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 Circulrars, 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.
2001 COMPREHENSIVE REPORT

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The Comprehensive Report is a record of Bureau research projects and professional activities of Bureau staff during the calendar year. Additional information about Bureau research and researchers, news items, funding, and awards can be found in the Bureau’s Annual Report and Midyear Report. The List of Publications contains titles of all Bureau publications, brief descriptions of new publications, and information regarding placing orders. These reports are available on request.
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ENERGY

Energy research at the Bureau comprises basic research, basin and field studies, and resource evaluations.

Basic Energy Research

Reservoir Characterization Research Laboratory (RCRL): Characterization of Carbonate Reservoirs

Charles Kerans and F. Jerry Lucia, principal investigators; James W. Jennings, Jr., and Jerome A. Bellian; assisted by Jason W. Rush, Ted E. Playton, and Zeno G. Philip

The Reservoir Characterization Research Laboratory (RCRL) has developed several new research directions in 2001. Fundamental research into a unified method for calculating permeability in carbonates from well data resulted in the presentation of a model at this year’s Society of Petroleum Engineers meeting by Jim Jennings and Jerry Lucia. This presentation was selected as part of the “Best of SPE for AAPG” session for the 2002 American Association of Petroleum Geologists annual meeting in Houston.

Icehouse carbonate reservoirs have been a major focus of this year’s geological research. Unique outcrops of Early Permian carbonates in the Victorio Canyon area have permitted continuous mapping of shelf, slope, and basin depositional units. Lowstand platforms and lowstand basin-floor fans appear as key reservoir elements that have not previously been studied in detail. New laser imaging technology has been added to the program in late fall to facilitate 3-D mapping of these features. Jerry Bellian, who is newly associated with the RCRL, brings expertise in 3-D laser imaging. He will spearhead the first attempt to integrate state-of-the-art ILRIS imaging technology in the Victorio Canyon area.

Subsurface reservoir modeling has resulted in generation of a 3-D reservoir simulation for the lower Clear Fork reservoir at the Oxy Wasson Unit. Detailed core, log, and 3-D seismic interpretation to develop an integrated static model of the Pennsylvanian SACROC unit of the Horseshoe Atoll is under way. Seismic data are revealing a highly complex Upper Pennsylvanian framework that should provide new understanding of the complex flow unit architecture.

The RCRL, supported by an industrial consortium since 1989, works to develop new techniques for characterizing carbonate reservoirs worldwide. RCRL expertise includes carbonate sequence stratigraphy and facies analysis, carbonate-rock-fabric facies analysis and petrophysics, 3-D geological modeling, geostatistics, and reservoir engineering.

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

The outcrop stratigraphy and petrophysics has been integrated with subsurface data to construct a reservoir model suitable for fluid flow simulation and performance prediction. The model was built using rock-fabric flow layers constrained by high-frequency cycles and sequence boundaries. High-frequency cycles contain a lower mud-dominated fabric and an upper grain-dominated fabric, which defines two rock-fabric flow layers per cycle. Mud-dominated fabrics typically have lower porosity than do grain-dominated fabrics, and the porosity difference was used to correlate cycles throughout the study area. New sophisticated statistical methods were used to scale up porosity and permeability from core and log measurements to grid-block scale. This method preserves the stratigraphic layering of petrophysical properties in the simulation model, whereas more traditional methods fail in this regard. Investigations into modeling fracture permeability using a geomechanical approach have been informative and have isolated a number of research issues that need to be addressed before this approach can be integrated into the simulation model. Sufficient information has been obtained, however, to suggest that fracture permeability is not a major contribution to the flow properties of the South Wasson Clear Fork field.

This study of carbonate reservoirs is funded by the U.S. Department of Energy, and matching funds are provided by the Reservoir Characterization
Research Laboratory for Carbonate Reservoirs. The objective of this project is to investigate and develop improved engineering and geological methods for characterizing carbonate reservoirs for input into fluid-flow simulators to predict reservoir performance. The project is focused on investigations of interwell heterogeneity in Clear Fork reservoirs of the Permian Basin, West Texas, and New Mexico. Data were collected and analyzed from the excellent Clear Fork-age outcrops in the Sierra Diablo Mountains, West Texas, and from the South Wasson Clear Fork reservoir, a major Clear Fork reservoir in the Permian Basin. The study addresses three fundamental questions: (1) What are the best methods of predicting the distribution of high- and low-permeability rock-fabric facies? (2) What effect does the fine-scale heterogeneity located within rock-fabric flow units have on recovery? (3) What is the impact of natural fractures on reservoir performance in Clear Fork reservoirs?

**Refining the Geologic Time Scale: Integrated Biostratigraphy, Chem stratigraphy, and Sequence Stratigraphy**

Stephen C. Ruppel, principal investigator; Eric W. James; assisted by Lance N. Christian and Yong-Joon Park

During the second full year of this project, samples were collected for recovery of conodonts and fusulinids in several new outcrop sections in the Leonardian and Wolfcampian rocks of the Sierra Diablo Mountains of West Texas. Processing of the first of these samples has yielded substantial numbers of conodonts that will be analyzed for $^{87}\text{Sr}/^{86}\text{Sr}$. Additional samples of anhydrite were collected from subsurface Leonardian cores in the Permian Basin, then processed and analyzed for $^{87}\text{Sr}/^{86}\text{Sr}$. Ongoing sequence stratigraphic studies in the subsurface, using cores, seismic, and wireline log data, and in outcrops are improving the stratigraphic resolution of Leonardian sections. The ultimate goal of the project, which was funded by the Texas Higher Education Coordinating Board as part of the Advanced Research Program, is to develop a high-resolution temporal framework for the Leonardian (Lower Permian) using a synthesis of conodont and fusulinid biostratigraphy, strontium isotope chem stratigraphy, and sequence stratigraphy. Once established, this framework will serve as a primary reference standard for comparison, correlation, and dating of equivalent successions worldwide.

Major elements of the sequence stratigraphy of the Wolfcampian and Leonardian sections have been worked out through integrated studies of outcrop and subsurface data. Using this sequence-stratigraphic framework, we are currently collecting samples from outcrops and cores for biostratigraphic and geochemical analysis. Biostratigraphic studies will focus on fusulinid and conodont faunas; the two faunal groups that have shown to have great value in biozonation of the Permian. Geochemical studies will measure strontium isotope ratios ($^{87}\text{Sr}/^{86}\text{Sr}$) from anhydrite in cores and conodont elements; two mineral phases that have proven to be good preservers of original seawater ocean chemistry.

**Applied Geodynamics Laboratory (AGL)**

Martin P. A. Jackson, principal investigator; Bruno C. Vendeville, laboratory manager; Michael R. Hudec, Daniel D. Schultz-Ela, and Randy L. Remington; assisted by Joel H. Le Calvez, Asif Muzaffar, and Patrick Walsh

Several major advances were made in Applied Geodynamics Laboratory (AGL) research during 2001, including the release of the first module of *The Salt Mine*, a digital atlas of salt tectonics. New research was launched for a second large state-of-the-art 3-D seismic volume, and the AGL’s first set of 3-D numerical models was completed.

Research continued into salt tectonics and basin evolution along the Angola Margin. Well data, potential-field data, and 2-D seismic data lent by Shell enabled investigations to continue into the effects of tectonic segmentation on salt-tectonic styles along a passive margin. Outstanding-quality 3-D seismic data from deepwater Gabon was lent by TotalFinaElf to begin investigations of syn-sedimentary thrusting of salt-related structures and crestal faulting in anticlines. Results of these studies are then applied to investigations of poorly imaged subsalt structures in the Gulf of Mexico.

The AGL has conducted research into tectonic and salt processes associated with hydrocarbon traps since 1988. Researchers use computer-controlled rigs to simulate structural styles, and overhead photographs, serial sections, time-lapse videos, and CT scans to reconstruct and analyze structural evolution. Modeling investigations include turtle structures, growth folds, diapir drag, strike-slip along allochthonous salt sheets, and extension above basement steps.

*The Salt Mine* is a browser-based, interactive atlas of salt tectonics featuring an exhaustive collection of salt structure images and the best models produced during the lab’s 14-year history. Compilation began for two other atlas modules, all of which are available only to AGL sponsors.
Fracture Research and Application Consortium (FRAC)

Stephen E. Laubach, Randall A. Marrett (Department of Geological Sciences, The University of Texas at Austin), and Jon E. Olson (Department of Petroleum and Geosystems Engineering, The University of Texas at Austin), principal investigators; Julia F. W. Gale, Kitty L. Milliken (Department of Geological Sciences, The University of Texas at Austin), Jon Holder (Department of Petroleum and Geosystems Engineering, The University of Texas at Austin), and Robert M. Reed; assisted by Eloise H. Doherty, John Hooker, Astrid Makowitz, Orlando J. Ortega, Faustino Monroy, and Aysen Ozkan

The Fracture Research and Application Consortium (FRAC) enjoyed remarkable success this year and is now sponsored by 12 companies worldwide. The goal of FRAC is to develop new understanding of fractures and faults that influence the successful extraction of resources. Research is under way to better characterize, predict, and simulate reservoir-scale structures. 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. Recent results include linked geomechanical and structural-diagenetic models that can 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 as input in fluid-flow simulators.

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

The success of efforts to extract hydrocarbons from many remaining domestic exploration and development targets depends on creating 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. It is the latter with which we are concerned inasmuch as the mechanisms for fracture closure are not well defined. The basic dilemma 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 can be controlling fractures for fluid movement. The project involves a multidisciplinary team.

During 2001 a mathematical model was 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 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. Partially cemented fractures are created if cementation fails to completely fill the fracture or if subsequent dissolution leaches out some of the mineral. Certain sets of boundary conditions show how the fractures are completely filled by precipitation.

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 diagenetic 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, Robert J. Graebner, Paul E. Murray, Jon E. Olson (Department of Petroleum and Geosystems Engineering, The University of Texas at Austin), and Randall A. Marrett (Department of Geological Sciences, The University of Texas at Austin)

Phase I (Theory) of this DOE-funded research program was completed, and Phase II (Validation) has been implemented. Phase II studies will be conducted over that portion of McElroy field in West Texas that is operated by Chevron/Texaco, using data and co-funding provided by the operator. The objective of the research is to combine seismic shearwave (S-wave) imaging with a new microfracture-based analysis technique of oriented sidewall cores to create a next-generation technology for detecting and characterizing subsurface fractures. The seismic component of this research is an approach based on proper separation of SH and SV shear modes in multicomponent 3-D seismic data. This mode-separation model leads to a robust data-processing technology for detecting fractures when S-waves are recorded by 3-D seismic templates. The seismic calibration portion of the research relies on collecting sidewall cores and then observing and classifying microfractures to calibrate fracture-sensitive seismic attributes. The ability to use microfractures is an advantage of this method because large fractures, typically nearly vertical, have spacing that ranges from a few to thousands of feet. The chances of a vertical well bore penetrating large fractures that dominate reservoir behavior are small, whereas microfractures are abundant and can be observed even in sidewall cores.

Exploration Geophysics Laboratory (EGL): Seismic Vector-Wavefield Characterization of Complex Reservoirs

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

Several joint studies with industry sponsors this year resulted in the acquisition of multicomponent seismic data for exploration applications as well as a large amount of multicomponent marine data donated for Gulf of Mexico research. Exploration Geophysics Laboratory (EGL) research also included a study in which a predicted fracture orientation (from converted S-waves) led to the drilling of a confirmation horizontal well. Joining the staff this year was geophysicist Paul E. Murray, previously with PGS (Petroleum Geophysical Services) in Houston, Texas.

The EGL develops technologies, such as seismic field-recording techniques and data-processing and data-interpretation software, to image reservoirs using all components of the seismic wavefield. The goal is independent compressional-wave (P-wave) and shear-wave (S-wave) images of reservoir 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. Past donations by sponsors have enabled the acquisition of 2,000-channel seismic recording systems and access to a fully staffed seismic research crew. These resources are now used to record nine-component, three-dimensional (9C3D) data over test properties. More than 40 mi^2 of 9C3D research data have been recorded across several onshore prospects over the course of the research program.

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 subcontractor 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. During the 71st Annual Meeting of the Society of Exploration Geophysicists (SEG) in San Antonio
in September, seismic industry firm Input/Output (I/O) used the test site to demonstrate new seismic data-acquisition technologies to SEG delegates. During the convention, I/O provided transportation for groups of scientists to visit the site and observe the field demonstrations. I/O demonstrated new vibrator designs, VectorSeis sensors, and integrated cable and radio acquisition systems, as well as a multi-axis Sidewinder vibrator and VectorSeis sensors/cables. 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 non-university individuals, can be found on the Bureau's Website at www.beg.utexas.edu/indassoc/egl.

**Characterizing Marine Gas-Hydrate Reservoirs and Determining Mechanical Properties of Marine Gas-Hydrate Strata with Four-Component Ocean-Bottom-Sensor Seismic Data**

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

A large amount of four-component, ocean-bottom-sensor (4-C OBS) data was provided by Seatel Data to support this research. Shallow subsurface geologic and engineering data across the study site were collected from Devon Energy and Rice University and are being used to calibrate attributes extracted from the 4-C OBS data with shallow petrophysical, stratigraphic, and lithofacies conditions.

