geological Society

Member, University Advisory 
Board, CLEER (Center for Legislative 
Energy and Environmental Research)

Member, Core and Sample 
Preservation Committee, American 
Association of Petroleum Geologists

Director, Texas Regional Lead 
Organization, Petroleum 
Technology Transfer Council

Chairman, Field Seminar 
Subcommittee, Education 
Committee, American Association 
of Petroleum Geologists

Member, Coastal Processes 
Committee, Association of 
American State Geologists

Chairman, U.S. Potential Gas 
Committee, Association of 
American State Geologists

Member, Liaison Committee, 
Association of American 
State Geologists

Member, Executive Committee, 
Association of American 
State Geologists

Member, Education Committee, 
American Association of 
Petroleum Geologists

Chairman, Energy and Mineral 
Policy Committee, Association 
of American State Geologists

Member, Executive Committee, 
John A. and Katherine G. Jackson 
School of Geosciences, The 
University of Texas at Austin

Member, Steering Committee, 
John A. and Katherine G. 
Jackson School of Geosciences, 
The University of Texas at Austin, 
Austin, Texas

Member, Producer 
Advisory Group, Petroleum 
Technology Transfer Council

Member, Board of 
Visitors, Trinity University

Member, Continental Margins 
Committee, Association of 
American State Geologists

Technical Program Chairman, 
Steering Committee, Gulf Coast 
Association of Geological Societies 
Annual Meeting, Austin, Texas

Thomas A. Tremblay
Member, Critical Infrastructure 
Workgroup, Texas Geographic 
Information Council

Ramón Treviño
Treasurer, Gulf Coast Association 
of Geological Societies 
Annual Meeting

Bruno C. Vendeville
Member, White Paper 
Committee, NSF Tectonics

Convener, Forward Modeling in 
Structural Geology and Tectonics, 
Topical Session (Oral), Geological 
Society of America Annual 
Meeting, Denver, Colorado

Convener, Forward Modeling in 
Structural Geology and Tectonics, 
Topical Session (Poster), 
Geological Society of America 
Annual Meeting, Denver, Colorado

Member, Ph.D. Dissertation 
Committee, Joël Le Calvez, 
The University of Texas at 
Austin, completed

Member, Ph.D. Dissertation 
Committee, Ricardo Combellas- 
Bigott, The University of Texas 
at Austin

Member, M.S. Thesis Committee, 
Vernon Moore, Texas A&M 
University, College Station, Texas, 
completed
William A. White
Member, Science Validation Team for New Millennium Program
Earth Observing series (EO-1), National Aeronautics and Space Administration

Lesli J. Wood
Member, Core and Samples Preservation Committee, American Association of Petroleum Geologists
Member, Publications Committee, American Association of Petroleum Geologists
Member, Committee on Conventions, American Association of Petroleum Geologists
Member, OTC Committee, American Association of Petroleum Geologists
Member, Technical Program Committee, Gulf Coast Association of Geological Societies
Session Co-Chair, Deepwater Seismic Imaging: Case Studies from the Gulf of Mexico, Brazil, and West Africa, Offshore Technology Conference
Session Co-Convenor, Active Processes in Deep Water: Surveys, Measurements and Models, Offshore Technology Conference
Topical Session Chair, Gas Resources in the Gulf of Mexico, Gulf Coast Association of Geological Societies

HONGLIU ZENG
Member, Ph.D. Dissertation Committee, Hongbo Lu, The University of Texas at Austin, Austin, Texas
Member, Ph.D. Dissertation Committee, Yong-Joon Park, The University of Texas at Austin, Austin, Texas
Member, M.A. Thesis Committee, Songul Yildiz, The University of Texas at Austin, Austin

CONGRESSIONAL, LEGISLATIVE, AND SPECIAL COMMITTEE TESTIMONY

Scott Tinker
External member of panel to select Chief Energy Scientist, Central Region, U.S. Geological Survey

Scott W. Tinker
“Reservoir geology and advanced recovery”: presented to Geology 383R, Department of Geological Sciences, The University of Texas at Austin (with Scott W. Tinker)

Sergey B. Fomel
“Plane-wave destruction and other types of wave extrapolation”: presented to GEO 391 graduate class, Department of Geological Sciences, The University of Texas at Austin

UNIVERSITY TEACHING/CONTINUING EDUCATION

William L. Fisher
“Reservoir geology and advanced recovery”: presented to Geology 383R, Department of Geological Sciences, The University of Texas at Austin (with Scott W. Tinker)

