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florida Geology *forum*



A Newsletter from the Florida Geological Survey

florida springs initiative

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Gainer Spring in Bay County

The FGS continues to be involved in the effort to determine the health of Florida's springs and aid in the determination of how to correct the problems and return the springs to pristine conditions. Following the publication of FGS OFR-85 "First Magnitude Springs of Florida", the FGS effort focused on the State's second magnitude springs (10-100 cubic feet per second of flow; 6.46 million gallons [mgd] to 64.6 mgd of water per day). More than 200 second magnitude springs are known at this time. The FGS and the Water Management Districts are attempting to locate more springs.

The Springs Team began sampling the second magnitude springs during Spring 2002. The second magnitude springs that had been sampled for the 1977 FGS Springs Bulletin were selected for a one-time sampling in 2002 to provide a snapshot of the spring's health for comparison with previous analyses. Approximately 70 springs were scheduled to be sampled. To date, 59 springs have been sampled and the

analyses are being done by the DEP Laboratory. The remainder are being sampled as weather and property owners allow.

The FGS team will be attempting to locate, visit and describe as many of the State's 200+ second magnitude springs as possible. Following this effort, the team will investigate third and lower magnitude springs. This information will be published on CD and an abbreviated hard copy publication in 2005.



Ichnetucknee Blue Springs in Columbia County

Florida's Oil and Gas Fields in Decline



Most Floridians are only vaguely aware of oil and gas production in our state and are particularly surprised to learn that over half a *billion* barrels of crude oil have been produced here. Florida has produced as much as 48 million barrels of crude oil per year and has been ranked as high as 8th among oil producing states. But that was in the late 1970's. Since that time Florida's petroleum production has plummeted by an order of magnitude:

5% of the produced fluids) consisted of saltwater byproduct that had to be separated from the oil and discarded.

By 2002 the operator at Blackjack Creek was producing crude oil at an annual rate of only 124,000 barrels while having to extract and dispose of 8 million barrels of saltwater. Over 98% of the fluid being pumped and treated was saltwater.



Aerial view of Northwest Florida drill rig

of oil and 371 million cubic feet of gas have been produced from these fields (much less than 1% of the state's totals). Zero new fields have been discovered in Florida since 1988 (with the exception of a large natural gas discovery in federal waters south of Pensacola).

<i>Florida Petroleum Production</i>	<i>Peak Year 1978</i>	<i>Today 2002</i>
New Wells Drilled	21	1
Oil Produced (barrels)	48 million	3.7 million
Natural Gas Produced (cubic ft)	52 billion	4.1 billion
Producing Wells	111	70
Daily Oil Produced per Well	1185 barrels	145 barrels
Daily Water Produced per Well	143 barrels	3131 barrels
Water Cut (Saltwater portion of produced fluids)	11%	96%

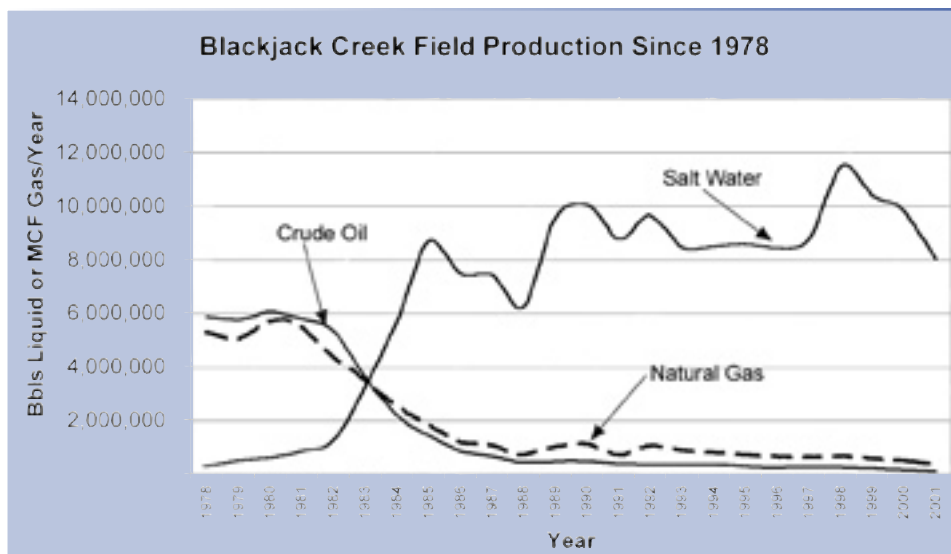
Production at all oil and gas fields ultimately succumbs to a parabolic/asymptotic decline curve. Blackjack Creek's production

rate declined steeply during the 1980's and leveled out during the 1990's. Florida's composite production curve is similar to Blackjack Creek's because no major oil fields have been discovered since 1978. Several small fields were discovered between 1978 and 1988, but a total of only 2.6 million barrels