This research is based on two concepts: (1) marine gas-hydrate reservoirs can be better characterized with multicomponent seismic data than with single-component seismic data, and (2) the elastic constants, shear moduli, and mechanical stability of strata that comprise and overlie marine gas-hydrate accumulations can be determined in a relative sense when multicomponent seismic data are recorded across gas-hydrate targets.

The advantage of using multicomponent seismic data for evaluating gas-hydrate systems is that the integration of P and S seismic attributes provides more information about sequence relationships, lithofacies distributions, and pore-filler material than does the use of P-wave attributes alone. In addition, the P-wave velocity ($V_p$) and S-wave velocity ($V_s$) associated with a sequence can be used to calculate key elastic constants of the material within that sequence and thereby infer the shear modulus and mechanical strength of the material. Thus a more detailed and informative characterization of marine gas-hydrate systems will result if gas-hydrate targets are described in terms of integrated P and S seismic data rather than just P-wave data, as is conventionally done in marine environments.

**Tops File along Austin Chalk Trend, East Texas**

Paul R. Knox, principal investigator; Kimberly Rogers

The U.S. Geological Survey (USGS) is responsible for assessments of oil and gas resources within the United States. One of the major hydrocarbon-productive trends in Texas is the self-sourcing Upper Cretaceous Austin Chalk trend. This trend stretches from Pearsall field in south Texas to Moncrief field in central Louisiana. The fractured nature of the reservoir has precipitated a horizontal drilling boom since the early to mid-1980’s, being one of the earliest and most significant applications of that new technology. Additionally, progressively deeper targets farther downdip toward the Gulf of Mexico are becoming of increasing interest. Fracturing in the Austin Chalk is enhanced by folding and faulting related to both the Tuscaloosa Fault Zone and a series of Lower Cretaceous reef zones aligned along the Angelina-Caldwell Flexure. These Lower Cretaceous reefal units are of increasing significance in hydrocarbon production themselves and may be involved in future USGS resource assessments.

In support of the USGS assessment effort, we gathered electric logs from approximately 100 deep wells in two core areas of East Texas and identified formation tops for 11 Upper and Lower Cretaceous units. The two areas included (1) Brazos, Grimes, and Madison Counties and (2) Polk, Angelina, Tyler, San Augustine, Sabine, Jasper, and Newton Counties. Formation tops identified included the Upper Cretaceous Navarro, Taylor, Lower Taylor, Austin, Eagle Ford, and Woodbine and the Lower Cretaceous Buda, Edwards, Glen Rose, Sligo, and Hasston. These data, along with supporting information regarding well location and completion information, will be combined by the USGS with similar data from Louisiana to map thicknesses and volumes of the various productive units to support conclusions of risked volumes of in-place and recoverable hydrocarbons. Such estimates are critical to the people of Texas and the United States in that they will invigorate drilling and production in this trend, expanding an important domestic source of oil and gas and generating revenues that will contribute to the local tax base.
State of Texas Advanced Resource Recovery (STARR) Project

Robert G. Loucks and Bob A. Hardage, principal investigators; L. Frank Brown, Jr., Randy L. Remington, Ramón H. Treviño, Luciano L. Correa, and Daniel L. Mendez

During the past 6 years, STARR researchers and oil and gas operators have undertaken reservoir characterization studies and extended development, including the drilling of new wells, recompleting old wells, and developing enhanced recovery programs, for 15 State Lands oil and gas fields. Investigations during 2001 centered on two offshore field areas, Mustang Island Block 889 and Red Fish Bay. The studies integrate geophysical, geological, and engineering data, and advanced sequence stratigraphy concepts help to define stratigraphic architecture and delineate reservoir types. 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 profitable 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. Holitz, and Eugene M. Kim; assisted by Cem O. Kilic, Claudia Rassi, Adrian C. Badescu, Ke-Sheng Chan, Dingshan Zhou, and Ayanna S. Redwood

As the United States moves from an oil-based economy to a natural-gas economy, programs such as Offshore Secondary Gas Recovery (Offshore SGR) continue to play a vital strategic role for the United States. This year, 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 the traditional field boundaries and open up new targets. Stratatal slicing (or proportional slicing) was used to create more coherent amplitude maps for initial identification of several low-sinusity, 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, is charged with identifying new technologies and processes to aid in the recovery of hydrocarbons from known fields. The current project extends 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 is 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. We anticipate that project results will add significantly to current resource assessments in the region and provide operators and interested companies with a road map to success in the GOM on-shelf Miocene.

Application of Advanced Reservoir Characterization, Simulation, and Production Optimization Strategies to Maximize Recovery in Slope and Basin Clastic Reservoirs, West Texas (Delaware Basin)

Shirley P. Dutton, principal investigator

Many mature oil fields in Texas and the nation are nearing the end of primary or secondary production and are in danger of abandonment unless effective, economic methods of enhanced oil recovery (EOR) can be implemented. In a project completed this year, the Bureau of Economic Geology and industry partner Orla Petco, Inc., demonstrated that EOR by CO₂ flooding can increase production from deepwater sandstone reservoirs of the Delaware Mountain Group in West Texas. The project targeted East Ford field in Reeves County, Texas. Primary production had dropped to 30 bbl/d when the CO₂ flood began in July 1995. As a result of the flood, production has increased to more than 185 bbl/d in 2001. The unit had produced 180,097 bbl of oil from the start of tertiary recovery through May 2001, and essentially all production can be attributed to the EOR project.

The project also demonstrated that reservoir characterization provides essential information for designing efficient EOR production strategies. Analysis of the results of the flood suggests that geologic heterogeneities affect reservoir displacement.
operations. The reservoir sandstones are deepwater turbidites deposited by a system of leveed channels having attached lobes and overbank splays. CO$_2$ injector wells in splay sandstones apparently have poor communication with wells in channel sandstones, perhaps because communication is restricted through levee deposits. Modification of the existing east-west alignment of injectors and producers may overcome the problem of apparently restricted communication between splay sandstones and channel sandstones in the north part of the unit. The south part of the unit is responding well to the existing north-south line of injectors. Recovery is interpreted to be good because the reservoir sandstones in this area are lobe deposits having better lateral continuity.

This study was funded by the U.S. Department of Energy as part of the Oil Recovery Field Demonstration Program for Class III (slope and basin clastic) reservoirs. Knowledge gained in the study can be applied to more than 350 other Delaware Mountain Group reservoirs in West Texas and New Mexico, which together contain more than 1.5 Bbbl of remaining oil.

**University Lands Advanced Recovery Initiative (ULARI)**

Stephen C. Ruppel, principal investigator; Stephen E. Laubach, Eugene M. Kim, Julia F. W. Gale, and Robert M. Reed; assisted by Yong-Joon Park and Leonel Gomez

The University Lands program in many ways establishes a new model for technology application. The University of Texas, as royalty owner, provides financial support for the Bureau to partner with oil and gas operators on University-owned lands. The goal of the program is to apply advanced reservoir characterization technology to improve field management strategies and enhance oil and gas recovery. Both the operator and the royalty owner invest in, and benefit from, the results.

In 2001, recovery activities were concentrated in three areas: (1) continued reservoir studies in the fracture-dominated Ellenburger reservoir at Barnhart field in Reagan County; (2) a new study of low-pressure gas resources in the Permian Basin; and (3) preparation for a new reservoir characterization study of Fullerton field, a major carbonate reservoir in Andrews County operated by ExxonMobil. This field is one of many typified by low recovery from carbonate platform rocks. Next year promises to be an exciting one in the ULARI program.

**Evaluation of Tertiary Plays of Eastern Mexico Basins**

Edgar H. Guevara, principal investigator; David C. Jennette, William A. Ambrose, Dallas B. Dunlap, Shirley P. Dutton, Khaled Fouad, Mark H. Holtz, Michael R. Hudec, Martin P.A. Jackson, Shinichi Sakurai, Luis A. Sánchez-Barreda, Steve J. Shi, Suhas Talukdar (consultant), Timothy F. Wawrzyniec, and Joseph S. Yeh; assisted by Ramiro A. Amaya, Luciano L. Correa, Elshayeb Tarek, Javier García, Robert F. Keirstead, Marel A. Sánchez, and Han-Ching Wu

The Bureau is a leader in state-of-the-art basin analysis, which integrates a broad range of data types and vintage to interpret structural, stratigraphic, and play systems in complex sedimentary basins. No project illustrates this modern approach to basin analysis better than the joint Bureau-PEMEX Exploration and Production study of the Mucuspana and Veracruz Basins in Eastern Mexico, which was completed at the end of the year. The gas plays in the Miocene-Pliocene section of the on-land and offshore portions of the basins were defined and assessed during this 20-month project. The multidisciplinary, integrated study provided a regional synthesis of the geological framework, petroleum systems, and petrophysical and engineering characteristics of the basins. The study involved close cooperation and participation of PEMEX management and staff. Topical reports of selected aspects of approaches and results of the study will be jointly published by PEMEX and Bureau scientists.

**Resource Evaluation**

**Deep-Basin Coal (Lignite) in Wilcox Group, Sabine Uplift, East Texas: Potential for Unconventional Coal-Gas Resource Development**

Stephen C. Ruppel, principal investigator; Eugene M. Kim and Susan D. Hovorka; assisted by Yong-Joon Park and Adrien L. Lindley

The goal of this project, which was completed in 2001, was to develop a coal-gas resource database and investigate the potential for coal-gas resource development in the Wilcox Group in the area of the Sabine Uplift in East Texas. Coal occurrence and lithofacies maps for the region were digitized and converted into a GIS (geographic information system) format for inclusion in the U.S. Geological Survey National Coal Resources Data System. These data enable prediction of coal seam thickness,
geometry, and continuity and therefore make it possible to define possible areas of coalbed methane production. These data indicate that the highest potential for production of coalbed methane exists in lower Wilcox coal seams of Panola and Shelby Counties. The project is part of an ongoing cooperative effort with the U.S. Geological Survey to develop a better basis for calculating and defining the coalbed methane potential in the United States. Exploitation of coalbed resources for methane generation is an environmentally friendly alternative to coal mining and combustion. This research will provide the Texas natural gas and coal industry with baseline information and may stimulate a new coalbed methane industry in the state.

ENVIRONMENT

Environmental research at the Bureau covers projects dealing with water resources, environmental quality, coastal processes, near-surface geophysics, and geological and terrain mapping.

WATER RESOURCES

Conversion of Panhandle Water Planning Area Ogallala Aquifer Model to GAM Standards

Alan R. Dutton, principal investigator;
Robert C. Reedy; assisted by Thet Naing

This project during 2001 made additional simulations of the Ogallala aquifer in the northern part of the Texas Panhandle to forecast groundwater levels under future drought conditions. The changes upgraded a computer model of the Ogallala aquifer prepared during 1999-2000 for the Panhandle Regional Water Planning Area (PWPA) as part of the regional water planning process set up under Senate Bill 1 (75th Texas Legislative Session). We also improved model calibration and provided further information and documentation of the PWPA Ogallala Aquifer Model. The new model is consistent with specifications set up by the Texas Water Development Board (TWDB) for the Groundwater Availability Modeling (GAM) Program for major aquifers in Texas.

Evaluation of Interplaya Recharge on the Southern High Plains

Bridget R. Scanlon, principal investigator;
Robert C. Reedy; assisted by Jinhuo Liang

The goal of this monitoring program is to evaluate infiltration in response to precipitation events in an interplaya setting. For the past few years, we have evaluated data gathered from an interplaya setting adjacent to Playa 5 and from the interplaya recharge monitoring installation at the Panex Plant in the High Plains of the Texas Panhandle, 17 mi northeast of Amarillo. Monitoring adjacent to Playa 5 has been ongoing since 1994 and at the Panex Plant since October 1998. The results of the monitoring program indicate that water currently penetrates readily to depths of 1.7 m in response to rainfall events. Monitoring results from thermo-couple psychrometers during 2001 suggested that preferential flow was occurring. To further evaluate this process, heat dissipation sensors were installed in November 2001, and these data indicated that the soils at depth were dry. Upward water potential gradients at depth suggest an upward driving force for water movement.

We are using the code HYDRUS-1D to evaluate the time scales represented by the water potential data and to determine if water may have been moving upward for thousands of years. Simulation results from this site are being compared with results from simulations of sites in the Chihuahuan Desert in West Texas and other arid settings. If water has been moving upward for a long time, then chloride would have to move downward by diffusion. Uncertainties in estimates of diffusive chloride fluxes are also being examined. The monitoring and modeling studies are important for evaluation of potential contaminant transport in interplaya settings.

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. Groundwater banking, or artificial recharge of groundwater, is used in many states such as California and Arizona for water management. In many cases, infiltration basins are constructed adjacent to surface-water bodies, and during times of excess surface runoff, water is diverted to the infiltration basin to increase recharge of the
underlying aquifer. This water is then available for later use. The Bureau’s involvement in this project includes a preliminary screening analysis to exclude aquifers that are currently rejecting recharge (that is, gaining streams), aquifers having low storage capacity (shallow water tables), and areas where surface-water or groundwater quality is poor. We will also be involved in evaluation of suitable unsaturated zones for infiltration basins. The results of this study will delineate surface-water bodies and aquifers in the state suitable for groundwater banking.