Martin P. A. Jackson
“Salt tectonics”: presented to Tectonics II (GEO 391) graduate class, Department of Geological Sciences, The University of Texas at Austin

James W. Jennings, Jr.
“Introduction to geostatistics for carbonate reservoir characterization and modeling”: presented to PGE383, Department of Petroleum and Geosystems Engineering, The University of Texas at Austin
“Introduction to geostatistics for reservoir characterization and modeling”: presented to PGE337, Department of Petroleum and Geosystems Engineering, The University of Texas at Austin

Charles Kerans
“Carbonate sequence stratigraphy”: presented as a series of 3 lectures, Geology 380N, Sequence Stratigraphy, Sequence Stratigraphy, Department of Geological Sciences, Sequence Stratigraphy, The University of Texas at Austin

Stephen E. Laubach
“Microfractures”: presented to structural geology class, Department of Geological Sciences, The University of Texas at Austin
“Fracture porosity evolution”: presented to structural geology class, Department of Geological Sciences, The University of Texas at Austin
“Brittle structure”: presented to Randy Marrett’s class, Department of Geological Sciences, The University of Texas at Austin

Jeffrey G. Paine
“Near-surface geophysical methods in hydrogeological investigations”: lecture and field demonstration of electromagnetic methods for field methods: presented to Hydrogeology Class, GEO376L, Department of Geological Sciences, The University of Texas at Austin

Bridget R. Scanlon
“Unsaturated zone hydrology”: presented to field class, Department of Geological Sciences, The University of Texas at Austin

Scott W. Tinker
“Reservoir geology and advanced recovery” (Geology 383R): Department of Geological Sciences, The University of Texas at Austin (with William L. Fisher)

Lesli J. Wood
“Basin analysis” (Geology 383): Department of Geological Sciences, The University of Texas at Austin (with William E. Galloway)
K-12 AND PUBLIC OUTREACH

**John R. Andrews**
“Virtual imaging as an integrated tool in Earth Science research,” virtual reality presentation to class from Lake Travis Elementary School, Austin, Texas
“3-D computer models help us understand geology,” Earth Science Week Career Day Fair presentation, Commons Conference Complex, Pickle Research Campus, The University of Texas at Austin
“3-D visualization of the geotextile-tubes (geotubes) installed along the Gulf of Mexico shoreline of the upper Texas coast,” virtual reality presentation, Coastal Coordination Council Meeting, Bureau of Economic Geology, The University of Texas at Austin

**Sigrid Clift**
Water for Texas: workshop presented at Conference for the Advancement of Science Teaching, El Paso, Texas
Rocks and minerals: presented at Annual Truck Rodeo State Championship, Austin, Texas

**Dallas B. Dunlap**
“3-D computer models help us understand geology,” Earth Science Week Career Day Fair presentation, Commons Conference Complex, Pickle Research Campus, The University of Texas at Austin

**Susan D. Hovorka**
“New views of familiar places—a GIS program for students”: presented at the Conference for Advancement of Science Teaching (CAST) and the 18th Annual GIS Conference, Education Session, Austin, Texas
“New views of familiar places” short course, Region XIII training: presented to the Round Rock ISD, Round, Rock
BEG virtual reality tour: presented to Whitte Museum staff, Austin, Texas
“Water for Texas”: workshop presented at the Conference for Advancement of Science Teaching, El Paso, Texas (assistant to Sigrid Clift)
“Aquifer-in-a-tank” and “Sugar karst”: presented at Environmental Science Institute Public Lecture Series, Austin, Texas

**Michael R. Hudec**
“Earthquakes”: presented to the 5th grade at Hill Country Christian School (two presentations), Austin, Texas
“Groundwater and caves”: presented to the 6th grade at Hill Country Christian School (two presentations), Austin, Texas

**Rebecca C. Smyth**
“Landslides and flooding in Honduras: results of Hurricane Mitch, 1998”: presented at Gulf Coast Association of Geological Societies Annual Meeting, Teachers Workshop, Austin, Texas

Virtual reality and Bureau tour: presented to the Austin Nature and Science Center staff, Austin, Texas
“Aquifer-in-a-tank”: presented at the Aquarena Groundwater Festival
“Introducing the Jackson School Geoscience Alliance”: presented to Austin Geological Society, Austin, Texas
PUBLICATIONS

CONTRACT REPORTS

Collins, E. W., 2002, Geologic map of the Blanco quadrangle: The University of Texas at Austin, Bureau of Economic Geology, open-file geologic map prepared for the U.S. Geological Survey under cooperative agreement no. 01HQAG0039, 1 sheet, scale 1:24,000.