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

This study develops the aquifer database for an improved computer model of groundwater flow in the San Antonio segment of the Edwards aquifer. The Edwards aquifer is the major source of water for more than 1.5 million people in the San Antonio area and provides nearly all of the water used in the region for industrial, military, irrigation, and public supplies. Furthermore, accelerating withdrawals of groundwater are a threat to spring flow at Comal and San Marcos Springs. Both springs supply water to meet downstream needs, sustain Federally listed endangered species, and support local economies through tourism. 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 ensuring that the graphics-rich output is understandable to nonscientists.

Edwards Aquifer Fracture/Conduit Study

Susan D. Hovorka, principal investigator; Bridget R. Scanlon; assisted by Adrien L. Lindley

In this study, we will integrate and analyze a number of existing and in-collection data sets with a goal of improving the conceptual model of structurally influenced karst flow in the critical and complex recharge zone of the Edwards aquifer. The large amount of recently collected data provides a timely opportunity for an integrated study in the recharge zone. This study will capitalize on funds and efforts already expended and in turn will guide ongoing and future research.

Critical management questions that would be better handled using an improved conceptual model of flow in the recharge zone include (1) siting criteria for recharge structures, (2) potential for water storage in the recharge zone, (3) best assumptions for modeling of temporal and spatial relationships between recharge and water levels in the confined aquifer and springs, (4) effective processes for water quality protection via modifying land use, and (5) best assumptions for flowpaths in contaminant-release scenarios.

We are focusing on supporting, disproving, or qualifying the following testable hypotheses: (1) karst conduits are strongly controlled by structures such as fracture zones and fault displacements of the aquifer, (2) conduits are best developed and most active beneath streams, (3) conduits preferentially developed in some stratigraphic horizons within the Edwards Group, and (4) representative numerical characteristics for flow be can be developed for regions or domains of the aquifer. Methods include examination and cross-comparison of these data sets: (1) structure maps, (2) cave maps, (3) hydrographs (stream, well, and spring), (4) water levels, and (5) natural, contaminant, and introduced tracers.

Barton Springs Model Update to GAM Standards

Bridget R. Scanlon, principal investigator

This project involved updating the previously developed groundwater model of the Barton Springs segment of the Edwards aquifer to Groundwater Availability Modeling (GAM) standards. The Bureau, in collaboration with the Barton Springs Edwards Aquifer Conservation District, was primarily responsible for training District personnel on the various aspects of the model, assisting in improving the model calibration, and writing the report for the study. Calibration of the original model was improved using inverse modeling with UCODE. The results of this study demonstrated the sensitivity of spring discharge to groundwater recharge and suggest that future management of the aquifer should consider some form of enhanced recharge to provide water during potential drought periods.
Groundwater Recharge in Texas
Bridget R. Scanlon, principal investigator;
Alan R. Dutton, Marios Sophocleous, and
Samuel Perkins (Kansas State Geological Survey)

During 2001, in collaboration with the Kansas State Geological Survey, a database of existing information on recharge rates for each of the major aquifers in the State of Texas was developed. Various approaches for simulating recharge in groundwater models were evaluated, and conceptual models for recharge were described. Most aquifers, however, require additional studies to better quantify recharge. These data were presented in a report submitted to the Texas Water Development Board, together with proposals for techniques for quantifying recharge in each of the major aquifers. Accurate estimates of groundwater recharge are critical for water resources management because of diminishing supplies and projected rapid increases in population.

Environmental Quality

Optimal Geological Environments for Carbon Dioxide Disposal in Brine-Bearing Formations in the United States
Susan D. Hovorka, principal investigator; Paul R. Knox

In this year we followed up our Phase II results by developing a proposal for a CO2 field injection experiment in a brine-bearing, nonproductive Frio sandstone. Phase II results showed that the upper Texas Gulf Coast is both an area of high need for CO2 sequestration, because of the large volumes of CO2 produced from diverse sources, and an area of high potential for sequestration, because of large volumes of well-characterized, high-porosity, high-permeability sandstone and abundant reservoir seals. We proposed a Phase III experiment in 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. This experimental site is proposed as an ideal environment for validation of monitoring and modeling because it is representative of the available very large volumes of high-permeability rock that would be used if geologic sequestration were employed for greenhouse gas reduction.

CO2 Sequestration in Saline Formations
Susan D. Hovorka, principal investigator; Paul R. Knox

For this collaborative project with Lawrence Berkeley National Laboratory we used a geostatistical approach to create realistic but low-cost realizations of sedimentological heterogeneities in the Frio of the Upper Gulf Coast to support numerical modeling of CO2 sequestration at a field scale. These simulations were then used to document the impact of heterogeneity on CO2 storage capacity. Although fine-grained interbeds in a typical fluvial-deltaic system reduce porosity, modeling showed that baffles to buoyant vertical migration of CO2 produced by discontinuous stratigraphic barriers will improve dispersal of the CO2 through the rock volume. Heterogeneity therefore increases the short-term storage capacity of an injection horizon. We also used the geologically constrained simulation to estimate the CO2 injection volumes and rates needed to achieve concentrations required for proposed field experiments at a Frio brine sequestration site.

The geostatistical approach developed included (1) mapping representative facies geometries and orientations for the model area using a detailed facies study from nearby reservoirs and regional trends, (2) using these maps to create 10 stochastic 3-D realizations from each idealized facies map using TProGS (Transition Probability Geostatistics) software, and stacking geologically likely combinations of the realizations to form field-scale reservoir models. Other modeling parameters were selected through examination of reservoir characteristics in similar facies in adjacent reservoirs.

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 Neuschwander (Center for Space Research, The University of Texas at Austin); Frank Judd (co-principal investigator) and Robert Lonard (The University of Texas-Pan American); Gene Paul (co-principal investigator) (The University of Texas at Brownsville)

During 2001, progress was made in the areas of current land-use mapping, vegetation surveys, remote data classification, data acquisition, geographic information system (GIS) development, and analysis/modeling in the GIS environment. In addition, historical distribution patterns of riparian vegetation and the location and magnitude of losses were digitized and analyzed using early-1900 U.S. Geological Survey topographic maps.

This ongoing assessment of southwestern U.S. riparian ecosystems along the Lower Rio Grande

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Bureau of Economic Geology
Valley of Texas and Mexico is supported by a grant from the U.S. Environmental Protection Agency’s Science to Achieve Results program. Researchers work 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 if 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.

GIS is being used to examine links between riparian ecology and parameters such as geology, topography, soils, water quality, hydrology, and land cover/land use.

Support of the State Energy Conservation Office in Environmental Oversight of the U.S. Department of Energy Pantex Plant

Alan R. Dutton and Bridget R. Scanlon, co-principal investigators, Robert C. Reedy

During 2001 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. We are using these data to determine the potential for upward water movement below this soil zone in several interplaya settings for use in an environmental review and design of an engineered cover for the landfill at the Pantex site.

Kelly Air Force Base

Susan D. Hovorka, principal investigator; Edward W. Collins and Jeffrey G. Paine; assisted by Adrien L. Lindley

This project will undertake an 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 (AFB) via faults and wells. Contamination of a deeper aquifer from a shallow aquifer is a significant and well-known risk in some hydrologic settings. Such cross-contamination has serious implications for groundwater use because not only is the shallow water supply lost but the deeper one is degraded. The Edwards aquifer, which is highly transmissive and serves as a water supply for many users and provides a habitat for endangered species, should be provided high-quality protection from risk of such degradation.

We propose to assess the possible contaminant loading of the Edwards aquifer that could occur as a result of flux of dissolved phase contamination from the shallow alluvial aquifer in the vicinity of Kelly AFB to the Edwards. We will focus on the hypotheses (1) that unidentified and improperly cased wells might permit downward contaminant movement and (2) that faults and associated fracture systems may be capable of transmitting fluids downward. We will test these hypotheses beneath the contaminant plume in the shallow aquifer using data sets collected as part of the environmental assessment near Kelly AFB and the extensive existing data sets that describe the Edwards aquifer and San Antonio area geology. In addition, we will acquire historical material and do limited field tests to determine the feasibility of using geophysical methods to identify well bores.

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

Alan R. Dutton, principal investigator; H. Seay Nance, Rebecca C. Smyth

Data on the number, acreage, and volume of waste 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. The study is sponsored by the U.S. Department of Energy, National Energy Technology Laboratory. The American Petroleum Institute has contributed a matching grant, and the Ground-Water Protection Council is providing in-kind services. 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. Some operators of centralized and commercial disposal facilities revamped their
operations to come into compliance with new regulations, and other operators chose to close their sites. In addition, some sites have been abandoned and have become State responsibility for closure. The legacy of abandoned sites includes uncertainty as to the quantity and character of possible contaminants in spent drilling mud and the possibility of soil and groundwater contamination. A preliminary count suggests there may be at least 80 abandoned drilling-fluid disposal sites in these four states. 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. Cleanup of abandoned sites generally is the jurisdiction of State-funded programs administered by regulatory agencies.

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

Bridget R. Scanlon, principal investigator;
Robert C. Reedy, 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, as 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 2001, with the conclusion that neutron probe logging and heat dissipation sensors are much more reliable than time-domain reflectometry and thermocouple psychrometry.

Engineered covers are used to minimize the seepage of water into current and future solid- and hazardous-waste disposal facilities and to minimize contamination at sites where remediation is not feasible. This study, funded by the U.S. Environmental Protection Agency, analyzes different monitoring strategies and numerical models in order to evaluate the long-term performance of engineered covers of various design. Bureau researchers use monitoring data from engineered covers installed in the Chihuahuan Desert of Texas. These results are compared with results from the Nevada Test Site and the Idaho National Environmental and Engineering Laboratory. Optimal project results depend upon the collaborative efforts of researchers involved in writing codes, monitoring field sites, and analyzing data.

**Plume Research Group: Integrated Regional, Site-Specific, and Theoretical Studies of Groundwater Contaminant Plumes**

Bridget R. Scanlon, principal investigator;
assisted by Susan Palachek

During 2001, detailed analysis of MTBE behavior was conducted using data from Harris County, Texas. These behaviors were compared with behaviors of hydrocarbon compounds such as benzene, toluene, ethylbenzene, and xylene (BTEX), and with that of the total petroleum hydrocarbons (TPH). The data set consisted of 31 sites, 261 wells, and 1,065 samples for a 5-year time period (June 1991 to June 1996). Preliminary results of this study indicate that MTBE is not highly correlated with BTEX or TPH. The time-series analysis was conducted to evaluate natural attenuation of MTBE; however, lack of continuous samples from monitoring wells and incomplete analysis of all samples rendered the results inconclusive. Current studies are focusing on data from 1998 to the present because of much-improved sampling and analysis protocols.

**Edwards Aquifer Protection Program Geologic Assessment**

Susan D. Hovorka, principal investigator

In this project we used karst literature, interviews and field visits, and data examination to redesign the forms and instructions used by the Texas Natural Resource Conservation Commission (TNRCC) for protection of karst recharge features above the Edwards aquifer. The goal of this project is to improve the effectiveness without compromising the efficiency of the process used to identify karst features that may be sensitive to water-quality degradation during and after development.

We proposed several changes to the process, including streamlining the field classification scheme, increasing the emphasis on matching appropriate engineering responses to sensitive features, better defining the criteria on which to evaluate relative infiltration rate, and considering the terminology used and data commonly collected to comply with requirements of other regulatory agencies. We made the instructions more complete
and added a glossary. Field validation of the redesigned method will be undertaken as a follow-on study.

Impact of Reservoir Production Characteristics on Subsidence
Fred P. Wang, principal investigator

Phase 1 of this study, funded by the U.S. Geological Survey, was completed in September. Phase II is now under way. The goal of this study is to evaluate the effects that production and depressurization of oil and gas fields in coastal southeast Texas have on land subsidence and fault activation. The study includes a review of existing reservoir data and the construction of a database. Data input include pressure decline data, cumulative formation fluid production and injection, production and injection rate information, pay-zone depth, thickness, average porosity, and secondary recovery history.

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

The Bureau of Economic Geology and Center for Space Research have conducted preliminary evaluations of newly acquired imagery of Belize, Central America, that are supporting the development and application of advanced imaging technologies. Preliminary evaluation of the multispectral Advanced Land Imager (ALI) indicates that classification results were similar but superior to Landsat 7 ETM+ for several difficult classes in test data. The imagery is from the National Aeronautics and Space Administration’s (NASA’s) Earth Observing-1 (EO-1) satellite that was launched in November 2000 from Vandenberg Air Force Base. The new satellite has three technologically advanced imagers on board that are being investigated to determine their capabilities in imaging the Earth’s surface. We are analyzing the imagery in Belize, where we have previously conducted remote sensing studies in cooperation with the Government of Belize. The investigation includes comparing multispectral, panchromatic, and hyperspectral data from EO-1 sensors to Landsat 7 ETM+ data in two areas of Belize where we have analyzed land cover/land use and deforestation using Landsat TM data. At least 14 land cover/land use classes, comprising 6 classes of forests and savannah, 5 classes of wetlands and coastal lands, and 3 classes of developed land, are being classified in central and southern Belize. We are also evaluating the new sensors in terms of accurate classification of specific types of agricultural land, such as citrus orchards, and certain forest classes, including broad-leaf forest regrowth areas, pine forests, and mangroves. In addition, status and trends in land use and deforestation since 1994 will be determined through spatial and temporal analyses of classified imagery.

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 with GPS coordinates. Expected results include a detailed evaluation and validation of the capabilities of EO-1 and Landsat 7 ETM+ data for (1) classifying a diverse set of land cover/land use types and (2) analyzing trends such as rates of deforestation and regrowth. Remote sensing data are important in mapping and managing the natural resources in poorly accessible, environmentally sensitive areas such as in Central America.

This project is a 2-year investigation funded through NASA’s EO-1 program. The work is being conducted in cooperation with the Land Information Centre and Forest Department, Belize Ministry of Natural Resources and the Environment. The Government of Belize has a long-term commitment to the use of optical remote sensing technologies for mapping land cover and land use.

Coastal Processes

The Texas Shoreline Change Project
James C. Gibeaut, principal investigator; William A. White, Rachel L. Waldinger, Tiffany L. Hepner, Thomas A. Tremblay, Roberto Gutierrez, John R. Andrews, Rebecca C. Smyth, and Jerome A. Bellian; assisted by Douglas S. Sassen, Liying Xu, and Haiyan E. Yang

During 2000 and 2001, the Bureau conducted detailed topographic surveys of the Gulf of Mexico
beaches and dunes using airborne light detection and ranging (lidar) surveys, providing accurate and continuous models for beach-erosion assessments. These data will now be compared with shorelines mapped from historical vertical aerial photographs to help document rates of shoreline change. For the bay systems, shoreline positions were updated using 1990’s-vintage digital orthophotos. Ground surveys of two bay shorelines, Corpus Christi and Baffin Bays, were completed and supplement the aerial photograph study.

Texas Shoreline Change Project (TSCP) research is conducted per the Coastal Erosion Planning and Response Act (CEPRA), which authorized the General Land Office of Texas to conduct a coastal-erosion response 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 their research and creating a comprehensive, digital database of historical shoreline positions and average annual rates of shoreline change that will be made available to the public through the Internet. 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.

Surveys and Analysis for the 2001 Exxon Valdez Oil Spill Shoreline Survey

James C. Gibeaut, principal investigator, Tiffany L. Hepner

During May 2001 Bureau coastal geologists surveyed beaches in Prince William Sound (PWS), Alaska, for oil left from the 1989 Exxon Valdez oil spill. The Bureau is working with biologists and chemists from Auke Bay Laboratory of the National Marine Fisheries Service in a study funded by the Exxon Valdez Oil Spill Trustee Council (Council) to determine the amount of oil remaining on the beaches of PWS.

Twenty-three sites were surveyed, and Exxon Valdez oil was found at all but one site. The oil commonly remains on gravel beaches either as an asphalt pavement on the surface or as more fluid oil in the subsurface. The data will be analyzed to determine trends of oil reduction and character through time and to relate these trends to geomorphic and sedimentologic settings. This research is a follow-up to a study conducted by Gibeaut in 1993 and published by the Council in 1998. The 1993 study, which involved more sites within PWS, serves as a significant point of reference for residual Exxon Valdez oil in the PWS intertidal zone.

GIS for Sand Resources of Sabine and Heald Banks and the State of Beach Erosion in Southeast Texas

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

Shoreline retreat along the Texas southeast coast has prompted interest in finding sources of sand for beach nourishment projects. In 2001, 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 to 1995 to collect and analyze data pertaining to Sabine and Heald Banks. During 2001, the renewed cooperative incorporated those earlier acquired data into a geographic information system (GIS) for distribution on a CD-ROM. A Web-based GIS site using ArcMS software was also developed and is currently served on the Bureau’s Internet site. Data and documentation may be viewed and downloaded from the Website. In addition to the geological data, GIS layers of obstructions to potential sand mining operations, such as oil platforms, pipelines, shipwrecks, and navigation channels were added. Shoreline data acquired by the Bureau’s lidar system in May 2000 were also analyzed during 2001 and integrated with historical shoreline data sets that the Bureau maintains to compute short- and long-term shoreline change rates. A separate ArcMS Website that contains historical shorelines and a beach profile database was also developed and maintained.

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. This retreat has recently received increased attention 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 with 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 unnaturally narrow and steepen and the adjacent shorelines to retreat at a higher rate 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, funded by the Texas Coastal Management Program, is collecting and analyzing a time series of data to determine the efficacy of the geotubes. Three ground surveys and an airborne lidar survey were conducted during the year, and surveys will continue next year. 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.

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 very 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.

Down to Earth at Mustang Island

Jay A. Raney, principal investigator; William A. White

This project will produce an attractively illustrated public guide to Mustang Island, Texas. Years of coastal research by Bureau scientists provide the basis for this addition to the Bureau’s popular “Down to Earth” series of publications designed to provide good science to the general public in an easily read and amply illustrated format. Mustang Island is a frequently visited 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 the physical setting and the 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.

The draft text and more than 100 illustrations are in review, and the final publication will be available in 2002. 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.

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

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

Among the significant findings of this investigation during the past year is a major active surface fault traceable for more than 5 km across Matagorda Peninsula. The fault 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 the fault.

This research, funded by the National Oceanic and Atmospheric Administration through the Coastal Management Program and administered by the General Land Office of Texas, seeks to determine the status and trends—and the probable causes—of coastal wetlands on barrier islands in the Matagorda Bay system along the central Texas coast. The wetlands, including marshes, are part of a highly productive ecosystem on which a variety of flora and fauna depend.

Maps, historical and recent aerial photographs, and field surveys are used to analyze spatial and temporal changes in the marshes, mangroves, tidal flats, and water bodies on barrier islands and peninsulas stretching from Matagorda Bay to Mesquite Bay. Digital imagery to be acquired in early 2002 will be used to determine the current status of the research area. Previous Bureau studies document substantial losses resulting from subsidence and associated relative sea-level rise. Some of these losses have occurred along surface faults.
that have become active as a result of underground fluid production. Such losses have occurred in some areas on the Matagorda barriers, yet in other areas, gains have occurred as marsh vegetation spreads over wind-tidal flats.

**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. 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. Users can make custom maps and data queries on-line. All GIS data may also be downloaded.

**Near-Surface Geophysics**

**Assessing Lacy Creek Salinization Using Airborne Geophysics**

Jeffrey G. Paine, principal investigator

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

The high-resolution airborne survey covered an area of 100 km² with a flight-line spacing of 100 m and is providing electrical conductivity measurements of the ground to a depth of about 300 m. These data are being used to delineate the lateral extent and intensity of salinization in the area, to determine whether Lacy Creek is being affected by salinization, and, if so, to identify possible sources of salinization. The project is scheduled to be completed in March 2002.

**Establishing Acceptable Ground Motion at the Texas Department of Agriculture Metrology Laboratory**

Jeffrey G. Paine, principal investigator

The Texas Department of Agriculture is responsible for the calibration of commercial weights, volumes, and measures for the State of Texas. Among other things, they certify flow rates of gasoline pumps and the accuracy of scales in supermarkets. Their current calibration facility (the Metrology Laboratory) is located in Austin, where urban activities generate seismic noise that commonly renders their most sensitive instruments unusable. Bureau researchers are measuring ground-motion characteristics of their current laboratory and helping to establish acceptable levels of ground motion for a new calibration laboratory.

Commercial vibration monitoring systems, based on electromagnetic geophone technology and used primarily for blast monitoring, are not capable of accurately measuring the low-level vibrations that disrupt calibration activities at the laboratory. The Bureau is designing and constructing an accelerometer-based, three-component instrument for indoor/outdoor use to help compare vibration characteristics at the current and proposed laboratory sites. These portable instruments will show how vibration intensity diminishes with distance from the source at each site. These data will be used to help select the best site for a new laboratory and to establish design criteria for the new buildings that will be constructed in 2002.

**Mapping Near-Surface Salinization Using Long-Wavelength AIRSAR**

Jeffrey G. Paine, principal investigator

In this multiyear study, which began in August 1998 and ends in July 2002, we are exploring 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 is sensitive to the electrical properties of the ground, and because the electrical conductivity of soil and water greatly increases with salinity, we are attempting to use airborne radar as a screening tool to identify salinization. We expect radar reflectance to be influenced by ground conductivity (particularly at the longer wavelengths)
and expect some degree of correlation between radar reflectance images at these wavelengths with ground conductivity images recorded during our previous studies of these test areas. The National Aeronautics and Space Administration (NASA) has collected and processed AIRSAR data in two test areas: (1) within the Colorado River watershed near San Angelo in West Texas (Runnels Test Site), where a 1996 high-resolution 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 (Montague Test Site), where a 1997 airborne geophysical study of salt-impacted agricultural lands revealed oilfield-related salinization extending over many square kilometers.

**Training for Seismic Refraction Instrument to Determine Bedrock Depth beneath Roads**

Jeffrey G. Paine, principal investigator

The Texas Department of Transportation (TxDOT) employs 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 are training 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. Tests and training sessions are being conducted at sites around the state, including Austin, San Antonio, Fort Stockton, and Abilene.

**GEOLOGICAL AND TERRAIN MAPPING**

**Geologic Mapping of Urban Corridors and Critical Aquifers of Texas**

Jay A. Raney, principal investigator; Edward W. Collins

During 2001, geologic mapping focused on the critical aquifers and urban growth corridors of Central Texas, including the Carrizo-Wilcox aquifer and the corridor east of Austin; the northern segment of the Edwards aquifer that coincides with the corridor north of Austin; the urban corridor west of Austin and the Hill Country Trinity aquifer; and the San Antonio segment of the Edwards aquifer west of San Antonio. Study of these areas has improved the understanding of deposits that host the major groundwater resources.

The **Geologic Map of the Central Hueco Bolson, Acala–Fort Hancock–Esperanza Region, Texas**, to be published by the Bureau in 2002, illustrates the surficial and bedrock geology of a large area of the Texas-Mexico border region southeast of El Paso. This mapping program is funded by the U.S. Geological Survey National Cooperative Geologic Mapping and Texas STATEMAP programs for the production of geologic maps to augment the Texas and national geologic database. The maps are used by scientists and the public to study and address issues related to urban growth, land use and Earth resources, water quality, groundwater management, construction practices, and engineering properties of near-surface materials.

**High-Resolution Elevation Data Capture and Analysis for Honduras**

James C. Gibeaut, principal investigator; Roberto Gutierrez, Rebecca C. Smyth, John R. Andrews, Jerome A. Bellian, and Andrew G. Warne

The purpose of this project, funded by the U.S. Geological Survey (USGS) and completed during 2001, was to conduct airborne light detection and ranging (lidar) surveys of 15 selected sites in Honduras for use in flood hazard assessments. This project was part of an effort by the United States to help Honduras recover from the devastation caused by Hurricane Mitch in 1998. Lidar surveys were successfully conducted and 1.5 m × 1.5 m digital elevation models (DEM) were constructed of the survey areas. The Bureau worked with USGS hydrogeologists in applying the DEM’s and river channel cross sections extracted from the lidar data to flood modeling. In addition, the Bureau provided geodetic Global Positioning System (GPS) surveying support to the USGS for bridge surveys.

**High-Resolution Lidar Digital Elevation Models for Applications Development**

Melba M. Crawford (Center for Space Research, The University of Texas at Austin), James C. Gibeaut, principal investigators; Roberto Gutierrez, Rebecca C. Smyth, John R. Andrews, Tiffany L. Hepner, Amy Neuenschwander (Center for Space Research, The University of Texas at Austin); assisted by Rachel L. Waldinger and Christopher Weed (Center for Space Research, The University of Texas at Austin)

Light detection and ranging (lidar) is a new technology for acquiring accurate and detailed topography of the Earth’s surface, vegetation cover, buildings, and infrastructure. Lidar instruments combine a scanning laser, a device that records aircraft motion, and high-accuracy Global Positioning System (GPS) receivers to obtain vertical
accuracy of 8 to 15 cm and data-point spacing of less than 1 m. This project, which is designed to develop the application of lidar data, is funded by the National Aeronautics and Space Administration (NASA) through the Raytheon Corporation. The Bureau is working with the Center for Space Research of The University of Texas at Austin to acquire and process lidar data of Port Ingleside, Texas, on the margins of Corpus Christi Bay, and downtown Austin, Texas. The Bureau’s state-of-the-art Optech model ALTM 1225 lidar instrument was installed in a Cessna single-engine aircraft operated by the Texas State Aircraft Pooling Board. The lidar instrument scans a laser across the ground to collect a swath of data during the flight. The areas were flown at a relatively low altitude of 2,500 ft above ground level. Adjacent data swaths overlapped, and each area was flown twice in a grid pattern. The results are highly detailed and accurate topographic data sets.