Collins, E. W., 2002, Geologic map of the Pace Bend quadrangle: The University of Texas at Austin, Bureau of Economic Geology, open-file geologic map prepared for the U.S. Geological Survey under cooperative agreement no. 01HQAG0039, 1 sheet, scale 1:24,000.

Collins, E. W., 2002, Geologic map of the Crabapple Creek quadrangle: The University of Texas at Austin, Bureau of Economic Geology, open-file geologic map prepared for the U.S. Geological Survey under cooperative agreement no. 01HQAG0039, 1 sheet, scale 1:24,000.

Collins, E. W., 2002, Geologic map of the Cypress Creek quadrangle: The University of Texas at Austin, Bureau of Economic Geology, open-file geologic map prepared for the U.S. Geological Survey under cooperative agreement no. 01HQAG0039, 1 sheet, scale 1:24,000.

Collins, E. W., 2002, Geologic map of the Driftwood quadrangle: The University of Texas at Austin, Bureau of Economic Geology, open-file geologic map prepared for the U.S. Geological Survey under cooperative agreement no. 01HQAG0039, 1 sheet, scale 1:24,000.

Collins, E. W., 2002, Geologic map of the Dripping Springs quadrangle: The University of Texas at Austin, Bureau of Economic Geology, open-file geologic map prepared for the U.S. Geological Survey under cooperative agreement no. 01HQAG0039, 1 sheet, scale 1:24,000.

Collins, E. W., 2002, Geologic map of the Martindale quadrangle: The University of Texas at Austin, Bureau of Economic Geology, open-file geologic map prepared for the U.S. Geological Survey under cooperative agreement no. 01HQAG0039, 1 sheet, scale 1:24,000.

Collins, E. W., 2002, Geologic map of the Martindale quadrangle: The University of Texas at Austin, Bureau of Economic Geology, open-file geologic map prepared for the U.S. Geological Survey under cooperative agreement no. 01HQAG0039, 1 sheet, scale 1:24,000.

Collins, E. W., 2002, Geologic map of the west half of the Taylor, Texas, 30 × 60 minute quadrangle: Central Texas urban corridor, encompassing Round Rock, Georgetown, Salado, Briggs, Liberty Hill, and Leander: The University of Texas at Austin, Bureau of Economic Geology, open-file geologic map prepared for the U.S. Geological Survey under cooperative agreement no. 01HQAG0039, 1 sheet, scale 1:100,000.

Collins, E. W., 2002, Geologic map of the Whithworth Ranch quadrangle: The University of Texas at Austin, Bureau of Economic Geology, open-file geologic map prepared for the U.S. Geological Survey under cooperative agreement no. 01HQAG0039, 1 sheet, scale 1:24,000.


Dutton, A. R., 2002, Analysis of predicted water-level changes in Roberts County given the proposed pumping rates for the Mesa, Quixx, and Courson projects: The University of Texas at Austin, Bureau of Economic Geology, letter report prepared for the Panhandle Groundwater Conservation District, White Deer, Texas, unpaginated.

Dutton, A. R., 2002, OGLL 5 data model, hydraulic conductivity, Southern High Plains Ogallala aquifer, GAM model: The University of Texas at Austin, Bureau of Economic Geology, contract deliverable prepared
for the Texas Water Development Board, CD-ROM.


Loucks, Robert, Treviño, Ramon, Brown, L. F., Jr., and Remington, Randy, 2002, Reservoir geology, structure, and sequence stratigraphy of the Mustang Island Block 889 Area, offshore South Texas: The University of Texas at Austin, Bureau of Economic Geology, final report prepared for Sabco Oil and Gas Corporation, variously paginated.


Paine, J. G., 2002, Bedrock depth and seismic velocity estimates at SRBA training sites in Comal, Hamilton, Pecos, Taylor, and Travis Counties, Texas: The University of Texas at Austin, Bureau of Economic Geology, report prepared for the Texas Department of Transportation, under contract no. 05-2990-1, 28 p.

Paine, J. G., 2002, Estimating depth to bedrock beneath pavement using the SRBA prototype: The University of Texas at Austin, Bureau of Economic Geology, report prepared for the Texas Department of Transportation, under interagency cooperation contract no. 05-2990-1, 42 p. + CD-ROM.