Lidar point data are being processed into 1 m × 1 m digital elevation models (DEM). Algorithms for this processing are being developed and tested as well as algorithms for classifying each laser data point as reflecting from either the ground, vegetation, or buildings. The Austin data set is of an urban area with the Colorado River and many creeks. This DEM will be tested with urban flood models. The ability to remove vegetation from DEM’s but keep buildings that substantially affect water flow is being addressed using the Austin data. Port Ingleside is in a low-lying coastal area with new and proposed housing developments. The topography of the Texas coastal zone is very subtle with natural relief of only a few meters on the barrier islands and across the broad plains and wetlands bordering the coastal bays. The coast is also subject to tropical cyclones that can cause storm surges of as much as 4 m and heavy rainfall. Episodic rainfall and storm surges combined with low relief can cause broad areas to be flooded. Because of the low relief, changes in water level of just 0.5 m can drastically change the amount of flooded land. For these reasons, more accurate and detailed topography than what is currently available is needed to improve flood-zone maps. The lidar DEM will be used with storm-surge models to see how predicted flood zones shift with the more accurate topographic data.

**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 Describing Reservoir Characterization Technology

Bob A. Hardage, principal investigator;
Scott D. Rodgers, John R. Andrews,
Kerza A. Prewitt, and Lisa E. Remington

In 2001, the Bureau continued its collaboration with the American Geological Institute (AGI) to develop educational, Web-based reservoir characterization modules by preparing the modules for distribution through AGI and the American Association of Petroleum Geologists. The modules, structured around real data sets, illustrate the principles of reservoir characterization for fluvial depositional environments. These interactive, game-theory-based modules will allow students to interact with geological, geophysical, and engineering data; make data interpretations; and then receive instruction, depending on the correctness of their answers.

Earth Science Week

Sigrid J. Clift and Scott W. Tinker

Earth Science Week (ESW) was observed nationwide October 7-13, and the Bureau celebrated by sponsoring an earth science Book Drive that collected $3,100 for the Austin Public Library and by hosting the 2nd Annual Career Day Fair. The Austin ESW Career Day Fair, organized by Bureau researcher and Austin ESW Chairperson Sigrid J. Clift and members of the Austin area ESW Consortium, treated 600 Austin-area middle school students to a day of learning about earth science careers from earth science professionals. To find out more about ESW in Austin and in cities throughout Texas, visit the Texas ESW Website at www.beg.utexas.edu/esw.

Petroleum Technology Transfer Council (PTTC)

Scott W. Tinker, RLO Director, and Sigrid J. Clift, RLO Assistant Director; Sylvia J. Jennette, Eric C. Potter,
Amanda R. Masterson, Zachary M. Rogers, and Robert Andrews

The PTTC Texas Region, for which the Bureau serves as Regional Lead Organization, sponsored a variety of workshops for Texas independent producers during 2001: Predicting Reservoir Quality Using Diagenetic Models, Well-Bore Management, Putting the Internet to Work, Optimized Horizontal Well Technology, Field-Oriented Projects for Independents, and Cross-Section-Generation Computer Workshops. The Texas Region also publishes the quarterly newsletter ProducerNews, which is distributed to nearly 1,000 independent oil and gas producers by e-mail and regular mail.

National Geoscience Data Repository System (NGDRS)

Douglas C. Ratcliff, principal investigator

The Bureau provides assistance to the American Geological Institute (AGI) for work related to the National Geoscience Data Repository System (NGDRS). NGDRS is an effort by AGI to properly store and archive geologic materials ranging from rocks to digital data. The Bureau’s Core Research Center and Geophysical Log Facility have been primary focus points for the NGDRS, and data from these entities have been used to establish an on-line information system known as GeoTrek. During 2001, the Geophysical Log Facility added 44,714 geophysical logs to the database with assistance from AGI.

Using GIS Technology to Explore Earth Systems

Susan D. Hovorka, principal investigator;
John R. Andrews; assisted by Adrien L. Lindley

During this year we continued compilation of geographic information system (GIS) data sets for student use. The Bureau participated in a partnership led by ActiveInk Corporation and Fabens Independent School District to supply participating public school districts with Web-based interactive projects funded by a Technology Integrated into Education grant. We added six areas to the GIS data sets completed last year. Each area includes a digital geologic map, satellite images, shaded relief maps, soil characteristics, land use/land cover, vegetation, and cultural features to encourage the students to explore for relationships among data sets.
The 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.

The TCMP, in its fifth year of operation, receives funding from TCMP, Conoco, and the Exxon Foundation. The participating schools are Ball (5 years in the program), Port Isabel, and Port Aransas (3 years in the program) High Schools. During the 2000-2001 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/.

Virtual Oil Well—An AGI-Funded K-12 Outreach

Scott D. Rodgers, principal investigator;
Susan D. Hovorka, Bob A. Hardage, and Hongliu Zeng

The Virtual Oil Well is a collaborative effort funded by the American Geological Institute to explore the use of interactive Internet game-based activities to teach important earth science concepts. The Virtual Oil Well is designed to educate players about the essential problems and processes of oil and gas exploration and development. The “game” will allow players to acquire knowledge in a virtual library, and “spend” their resources to explore, “contract” for assistance, make critical decisions, and observe the results. Website mechanics are based around a 3-D data/decision cube that is programmed in Java. Work to date has been focused on the development of game scenarios, data development, and program mechanics. Continuing work includes graphical user interface design and Website production. This K-12 outreach project is near completion and will go on-line in early 2002.

Energy Posters for High School Earth Science Curricula

Stephen C. Ruppel, principal investigator;
assisted by Thomas A. Tremblay

The goal of this project, which was completed in 2001, was to compile data on energy production and usage in the United States that could be used by high school teachers as a basis for more innovative and data-based instructional programs in the earth sciences. Each of the two posters produced contains maps, graphs, and charts illustrating historical and recent patterns of energy production, sources, and consumption in the United States. Data are grouped into nonrenewable (petroleum, coal, and nuclear) and renewable (wind, biomass, solar, and hydrothermal) sources of energy. Accompanying the posters is a CD-ROM containing source data in an ARC/INFO format for easy access and usage by earth science educators. The project was funded by the American Geological Institute (AGI).
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 2001, the following 101 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.

“Application of Advanced Reservoir Characterization, Simulation and Production Optimization Strategies to Maximize Recovery in Slope and Basin Clastic Reservoirs, West Texas (Delaware Basin)”: supported by the U.S. Department of Energy.


“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.

“Field Training and Consultation for the 2001 Exxon Valdez Oil Spill Shoreline Survey”: supported by the Auke Bay Laboratory, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.


“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.
“An Investigation to Document Reservoirs That Can Be Better Detected with Seismic 5 Waves Than with Seismic P Waves”: supported by the U.S. Department of Energy through Visors Energy Corporation.

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

“Multidisciplinary Imaging Rock Properties in Carbonate Reservoirs for Flow Unit Targeting”: 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 Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-Arid Environments”: supported by the U.S. Environmental Protection Agency.

“Review of Documents and Dissemination of Environmental Geologic Information Related to Environmental Restoration at the U.S. Department of Energy’s Pantex Plant, Carson County, Texas”: supported by the Office of the Governor of the State of Texas (two contracts).

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


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


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

“Conversion of Panhandle Water Planning Area Opallala Aquifer Model to GAM Standards”: supported by the Texas Water Development Board through the Panhandle Regional Planning Commission.

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

“Edwards Aquifer Protection Program Geologic Assessment”: supported by the Texas Natural Resource Conservation Commission.

“Enhanced Recharge in Halle County, Texas”: supported by the Texas Water Development Board.

“Establishing Acceptable Ground Motion at the TDMA Metrology Laboratory”: supported by the Texas Department of Agriculture.

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

“Evaluation of Beach Nourishment Sand Resources along the East Texas Coast”: 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 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.

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**STATE AND LOCAL**

“Archeological Projects – Assistance to the Texas Department of Transportation”: supported by the Texas Department of Transportation (two contracts).

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

“Assistance to the Texas General Land Office”: supported by the Texas General Land Office.

“Barton Springs Model Update to Groundwater Availability Modeling (GAM) Standards”: supported by the Texas Water Development Board through the Lower Colorado River Authority.

“Capacity Building for Resource Assessment and Responsible Development, Trans-Mexico Border”: supported by the Texas Higher Education Coordinating Board.

“Coastal Hazards Atlas of Texas (two volumes): A Tool for Hurricane Preparedness and Coastal Management”: supported by the Texas General Land Office (two contracts).

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

“Numerical Ground-Water Model for the Panhandle Water Planning Area”: supported by the Panhandle Regional Planning Commission.

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

“Recent Changes in Gulf Shoreline Position, Mustang, and North Padre Islands, Texas”: supported by the Texas General Land Office.

“Refrining the Geologic Time Scale: Integrated Biostratigraphy, Chemostatigraphy, 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 (two contracts).

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

“Technical Support to the Texas Water Development Board”: supported by the Texas Water Development Board (two contracts).

“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, Year 4”: supported by the General Land Office through Galveston Independent School District.

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

“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.

“The Texas Shoreline Change Project—Gulf of Mexico Shoreline from Port Aransas to Padre Island National Seashore and Baffin Bay”: supported by the Texas General Land Office.

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

“University Lands Advanced Recovery Initiative”: supported by the University of Texas System (two contracts).

“Using GIS Technology to Explore Earth Systems, Phase II”: supported by Fábens Independent School District.

“Vadose Zone Hydrology Workshop”: supported by the Texas Natural Resource Conservation Commission.

PRIVATE

“API Support of Analysis of Soil Remediation Requirements of Abandoned Centralized and Commercial Drilling-Fluid Disposal Sites”: supported by the American Petroleum Institute.


“Carbonate Reservoir Characterization Workshop”: supported by Abu Dhabi National Oil Company.

“Carbonate Reservoir Characterization Workshop”: supported by Occidental Oil and Gas Corporation (two contracts).

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


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

“LIDAR Surveys in Support of Raytheon Demonstration #2”: supported by Raytheon.

“Maintenance of Borehole Geophysics Test Site: The University of Texas at Austin” supported by the University of Texas at Austin.
Austin”: supported by the Society of Exploration Geophysicists.

“Plume Research Group: Integrated Regional, Site-Specific, and Theoretical Studies of Ground-Water Contaminant Plumes”: supported by the ExxonMobil Foundation.

“Reservoir Characterization Research Laboratory: Carbonate Reservoirs”: supported by Amerada Hess Corporation, Anadarko, Aramco Oil Company, British Petroleum, ChevronTexaco, ExxonMobil, Great Western Drilling Company, Kinder Morgan, Marathon Oil Company, Occidental Oil & Gas Corporation, PanCanadian, Petroleum Development Oman LLC, Shell Oil Company, Statoil, and TotalFinaElf.

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


“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.

“Study of Evaluation of Tertiary Plays of the Central and Southeastern Mexico Basins”: supported by PEMEX.

“Support of EarthView Texas by the Hillcrest Foundation.”

“Support of EarthView Texas by the Shell Foundation.”

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

“Training for and Research Collaboration with Ecopetrol”: supported by Ecopetrol.

“Workshop on Detailed Architectural Analysis of a Late Miocene Channel Complex, Capistrano Formation, San Clemente, California”: supported by Chevron Petroleum Technology Center.
BUREAU RESEARCH AND SUPPORT STAFF ACTIVITIES

LECTURES AND PUBLIC ADDRESSES

For presentations that were published as papers or abstracts, see p. 37-45.

WILLIAM A. AMBROSE
“Valley-fill and estuarine depositional sequences inferred from cores and lithologic maps of lower Eocene tide-dominated depositional reservoirs in the lower Eocene Misoa Formation, Bloque I, Lake Maracaibo”: guest lecture presented at BEG short course in sequence stratigraphy led by L. F. Brown, Jr.

“Facies mapping of fluvial gas reservoirs in Seeligson field, South Texas”: presented to the American Geological Institute and American Association of Petroleum Geologists, Austin, Texas.

DALLAS B. DUNLAP

ALAN R. DUTTON
“Conceptual model and development of numerical data for the central Carrizo-Wilcox aquifer GAM model”: presented at Stakeholder Advisory Forum for the Central Carrizo-Wilcox Model, College Station, Texas.

“Project organization and conceptual model of the central Carrizo-Wilcox GAM model”: presented at Stakeholders Advisory Forum for the Central Carrizo-Wilcox Model, Austin, Texas.

“Groundwater flow velocities in the vicinity of the Pantex Plant”: presented at Pantex public meeting hosted by the U.S. Department of Energy and the Texas Natural Resource Conservation Commission, Panhandle, Texas.

“Approaches to using groundwater examples in teaching math and science in Texas middle schools”: presented to Texas Environmental Education Network, Austin, Texas.

“Development of a groundwater model of the Ogallala aquifer: prediction of 2000 to 2050 saturated thickness for Panhandle Regional Water Planning Group (Region A)”: presented to Texas Water Development Board, Austin, Texas.

“Development of the central Carrizo-Wilcox aquifer GAM model”: presented at Stakeholder Advisory Forum for the Central Carrizo-Wilcox Model, Austin, Texas.

“Groundwater field methods: Luling oil field”: lecture with field demonstration on site assessment of abandoned oil-field pollution presented to The University of Texas at Austin, Department of Geological Sciences (Geology 367L and Geology 382C), Austin, Texas.