Gibeaute, J. C., Gutierrez, Roberto, and Hepner, Tiffany, 2002, Threshold conditions for episodic beach erosion along the Southeast Texas Coast: Gulf Coast Association of Geological Societies Transactions, v. 52, p. 323-335.


Tinker, S. W., 2002, Valuing Earth’s books: Geotimes, v. 47, no. 6, p. 6-7.


Abstracts


Henk, Bo, and Loucks, R. G., 2002, An incised valley fill of marginal marine and estuarine deposits within the Frio Formation, West Mustang Island field,
Nueces County, Texas (ext. abs.), in SEPM Hedberg Conference on Incised Valley Fills: Casper, Wyoming.


Jennette, D. C., Fouda, Khaled, Wawrzyniec, Tim, Dunlap, Dallas, Munoz, Rafael, and Meneses-Rocha, Javier, 2002, Slope and basin-floor reservoirs from the Miocene and Pliocene of the Veracruz Basin, southeastern Mexico (abs.), in European Association of Geoscientists and Engineers Workshop on Turbidite Reservoirs, Parma, Italy, unpaginated.


Reed, R. M., and Milliken, K. L., 2002, A technique for avoiding imaging problems associated with carbonate minerals on SEM-based cathodoluminescence systems (abs.):


Tinker, S. W., 2002, Are those extra dimensions worth it? 3-D and 4-D modeling of oil reservoirs and aquifers (abs.): SIEPS Meeting, Austin, Texas.


Tinker, S. W., 2002, A decade of 3-D reservoir modeling...and a brief glimpse at the future (abs.): ChevronTexaco Geology Forum, Galveston, Texas.

Tinker, S. W., 2002, Fossil energy in Texas and the Bureau of Economic Geology (abs.): 21st Annual Advanced Oil, Gas and Energy Resources Law Seminar, Dallas, Texas.

Tinker, S. W., 2002, Gassing up the car and turning on the lights: plate tectonics, sedimentary basins, and hydrocarbon reservoirs (abs.): North Houston Landman’s Association, Houston, Texas.

Tinker, S. W., 2002, Getting the word out: linking EarthScope public and K-12 outreach to state geologic surveys (abs.): EarthScope Education and Outreach Workshop, Boulder, Colorado.

Tinker, S. W., 2002, A multidimensional Bureau of Economic Geology: 3-D models, 3-D seismic, Lidar, and other neat technology (abs.): East Texas Geological Society, Tyler, Texas.

Tinker, S. W., 2002, Oil and gas technology for the coming gas economy (abs.): 17th World Petroleum Congress, Rio de Janeiro, Brazil.

Tinker, S. W., 2002, Oil and water: rocks and models improve resource understanding (abs.): Houston Geological Society Meeting.


Tinker, S. W., 2002, There’s gas in them there hills (abs.): Rocky Mountain Section/American Association of Petroleum Geologists meeting, Laramie, Wyoming.

Tinker, S. W., 2002, 3-D and 4-D modeling of reservoirs and aquifers: adding new dimensions to your data (abs.): SIEPS San Antonio Chapter Lunch Meeting, San Antonio, Texas.

Tinker, S. W., 2002, Upstream technology for the coming natural gas economy (abs.): Lawrence Livermore National Laboratory, Livermore, California.


PUBLIC INFORMATION RESOURCES

In addition to being a research unit of The University of Texas at Austin, the Bureau serves the State of Texas as the Texas Geological Survey. In this role, the Bureau maintains the following public resources and facilities: Core Research Centers, Data Center (composed of the Geophysical Log Facility and the Reading Room), and Publication Sales. These facilities are open to the public Monday through Friday from 8:00 a.m. to 5:00 p.m. Comprehensive information about these resources can be found on the Bureau’s Website at www.beg.utexas.edu under the menu Public Resources.

CORE RESEARCH CENTERS

The Core Research Centers (CRC’s) are the Bureau’s research and storage facilities in Austin, Houston, and Midland that house core and rock material donated to the University. The central core repository is the Austin CRC, located adjacent to Bureau headquarters on the University’s J. J. Pickle Research Campus. Public facilities include core examination rooms, processing rooms for slabbing core, and office space. For-a-fee services are available, such as core photography and CRC inventories on CD’s. For information, please call the Austin CRC manager, George Bush, at 512-471-0402, or read about the facilities on the Bureau’s Website at www.beg.utexas.edu/mainweb/geolinks01.htm.