SHIRLEY P. DUTTON
“Deposition and diagenesis of turbidite sandstones in East Ford field, Bell Canyon Formation, Delaware Basin, Texas”: presented at the Southwest Section American Association of Petroleum Geologists annual meeting, Dallas, Texas.

“Field development of a Permian deep-water sandstone, East Texas field, Bell Canyon Formation, Delaware Basin, Texas”: presented at the American Association of Petroleum Geologists annual meeting, Denver, Colorado.

“Diagenetic impacts on clastic reservoirs”: presented to The University of Texas at Austin, Department of Geological Sciences, Reservoir Geology and Advanced Recovery (Geology 383R), Austin, Texas.

“Reservoir characterization of a Permian deep-water sandstone, East Ford field, Bell Canyon Formation, Delaware Basin, Texas”: presented to the South Texas Geological Society, San Antonio, Texas.

“Diagenesis and reservoir quality of turbidite sandstones in the Bell Canyon Formation, Delaware Basin, Texas”: presented at the Geological Society of America annual meeting, Boston, Massachusetts.

“Application of advanced reservoir characterization, simulation, and production optimization strategies to maximize recovery in slope and basin clastic reservoirs, West Texas (Delaware Basin)”: project results presented to the U.S. Department of Energy, National Petroleum Technology Office, Tulsa, Oklahoma.

“Influence of calcite cement on fluid flow in reservoirs”: presented to The University of Texas at Austin, Department of Geological Sciences, Petrology of Sandstones (Geology 383L), Austin, Texas.

WILLIAM L. FISHER

“The current energy scene and the President’s energy plan”: luncheon speaker, all-convention luncheon, presented at American Association of Petroleum Geologists, annual meeting, Denver, Colorado.
“Advance of technologies in fossil energy resources”: presented to The Presidents’ Circle, The National Academies, Woods Hole, Massachusetts.


“The Gulf in the coming methane economy”: all-convention luncheon address, presented at Gulf Coast Association of Geological Societies, annual meeting, Shreveport, Louisiana.

“Principal issues in U.S. and world energy”: presented at National Academy of Engineering, Energy Workshop, Washington, D.C.

“The professionalism of Don R. Boyd”: presented at posthumous award of Boyd Medal to Don R. Boyd, Corpus Christi Geological Society, Corpus Christi, Texas.


**Julia F. W. Gale**

“Permeability prediction and horizontal well design”: presented to Fracture Research and Application Consortium technical review meeting, Bureau of Economic Geology, The University of Texas at Austin, Austin, Texas.

“Stress sensitivity of natural fractures”: presented to Fracture Research and Application Consortium technical review meeting, Bureau of Economic Geology, The University of Texas at Austin, Austin, Texas.

“Issues in fracture characterization”: presented to Schlumberger during field trip on Geology of Central Texas, Austin, Texas.

**Bob A. Hardage**

“3-D seismic evidence of the effects of carbonate karst collapse on overlying clastic stratigraphy and reservoir compartmentalization”: presented at Southwest Section American Association of Petroleum Geologists, annual meeting, Dallas, Texas.

**Mark H. Holtz**


**Susan D. Hovorka**

“Reducing atmospheric emissions of greenhouse gases by injecting them underground”: presented to Austin Geological Society meeting, Austin, Texas.

“Identifying optimal environments for geologic storage of large volumes of CO₂ onshore US”: presented to Princeton Environmental Institute, Princeton University, Princeton, New Jersey.

**Martin P. A. Jackson**

“Regional implications of tectonostratigraphic patterns formed by seaward translation of minibasins over basement steps, deepwater Kwanza Basin, Angola”: presented to Woodside Energy, Perth, Australia.

“Introduction and Applied Geodynamics Laboratory overview”: presented to Industrial Associates at the Applied Geodynamics Laboratory annual review meeting, Austin, Texas.

“Orogenic telescoping of a Gulf of Mexico-type allochthonous salt complex in the Neoproterozoic Katanga Basin, Congo”: presented to Industrial Associates at the Applied Geodynamics Laboratory annual review meeting, Austin, Texas.

“Megabreachy magical mystery tour”: presented to Industrial Associates at the Applied Geodynamics Laboratory annual review meeting, Austin, Texas.

“Thrust systems and squeezed diapirs, deepwater Gabon: preliminary observations”: presented to Industrial Associates at the Applied Geodynamics Laboratory annual review meeting, Austin, Texas.

**James W. Jennings, Jr.**

“Predicting permeability from well logs in carbonates with a link to geology for interwell permeability mapping”: presented to Shell International Exploration and Production, Rijswijk, Netherlands.

“Predicting permeability from well logs in carbonates with a link to geology for interwell permeability mapping”: presented at Society of Petroleum Engineers Annual Technical Conference and Exhibition, New Orleans, Louisiana.

“Integrated outcrop and subsurface studies of carbonate reservoirs: Clear Fork, West Texas, and New Mexico”: presented to ChevronTexaco, Houston, Texas.

“Spatial statistics and petrophysical models for carbonate permeability and implications for reservoir modeling”: presented to Statoil, Stavanger, Norway.

“Introduction to geostatistics for reservoir characterization and modeling”: presented to The University of Texas at Austin, Department of Petroleum and Geosystems Engineering (PGE337), Austin, Texas.

“Spatial statistics of carbonate permeability and the resulting scale effects in data analysis and modeling”: presented to Saudi Aramco, Dhahran, Saudi Arabia.

“Integrated outcrop and subsurface studies of carbonate reservoirs: Clear Fork, West Texas, and New Mexico”: presented to Martha Shassten, aide to U.S. Congressman Ralph Hall.

“Introduction to spatial trend analysis for reservoir characterization and modeling”: presented to The University of Texas at Austin, Department of Petroleum and Geosystems Engineering (PGE383), Austin, Texas.

“Introduction to geostatistics for reservoir characterization and modeling”: presented to The University of Texas at Austin,
Department of Petroleum and Geosystems Engineering (PGE383), Austin, Texas.

"Predicting permeability from well logs in carbonates with a link to geology for interwell permeability mapping": presented to The University of Texas at Austin, Department of Petroleum and Geosystems Engineering, graduate seminar, Austin, Texas.

CHARLES KERANS
"Facies, 1-D, and 3-D model of Northern Platform, SACROC area": presented at Carbonate Reservoir Characterization Research Laboratory Annual Review Meeting, Austin, Texas.

"Regional trends in Shuaba shelf margin reservoir architecture": presented at Carbonate Reservoir Characterization Research Laboratory Annual Review Meeting, Austin, Texas.

"Slope and basin systems of the Lower Permian—depositional architecture in a sequence framework": presented at Carbonate Reservoir Characterization Research Laboratory Annual Review Meeting, Austin, Texas.

"Geologic setting of Wolfcampian carbonates, Apache Canyon": presented at Permian Basin Section SEPM Annual Field Trip, Van Horn, Texas.

"Carbonate facies dimensions for petrophysical modeling": presented to Abu Dhabi Geological Society, Abu Dhabi, United Arab Emirates.

"Carbonate stratigraphy and reservoir framework of SACROC Unit, Permian Basin": presented to Kinder Morgan and Marathon Oil Companies, Austin, Texas.

"Recent developments in carbonate reservoir characterization": presented to Saudi Aramco, Dhahran, Saudi Arabia.

"Carbonate sequence stratigraphy": series of three lectures presented to The University of Texas at Austin, Department of Geological Sciences (Geology 380N), Austin, Texas.

EUGENE M. KIM
"The future of gas resources in the southwest United States": presented as invited address at the General Land Office 8th Annual Border Energy Forum, Tucson, Arizona.

"Geoscience technology for the coming gas economy": keynote address presented to the West Texas Geological Society symposium, Midland, Texas.

"U.S. and Texas gas supply: where are we now and where are we headed": presented at 2nd Annual Petroleum Technology Conference, Mexico City, Mexico.

"U.S. natural gas overview": presented to Texas Mineral and Land Association, Austin, Texas.

STEPHEN E. LAUBACH
"Recent developments in the domestic U.S. petroleum industry: a research organization perspective; and Insights from structural diagnosis for structural analysis": presented to Northern Illinois University, DeKalb, Illinois.

"Structural diagnosis: implications for tectonic interpretation of distal structures": presented to UT Institute for Geophysics, Austin, Texas.

"Identifying open fractures in Rocky Mountain reservoirs" and "Drilling and stimulation strategy: Are open fractures aligned with maximum horizontal stress?": presented to Rocky Mountain Association of Geologists symposium, Denver, Colorado.

"Using surrogates for fracture analysis": presented to Rocky Mountain Association of Geologists, luncheon talk, Denver, Colorado.

"Productivity in tight gas reservoirs: why should you care about fracture quality and scaling, major controls on fracture quality, and approaches to fracture characterization": presented to Petroleum Technology Transfer Council workshop, Jackson, Mississippi.

Three lectures to structural geology classes: presented to The University of Texas at Austin, Department of Geological Sciences (Geology 228), Austin, Texas.

"Innovations in fracture characterization and modeling of clastic and carbonate reservoirs": presented to Petroleum Technology Transfer Council, Midland, Texas.

"Fracture quality map of East Texas": presented to Fracture Research and Application Consortium meeting, Austin, Texas.

"Summary of fracture attributes in dolomite": presented to geological staff, PEMEX, Ciudad del Carmen, Mexico.

ROBERT G. LOUCKS
"Paleocave systems: origins, burial-depth modifications, and spatial complexity": presented to Edwards Aquifer Authority Technical Advisory Group, Austin, Texas.

"Paleocave systems: origins, burial-depth modifications, and spatial complexity, and reservoir implications": presented to Nevada Petroleum Society, Reno, Nevada.

"Depositional and diagenetic framework of larger foraminiferan nummulite deposits": presented to University of Nevada at Reno, Reno, Nevada.

H. SEAY NANCE
"Beginner’s guide to hydrogeology": presented to Capital Area Master Naturalists, Austin Nature and Science Center, Austin, Texas.

JEFFREY G. PAINE
"Evaluating the integrity of the Ogallala fine-grained zones using airborne electromagnetic induction": presented at Innovative Technology and Remediation Demonstration, Pantex Southeast Groundwater Project Technical Advisory Group meeting, Amarillo, Texas.

"Identifying and assessing groundwater in the Lower Rio
Grande Valley, Texas, using airborne electromagnetic induction”: presented to LBG-Guyton Associates, Austin, Texas.

“Applying airborne and ground geophysics in groundwater resource and contamination investigations”: presented to Los Alamos National Laboratory, Los Alamos, New Mexico.

“Geophysical investigations of oilfield salinization in the Red River Basin, Texas”: presented at Airborne Geophysics seminar, Austin, Texas.

“Geophysical investigations of oilfield salinization in the Red River Basin, Texas”: presented to LBG-Guyton Associates, Austin, Texas.


**STEPHENV. C. RUPPEL**


“Sequence and cycle-scale stratigraphy of the Leonardian: lessons from outcrops and the subsurface”: presented at the Permian Basin Section SEPM luncheon, Midland, Texas.

Bridget R. Scanlon

“Groundwater modeling of the Barton Springs segment of the Edwards aquifer”: presented to Regional Water Planning Group meeting, Bastrop, Texas.

“Suitability of alternative engineered covers for waste containment”: presented to Texas Natural Resource Conservation Commission, Austin, Texas.

“Isotope hydrology”: presented to The University of Texas at Austin, Department of Geological Sciences, Austin, Texas.


“Results of unsaturated zone monitoring at the Pantex plant”: presented to U.S. Department of Energy, Amarillo, Texas.

Lecture in hydrogeology and isotope hydrology: presented to The University of Texas at Austin, Department of Geological Sciences, Austin, Texas.

**SCOTT W. TINKER**


“Modeling oil, gas, and water: do third and fourth dimensions add value?”: presented at Fort Worth Geological Society meeting, Fort Worth, Texas.

“What are the future needs and directions for longer term fundamental research that will lead to the next generation of technology breakthroughs and technology developments?”, keynote address presented to the DOE Plenary Workshop, Houston, Texas.


“Geoscience technology for the coming gas economy”: keynote address presented to the West Texas Geological Society symposium, Midland, Texas.

“Oil and gas technology: why should a royalty owner care?”: presented at National Association of Royalty Owners Convention, San Angelo, Texas.

“3-D Modeling of geologic data: from petroleum reservoirs to aquifers?”: presented at South Texas Geological Society meeting, San Antonio, Texas.

“Energy production trends and the role of technology”: presented at AAPG Prospect and Property Expo (APPEX), Houston, Texas.

“3-D Reservoir modeling: hydrocarbons and aquifers”: presented at the SEPM 75th Anniversary Diamond Jubilee Symposium, AAPG/SEPM Annual Convention, Denver, Colorado.


“Carbonate sequence stratigraphy and reservoir characterization”: presented to Northwestern University, Department of Geological Sciences, Evanston, Illinois.

“Value of applied research and the natural gas supply: how the U.S. natural gas production curve was built and how it will be sustained in the future”: presented to East Texas Geological Society, Tyler, Texas.

“Does technology really matter? The value and future of upstream technology in the petroleum industry”: presented at The University of Texas at Austin, Department of Petroleum Engineering Graduate Seminar Series, Austin, Texas.