THE DATA CENTER

The Data Center, comprising a Reading Room and Geophysical Log Facility managed by Sigrid J. Clift, is located on the first floor of the Bureau’s headquarters in Austin. The Reading Room maintains a collection of geological reference materials, including periodicals, maps, well logs, publications, and reports from various governmental and nongovernmental earth science entities. For information, please call the Public Information Geologist at 512-471-0320.

The Geophysical Log Facility (GLF) stores downhole log data received from private donations, Bureau research projects, and the Railroad Commission of Texas, which by law receives a copy of geophysical logs from every new, deepened, or plugged well drilled in Texas. Data available for public research include wireline electric logs, well records, and scout tickets from hundreds of thousands of Texas wells. Sample logs from the 1930’s through the 1950’s are also stored and made available for public research. Copies of logs can be requested either in person or by mail, telephone, fax, or e-mail. For information, please call the GLF manager, Daniel Ortuño, at 512-471-7139.

PUBLICATION SALES

The Bureau publishes and sells maps and reports of research conducted by Bureau staff since 1915 through the present. In 2001 we also began handling the sales of select Gulf Coast Association of Geological Societies (GCAGS) publications. Bureau publications include reports of investigations, guidebooks, handbooks, cross sections, maps, oil and gas atlases, interactive CD’s, seismic data sets, geologic folios, geologic atlas sheets, page-sized maps of Texas, classroom teaching aids, out-of-print publications, and most Bureau contract reports. The Publication Sales office is located on the first floor of Bureau headquarters in Austin. Orders for publications can be made either in person or by mail, telephone, fax, or e-mail, or through our Website at www.beg.utexas.edu. For information, please call the Publication Sales manager, Amanda Masterson, at 512-475-9513. Free copies of the current year’s List of Publications, Annual Report, and Midyear Report are available upon request.
SUPPORT STAFF

ADMINISTRATIVE

Wanda LaPlante, who recently celebrated 25 years of service at the Bureau, is the Assistant to the Director. Glynis Morse supervises the staff responsible for general administration of the Bureau. Glynis and her employees handle payroll, personnel, accounts payable and receivable, purchasing, travel and reimbursement, and countless other tasks for the Bureau’s 140+ employees.

CONTRACT MANAGEMENT

Contract Manager Lynda Miller and her staff help researchers prepare budgets and proposals and serve as liaisons for funding agencies. Contract management includes financial reporting, database and records management, and the documentation of progress and submission of deliverables.

FACILITIES MANAGEMENT

The day-to-day management of the building is the responsibility of Facilities Manager James A. Doss, Jr. His team provides behind-the-scenes support for in-house meetings, conventions, daily mail service, maintenance of Bureau vehicles, office moves, and inventories of basic equipment.

EDITING

Chief Editor Susie Doenges supervises the Bureau’s editing staff, who are responsible for editing, word processing, desktop publishing, and proofreading all varieties of Bureau publications, including contract reports, abstracts, peer-reviewed articles, and annual reports. Editing supports scientists’ publications in journals and books outside the Bureau as well.

GRAPHICS

Graphics Manager Joel Lardon heads up the Bureau’s team of computer illustrators, designer, and photographer, who are responsible for producing the design, artwork, and illustrations for Bureau research and publications. The team’s award-winning graphics include text illustrations and presentation materials, manual and digital photography, design and layout, map design and finishing, as well as Website content and posters for the Bureau booths displayed at conventions.

MEDIA TECHNOLOGY SERVICES

Scott Rodgers, Manager of the Bureau’s Media Technologies program, is responsible for the Virtual Imaging and Visualization Environment (VIVE), a laboratory for the application of virtual visualization technologies for the earth sciences. In addition, the program develops plans for integration of digital information systems and interactive educational technologies, including digital publishing and Internet development, within the Bureau.

PROVIDING MULTIPLE SUPPORT SERVICES

The Bureau is dedicated to providing high-quality, comprehensive support services to its researchers and staff. From administrative and contract management to facilities and graphics, the Bureau’s support staff ensures smooth operations and successful outcomes for its varied initiatives.

Information Technology Services (ITS) is managed by Ron Russell, who, with his team of IT experts, provides vital computer technology assistance to Bureau researchers and staff, including systems support, 3-D modeling, visualization, characterization, computer mapping, programming, database applications, statistical and graphical analysis of data, and PC and workstation platforms.

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The mission of the Bureau of Economic Geology is to conduct preeminent energy, environmental, and water research and disseminate the results.