“Natural gas supply: how the U.S. natural gas production curve was built and how it will be sustained in the future”: presented to Austin Geological Society monthly meeting, Austin, Texas.

“Value of applied research and the natural gas supply: how the U.S. natural gas production curve was built and how it will be sustained in the future”: invited by West Texas Geological Society, Midland, Texas.

“Current and future opportunities in the State geologic surveys”: presented at American Geological Institute-National Science Foundation Workshop, Identifying Geoscience Human-Resources Data Needs—A Workshop for Educators and Employers, University of Maryland, College Park, Maryland.
“Value of applied research and the natural gas supply: how the U.S. natural gas production curve was built and how it will be sustained in the future”: invited for the American Association of Petroleum Geologists 20th Annual Leadership Conference, Tulsa, Oklahoma.

“Value of applied research and the natural gas supply: how the U.S. natural gas production curve was built and how it will be sustained in the future”: invited for Second International Petroleum Technology Exhibition, Mexico City, Mexico.

“The value of upstream technology and the future of energy research": invited by The Victoria College, Victoria, Texas.

“Where are we and what lies ahead?": presented at panel discussion of Steering Committee, Fourth Joint AMGP/AAPG International Conference, Exploration and Development of Gas Plays, Veracruz, Mexico.

Visualization Lab Demonstrations: presented to The University of Texas System, Chancellor’s Council Executive Committee.

LESLI J. WOOD
“Down to do island arc depositional systems of the southeastern Caribbean margin": presented at Department of Geology and Geophysics Soft-rock Brown Bag Lecture, The University of Texas at Austin, Austin, Texas.

“Intimate relations the interaction of tectonics and sedimentation offshore eastern Trinidad and Venezuela": presented at University of Canterbury, New Zealand.


“Tectonomorphic provinces of the eastern East Maturin Basin": invited keynote lunch speaker, presented to University of Houston Geosciences Alumni Association, Houston, Texas.

“Intimate relations the interaction of tectonics and sedimentation offshore eastern Trinidad and Venezuela": presented to Phillips Petroleum, Inc.

“Tectonomorphic development of the southeastern Caribbean margin with emphasis on the latest Tertiary": presented to The University of Texas Institute for Geophysics PLATES Industrial Consortium, Austin, Texas.

“New oil from old fields": presented at American Association of Petroleum Geologists Prospect and Property Expo (APPEX), Houston, Texas.

HONGLIU ZENG

“From seismic stratigraphy to seismic sedimentology: a sensible transition": invited speech before Corpus Christi Geological Society and Coastal Bend Geophysical Society luncheon meeting.

BEG SEMINARS

WILLIAM A. AMBROSE
“Depositional controls on coalbed methane occurrence in the Fruitland Formation, San Juan Basin”

“History of the Bureau’s coalbed methane investigations of the San Juan, Greater Green River, Piceance, Powder River, and Raton Basins in the late 1980’s and early 1990’s”

ALAN R. DUTTON
“Development of a model for the Panhandle Regional Water Planning Group, Hydrogeology and groundwater resources of the Ogallala aquifer, northern Texas Panhandle”

SHIRLEY P. DUTTON
“Diagenesis and reservoir quality of deep-water sandstones in the East Ford field, Bell Canyon Formation, Delaware Basin, Texas”

TUCKER F. HENTZ
“Sequence-stratigraphic and seismic conceptualization of the Miocene succession, Starfish and Tiger Shoal fields, offshore Louisiana: implications for gas-resource development in mature fields of the Federal OCS”

JAMES W. JENNINGS, JR.
“Predicting permeability from well logs in carbonates with a link to geology for interwell permeability mapping”

REBECCA H. JONES
Coordinator, seminar series

CHARLES KERANS
“The next 20 years in carbonate research”

ROBERT G. LOUCKS
“Characterizing the three-dimensional architecture of a coalesced, collapsed-paleocave system in the Lower Ordovician Ellenburger Group by integrating ground-penetrating radar, shallow core, and outcrop data”

SCOTT W. TINKER
Weekly presentations on Bureau affairs and open Q&A

RAMÓN H. TREVIÑO
“Stratigraphy, structure, and reservoir characteristics of the Block 889 Area, offshore Texas”

TIMOTHY F. WAWRZYNIEC
“Dextral shear along the eastern margin of the Colorado Plateau—a kinematic link between Laramide contraction and Rio Grande rifting (ca. 75 Ma to 13 Ma)"

HONGLIU ZENG
“Seismic sedimentology and 3-D seismic expression of high-frequency sequence stratigraphy in Miocene Starfish and Tiger Shoal fields, offshore Louisiana”
**COMMITTEE SERVICES, OFFICES, AND OTHER PROFESSIONAL RESPONSIBILITIES**

**SIGRID J. CLIFT**  
Chair, Texas Environmental Awareness Network (TEAN).

**EDWARD W. COLLINS**  
Member, Field Trip Committee, Austin Geological Society.

Chairman, Field Trip Committee, Gulf Coast Association of Geological Societies 52nd Annual Meeting.

Co-leader, “Austin, Texas and beyond—geology and environment, a field excursion in memory of L. Edwin Garner”: field trip for Austin Geological Society.

Leader, “Geology of Trinity aquifer strata in and near Hays County”: field trip for Hays County Water District Advisory Group.

**MICHAEL V. DEANGELO**  
Member, Technical Program Committee, Society of Exploration Geophysicists 71st annual meeting.

**SUSANNE DOENGES**  
Member, Robert W. Hamilton Book Award Committee, The University of Texas at Austin.

**ALAN R. DUTTON**  
Associate Editor, *Hydrogeology Journal*.

Member, Edwards Aquifer Optimization Program Technical Advisory Group, Edwards Aquifer Authority.

Member, representing Bureau of Economic Geology, Groundwater Protection Committee, Texas Natural Resource Conservation Commission.


Dissertation committee for H. Seay Nance, The University of Texas at Austin, Austin, Texas.

Thesis committee for Thet Naing, The University of Texas at Austin, Austin, Texas.

Dissertation committee for Ming-Juan Shi, The University of Texas at Austin, Austin, Texas.

**SHIRLEY P. DUTTON**  
Co-Editor, Gulf Coast Association of Geological Societies, 52nd Annual Meeting Transactions.


Member, Soft-Rock Curriculum Committee, John A. and Katherine G. Jackson School of Geosciences, The University of Texas at Austin.

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


Member, Admissions and Support Committee, Department of Geological Sciences, The University of Texas at Austin.

**WILLIAM L. FISHER**  
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.

Chairman, John A. and Katherine G. Jackson School of Geosciences Chartering Committee, College of Natural Sciences, 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.

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.

Chairman, Resource Group, National Academies Workshop on Current and Emerging Energy Issues.

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.
ROBERT J. GRAEBNER
Member and Vice Chairman, 
Society of Exploration Geophysicists 
Foundation Trustee Associates.

BOB A. HARDAGE
Member, Editorial Board, 
*Journal of Petroleum Science and Engineering.*

MARTIN P. A. JACKSON
Co-supervisor for Pedro Gomez, Ph.D. 
candidate, Salt tectonics of 
Salina Basin, Mexico.

Member, Committee for Joel LeCalvez, 
Ph.D. candidate, Modeling of 
extensional faulting.

Member, Committee for Xinxia Wu, 
Ph.D. candidate, Stratigraphy in 
Gulf of Mexico.

Instructor, American Association 
of Petroleum Geologists School 
for E&P Methods and 
Technologies, Denver, Colorado.

SYLVIA J. JENNETTE
Chairperson, Spouse Committee, 
Gulf Coast Association of Geological 
Societies 2002 Annual Convention.

Member, Austin Science Fun Day 2002 
Committee, Texas Memorial Museum.

JAMES W. JENNINGS, JR.
Theme chairman, Reservoir modeling 
and visualization, Gulf Coast 
Association of Geological 
Societies 2002 Annual Convention.

Technical editor, *Reservoir Evaluation and Engineering,* 
Society of Petroleum Engineers.

CHARLES KERANS
Leader, “Geologic setting of 
Wolfcampian carbonates, Apache 
Canyon”: Permian Basin Section 
SEPM (Society for Sedimentary 
Geology), annual field trip.

STEPHEN E. LAUBACH
Member, Academic Liaison 
Committee, American Association 
of Petroleum Geologists.

Instructor, American Association 
of Petroleum Geologists Fractured 
Reservoir Characterization and 
Modeling School, Austin, Texas.

Session Developer, 38th Annual 

Member, seven Ph.D. and M.S. 
Student Committees, Departments 
of Geological Sciences and Petroleum 
and Geosystems Engineering, 
The University of Texas at Austin.

Speaker, American Association 
of Petroleum Geologists 
Visiting Geologists Program.

Chair, Research Group—Reservoir 
Deformation, American Association 
of Petroleum Geologists.

Member, Editorial Board, 
*Formation Evaluation,* 
Society of Petroleum Engineers.

Vice-chair, Research Committee, 
American Association of 
Petroleum Geologists.

Member, Editorial Review Committee, 
Society of Petroleum Engineers.

Leader of field trip “Geology of 
Central Texas”: Schlumberger, 
Austin, Texas.

ROBERT G. LOUCKS
Alternate AAPG Delegate from 
Austin Geological Society.

Member, Research Committee, SEPM 
(Society for Sedimentary Geology).

Liaison, Research Committee, SEPM 
(Society for Sedimentary Geology).

Liaison, Research Committee, 
American Association of 
Petroleum Geologists.

Member, Research Committee, 
American Association of 
Petroleum Geologists.

Member, Sandstone Diagenesis 
Committee, SEPM (Society for Sedimentary Geology).

Member, Carbonate Rock 
Committee, SEPM (Society for Sedimentary Geology).
JEFFREY G. PAINE
Review Panelist, Earth Science Enterprise Solid Earth and Natural Hazards Panel, National Aeronautics and Space Administration.
Associate Editor, Environmental & Engineering Geoscience.

ERIC C. POTTER
Reviewer of grant-in-aid proposals, Scholarship Committee, American Association of Petroleum Geologists.

DOUGLAS C. RATCLIFF
Chairman, Publication Committee, Gulf Coast Association of Geological Societies.

LISA E. REMINGTON
Chairperson, Registration Committee, Gulf Coast Association of Geological Societies.

STEPHEN C. RUPPEL
Co-Editor, Gulf Coast Association of Geological Societies, 52nd Annual Meeting Transactions.

BRIDGERT R. SCANLON

SCOTT W. TINKER
Director, Petroleum Technology Transfer Council Regional Lead Organization.
Member, Petroleum Technology Transfer Council Producer Advisory Group.
Member, International Steering Committee, 2001 AMGP (Asociacion Mexicana de Geologos Petroleros)/AAPG International Conference in Vera Cruz, Mexico.
Chairman, Field Seminar Sub-Committee, Education Committee, American Association of Petroleum Geologists.
Member, Core and Sample Preservation Committee, American Association of Petroleum Geologists.
Member, Education Committee, American Association of Petroleum Geologists.
Session Chair, American Association of Petroleum Geologists 2001 Annual Meeting.
Member, Organizing Committee, American Association of Petroleum Geologists APPEX (Property and Prospect Exposition).
Member, Energy and Mineral Policy Committee, Association of American State Geologists.
Member, Continental Margins Committee, Association of American State Geologists.
Member, Liaison Committee, Association of American State Geologists.
Member, U.S. Potential Gas Committee, Association of American State Geologists.
Member, Coastal Processes Committee, Association of American State Geologists.
Trustee, American Geological Institute Foundation.
Chairman, Technical Program Steering Committee, Gulf Coast Association of Geological Societies 2002 Annual Convention in Austin, Texas.
Member, State of Texas Oil Field Cleanup Fund Advisory Committee, appointed by Lieutenant Governor.
Member, Board of Visitors, Trinity University.
Member, Faculty Review Committee, Department of Geological Sciences, The University of Texas at Austin.
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.
Member, Dean’s Committee on Formation of the Jackson School of Geosciences, The University of Texas at Austin.
Member, Vice President’s Committee on ACES Energy Proposal, The University of Texas at Austin.
Member, CLEER (Center for Legislative Energy and Environmental Research), University Advisory Board, The University of Texas at Austin.

RAMÓN H. TREVINO
Treasurer, Gulf Coast Association of Geological Societies 2002 Annual Convention, Austin, Texas.

BRUNO C. VENDEVILLE
Member, Société Géologique de France Editorial Committee, Bulletin de la Société Géologique de France.
Co-advisor, Christine R. Fox, Master’s degree, Department of Geology, The University of Texas at Austin: Experimental modeling of the formation of arcuate foldbelts with application to the Monterrey Salient, Mexico.
Co-advisor, Asif Mazafar, M.S. degree, Analysis of the Cap rock of the Davis-Hill salt dome, Liberty County, Texas: The University of Texas at Austin, Austin, Texas.
Co-advisor, Joel Le Calvez, Ph.D. degree, Department of Geology, The University of Texas at Austin: Modeling of normal-fault relays.

WILLIAM A. WHITE
Member, NASA Science Validation Team for New Millennium Program Earth Observing series (EO-1).

LESJ J. WOOD
Member, OTC Subcommittee, American Association of Petroleum Geologists.
Member, Publications Committee, American Association of Petroleum Geologists.
Member, Core and Samples Preservation Committee, American Association of Petroleum Geologists.

Lecturer, Supervisor/Co-Supervisor of students, Department of Geological Sciences, The University of Texas at Austin.

HONGLI ZENG
Member, Dissertation committee for Yong-Joon Park: Lithology, depositional facies, and stratigraphic sequences in Jackson County, Texas Gulf of Coast Basin: an integrated approach using offset-dependent seismic attributes.

Member, Dissertation committee for Hongbo Lu: Global and local controls on depositional cyclicity: Canterbury Basin, New Zealand.

CONGRESSIONAL, LEGISLATIVE, AND SPECIAL COMMITTEE TESTIMONY

ALAN R. DUTTON
Comments on S.B. 1541 on permanent management of low-level radioactive waste: presented to Senate Natural Resources Committee, Austin, Texas.

JAMES C. GIBEAUT
Expert witness for the State of Texas in support of coastal property litigation.

SCOTT W. TINKER
Invited resource witness to Texas House of Representatives Energy Resource Committee, Austin, Texas.


Invited testimony, presented at U.S. Department of Energy Public Hearings on Oil and Natural Gas Technology:

Securing the Nation’s Energy Future, Strategic Review of the DOE Oil and Gas Programs, Denver, Colorado.


WILLIAM L. FISHER
“Sequence stratigraphy” (Geology 380N): The University of Texas at Austin, Department of Geological Sciences, Austin, Texas.

“Research in basin analysis” (Geology 384): The University of Texas at Austin, Department of Geological Sciences, Austin, Texas.

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

MARTIN P. A. JACKSON


JAMES W. JENNINGS, JR.
“Statistical analysis, spatial statistics, scaleup, and model construction in carbonate reservoirs”: section of carbonate reservoir characterization and modeling short course presented to Statoil, Stavanger, Norway.

“Statistical analysis, spatial statistics, scaleup, and model construction in carbonate reservoirs”: section of carbonate reservoir characterization and modeling short course presented to Abu Dhabi National Oil Company: Abu Dhabi, United Arab Emirates.

“Statistical analysis, spatial statistics, scaleup, and model construction in carbonate reservoirs”: section of carbonate reservoir characterization and modeling short course presented to Occidental Petroleum: Houston, Texas.

CHARLES KERANS
“Sequence framework and facies architecture of a Cretaceous carbonate ramp: late Albian of the Pecos River, West Texas”: presented to BP, Pecos River Canyon, Texas (with Laura Zahm and Scott Tinker).

Carbonate reservoir characterization: short course presented to Oxy International, Houston, Texas (with F. J. Lucia and J. W. Jennings, Jr.).

Carbonate reservoir characterization: short course presented to ADCO/ADMA, Abu Dhabi, United Arab Emirates (with J. W. Jennings, Jr.).

“Stratigraphy and reservoir facies development”: presented as part of Reservoir Characterization Research Laboratory corporate school on Slope-Basin Carbonate and Mixed Clastic-Carbonate Systems, Van Horn, Texas (with Ted Playton).

JEFFREY G. PAINE
Lecturer, Near-surface geophysical methods in hydrogeological investigations: lecture and field demonstration of electromagnetic methods for Field Methods. Hydrogeology class (Geology 376L), The University of Texas at Austin, Austin, Texas.

BRIDGET R. SCANLON
“Unsaturated zone hydrology”: short course presented at Texas Natural Resource Conservation Commission, Austin, Texas.

“Techniques for estimating groundwater recharge”: short course presented at Texas Water Development Board, Austin, Texas.
“Techniques for quantifying groundwater recharge”: short course presented at Geological Society of America, annual meeting, Boston, Massachusetts.

**SCOTT W. TINKER**
“Reservoir geology and advanced recovery” (Geology 384R): The University of Texas at Austin, Department of Geological Sciences (with William L. Fisher).

“Basic petroleum geology” short course: presented at “Basic Oil and Gas Geology and Technology for Lawyers and Other Non-Technical Personnel,” co-sponsored by the Rocky Mountain Mineral Law Foundation and the Oil, Gas & Mineral Law Section of the State Bar of Texas, Houston, Texas.

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

**K–12 AND PUBLIC OUTREACH**

**SIGRID J. CLIFT**
Organizer, Texas Petroleum Technology Transfer Council

**WILLIAM L. FISHER**
“Energy and environment—a global challenge”: Outreach Lecture Series, Department of Geological Sciences, The University of Texas at Austin, Austin, Texas.

**K–12 AND PUBLIC OUTREACH**

**SUSAN D. HOWORKA**
“Using GIS for upper elementary students”: presented at the Texas Memorial Museum’s “2001 Austin Science Fun Day,” The University of Texas at Austin, Austin, Texas; in partnership with fifth-grade science class, Parkside Elementary School, Austin, Texas.

**DAVID C. JENNETTE**
“Using stream tables to illustrate sediment deposition and erosion in a fluvial (river) environment”: presented at the Texas Memorial Museum’s “2001 Austin Science Fun Day,” The University of Texas at Austin, Austin, Texas; in partnership with Mrs. Skagg’s fifth-grade science class, Spicewood Elementary School, Austin, Texas.

**Sylvia J. Jennette**
“Using stream tables to illustrate sediment deposition and erosion in a fluvial (river) environment”: presented at the Texas Memorial Museum’s “2001 Austin Science Fun Day,” The University of Texas at Austin, Austin, Texas; in partnership with Mrs. Skagg’s fifth-grade science class, Spicewood Elementary School, Austin, Texas.
PUBLICATIONS

Contract Reports


Hardage, B. A., 2001, An investigation to document Morrow reservoirs that can be better detected with seismic shear (S) waves than with compressional (P) waves: The University of Texas at Austin, Bureau of Economic Geology, final report prepared for U.S. Department of Energy, under DOE program solicitation DE-PS26-99BC15146, entitled Technology Development with Independents, 26 p.


Hovorka, S. D., 2001, Task 1 milestone: draft bibliography on karst geomorphology and hydrology relevant to geologic assessment of recharge features in the Edwards aquifer interagency contract on evaluation of the geologic assessment of sensitive features: The
University of Texas at Austin, Bureau of Economic Geology, milestone report prepared for Texas Natural Resource Conservation Commission, 10 p.


Paine, J. G., 2001, Comparing ground motion at the current and proposed sites of the metrology laboratory: The University of Texas at Austin, Bureau of Economic Geology, final report prepared for the Texas Department of Agriculture, under contract no. UTA02-083, 23 p.

Paine, J. G., 2001, Establishing acceptable ground motion at the TDA Metrology Laboratory, Austin, Texas: The University of Texas, Bureau of Economic Geology, report prepared for the Texas Department of Agriculture, under contract number UTA01-492, 19 p.


Economic Geology, annual performance report prepared for the U.S. Environmental Protection Agency, 7 p.


PAPERS AND ABSTRACTS BY BUREAU STAFF IN OUTSIDE (NON-BUREAU) PUBLICATIONS

PAPERS

Fisher, W. L., 2001, Citation for John A. Jackson, Hall of Honor Inductee, College of Natural Sciences, The University of Texas at Austin.


ABSTRACTS


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Hooper, R. J., Fitzsimmons, R. J., Grant, N. T., and Vendeville, B. C., 2001, Linked extensional


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PUBLIC INFORMATION RESOURCES

CORE RESEARCH CENTERS

The Core Research Center (CRC) in Austin and the Midland Core Research Center (MCRC) are research and storage facilities managed by the Bureau to house core and rock material donated to The University of Texas. There were two donations of core to the CRC in 2001. The centers are managed by Curator George Bush, who assisted more than 279 visitors during 2001.

The CRC, the Bureau’s central core repository, is located adjacent to Bureau headquarters on the University’s J. J. Pickle Research Campus. This 95,000-ft² facility contains more than 500,000 boxes of core and 750,000 boxes of well cuttings and outcrop samples.

The MCRC became Bureau property in 1994, when Shell Oil Company donated its core lab, containing 450,000 boxes of core, well cuttings, and outcrop samples, to the University. Eighty-five thousand boxes of West Texas Permian Basin core were added to the MCRC’s inventory in 2000 from a donation by Altura Energy, Ltd. A 13,500-ft² warehouse extension was built at this time to store this additional material.

Both facilities are open to the public Monday through Friday from 8:00 a.m. to 5:00 p.m. Public facilities include core examination rooms, processing rooms for slabbing core, and office space. For-a-fee services, such as core photography, are available, as are computer printouts and CD-ROM-based CRC inventories. Should visitors conduct any type of sample analysis on the material, the Bureau asks that they provide a copy of the results within 1 year of finishing their research. This information then becomes part of the CRC’s reference material. For information, please call the Austin CRC at 512-471-0402 or visit the Bureau’s Website at http://www.beg.utexas.edu.

Geologist Sigrid Clift serves as both the Public Information Geologist and manager of the Data Center, which includes the Reading Room and Geophysical Log Facility.

PUBLIC INFORMATION GEOLOGIST

As a public institution, the Bureau receives questions about the geology, energy, and land resources of Texas from people and organizations in Texas and throughout the world. Geologist Sigrid Clift handles the daily appeals for facts and resources. Members of the Bureau’s geoscience research staff also provide advisory and technical services. For information, please call the Public Information Geologist at 512-471-0320 or e-mail sigrid.clift@beg.utexas.edu.

READING ROOM

The Reading Room is an open-file document storage section containing a large collection of geologic reference materials. These materials include periodicals, maps, well logs, and reports from various governmental and nongovernmental geoscience entities. The Reading Room is open to the public Monday through Friday from 8:00 a.m. to 5:00 p.m. and is located on the first floor of Bureau headquarters in Austin. For information, please call the Data Center Manager at 512-471-0320 or e-mail sigrid.clift@beg.utexas.edu.

GEOPHYSICAL LOG FACILITY

The Geophysical Log Facility is the repository for geophysical 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. The facility is supervised by Daniel Ortuno, who
manages both the numerous daily requests for
copies of well logs and the flow of new geophysical
data into the facility.

Geophysical data available for public research
include wireline electric logs, well records, and scout
tickets from hundreds of thousands of wells located
in Texas. Sample logs from the 1930’s through the
1950’s are also stored in the facility and are avail-
able for public research. Requests for copies of logs
can be made in person or by mail, telephone, fax,
or e-mail. For information, call the Geophysical Log
Facility manager at 512-471-7139 or e-mail
daniel.ortuno@beg.utexas.edu.

SALES OF BUREAU
PUBLICATIONS

The Bureau publishes and sells maps and reports
of research conducted by Bureau staff from 1915 to
the present. The office of Publications Sales, under
the guidance of Publication Sales Manager Amanda
Masterson, receives and processes a daily stream of
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Bureau publications include reports of investiga-
tions, guidebooks, handbooks, cross sections, maps,
oil and gas atlases, seismic data sets, geologic folios,
geologic atlas sheets, page-sized maps of Texas,
and classroom teaching aids such as rock kits. Out-
of-print publications and most contract reports
produced by the Bureau are also available for
purchase. Bestsellers for the year 2001 included
geologic atlas sheets, guidebooks, page-sized maps,
and open-file STATEMAP maps.

The Bureau also sells selected publications of
the Gulf Coast Association of Geological Societies
(GCAGS) and seven of its member societies.

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checks, money orders, major credit cards, and
international wire transfers.

Free copies of the current year’s List of
Publications, Annual Report, Midyear Report, and
Comprehensive Report are available upon request.
SUPPORT STAFF

ASSISTANT TO THE DIRECTOR

Wanda LaPlante is Assistant to the Director, managing the Director’s nonstop travel, meeting, and planning schedules.

ADMINISTRATIVE

Senior Administrative Associate Glynis Morse supervises the administrative staff responsible for general management of the Bureau, including travel, purchasing, payroll, personnel, and accounting.

CONTRACT MANAGEMENT

Most of the Bureau’s research funding comes from Federal, State, and industry sponsors and agencies. Contract Management personnel, supervised by Lynda Miller, provide financial reporting and database and records management and assist Bureau researchers in preparing budgets and proposals.

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-scene support for inhouse meetings, conventions, daily mail service, maintenance of BEG vehicles, office moves, and inventories of basic equipment.

GRAPHICS

Graphics manager Joel Lardon supervises the Bureau’s team of computer illustrators, a designer, and a photographer, who produce the design, layout, artwork, illustrations, presentation materials, and film-based and digital photography for Bureau research, maps, publications, and presentations.

EDITING

Chief Editor Susie Doenges supervises the Bureau’s editing staff responsible for editing and proofreading reports, documents, and graphics for publication by the Bureau or in professional journals.

INFORMATION TECHNOLOGY SERVICES

Information Technology Services (ITS), managed by Ron Russell, provides computer technology that assists researchers in their interpretation, 3-D modeling, visualization, and characterization studies as well as computer mapping, programming, database applications, and statistical and graphical analysis of data, network design, purchasing, testing, installation, and user training.

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Scott R. Rodgers manages Media Technologies Services, responsible for the design, programming, and function of the Bureau’s Intra- and Internet Websites and the Virtual Reality Laboratory.
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