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Typical 1970's era heavy duty drill rig in Northwest Florida. Capable of reaching petroleum deposits in the Smackover Formation at depths of 3 miles.



mits since 1978 and have completed 252 wells under these permits. The industry has also committed substantial resources toward geophysical prospecting in hopes of finding candidate sites for wildcat wells. Since 1985, when the Oil & Gas Section began regulating geophysical surveys, the industry has applied for 159 geophysical permits and actually conducted 126 geophysical surveys. Hundreds more unregulated geophysical surveys were conducted between 1978 and 1985.

Unless a major new oil field or cluster of fields is discovered, Florida is unlikely to approach the production rates of 1978. As with the rest of the U.S. (which reached peak oil/gas production in 1969) the largest and easiest field discoveries in Florida have probably already been made. Wildcat wells have been drilled in 62 of our 67 counties with a discovery rate of only 2.8%. All

of Florida's oil and gas production has come from only 6 of our 67 counties: Escambia, Santa Rosa, Lee, Hendry, Collier, and Dade. Outside of these counties only traces of oil were discovered in Gulf and Franklin Counties during the mid-1970's. A total of 19 offshore wells have been drilled in state waters, of which one well near Key West produced test oil at rate of 25 barrels per day in 1959. No offshore wells have been drilled in state waters since 1982, and with the exception of the 6 producing counties listed above, no new wildcat wells have been drilled since 1991.

Although Florida's fields are in decline and fewer than five wells per year are now being drilled, some of the Oil and Gas Section's most critical challenges still lie ahead. Generally the greatest environmental threat posed by oil and gas wells is potential freshwater aquifer contamination

by the millions of barrels of saltwater (mentioned above) associated with petroleum deposits. Inadequate plugging design or execution can allow uphole migration of saltwater which can destroy valuable drinking water resources. Plugging inspections are among the approximately 4300 inspections conducted annually by the Oil and Gas Section's field office staff in Fort Myers and Jay. These inspectors help ensure the safe operation of the remaining 219 wells and related facilities.

The home office in Tallahassee enforces regulatory deadlines, reviews permit applications, considers workover proposals, tracks production, and evaluates plugging designs. If future regulatory efforts by the Oil & Gas Section are successful, most Floridians will continue to have only a vague awareness of petroleum production in our state.

New Oil and Gas Employee

In April the Oil & Gas Section hired **Al Keaton** to conduct engineering and operations review. Mr. Keaton, who specializes in well design and blowout prevention, has literally drilled thousands of oil and gas wells over a 32-year span in such places as New Mexico, Texas, Oklahoma, Montana, North Dakota, Kentucky, Ohio, Michigan, and Ontario. He has *punched holes* for Sun Oil Company, Shell, Amoco, Terra Energy, Oryx Energy, Petrostar, Tecumseh Gas Storage, Enbridge Gas Storage, and Keaton Consulting.

Hydrogeology Program Update



This past summer has been an important time for the FGS Hydrogeology Program. During this period, several projects reached milestones in terms of completing their goals. For example, a major Phase of the Southwest Florida Hydrogeologic Mapping project was completed, as well as the Florida Aquifer Storage and Recovery Geochemistry Project. Moreover, significant progress is being made on the Florida Aquifer Vulnerability Assessment Project. Most important, however, may be the completion of a FDEP-wide hydrogeology needs assessment. Results of this assessment, as well as updates on our program can be found at this web address:

[http://
www.dep.state.fl.us/
geology/
programssections/
hydrogeology.htm](http://www.dep.state.fl.us/geology/programssections/hydrogeology.htm)

This needs assessment will guide in-house and outsourced research and other hydrogeology-related projects during the next fiscal year. For questions regarding the FGS Hydrogeology Program, contact **Dr. Jon Arthur**, FGS Hydrogeology Program.

Outsourcing

As required by the Florida Legislature, most

of the funding allocated to the Hydrogeology Program was used to conduct research and other activities under contract with universities and the private sector. Close collaboration by staff and scientists of the FGS was provided through the design of projects, field work and data interpretation. A major focus of the first year's projects was on the interaction between ground and surface water especially as manifested by upland and submarine springs. In Florida's karstic geological setting such interaction will play a major role in determining how we manage and protect our watersheds and ecosystems.

Remote-Sensing Techniques

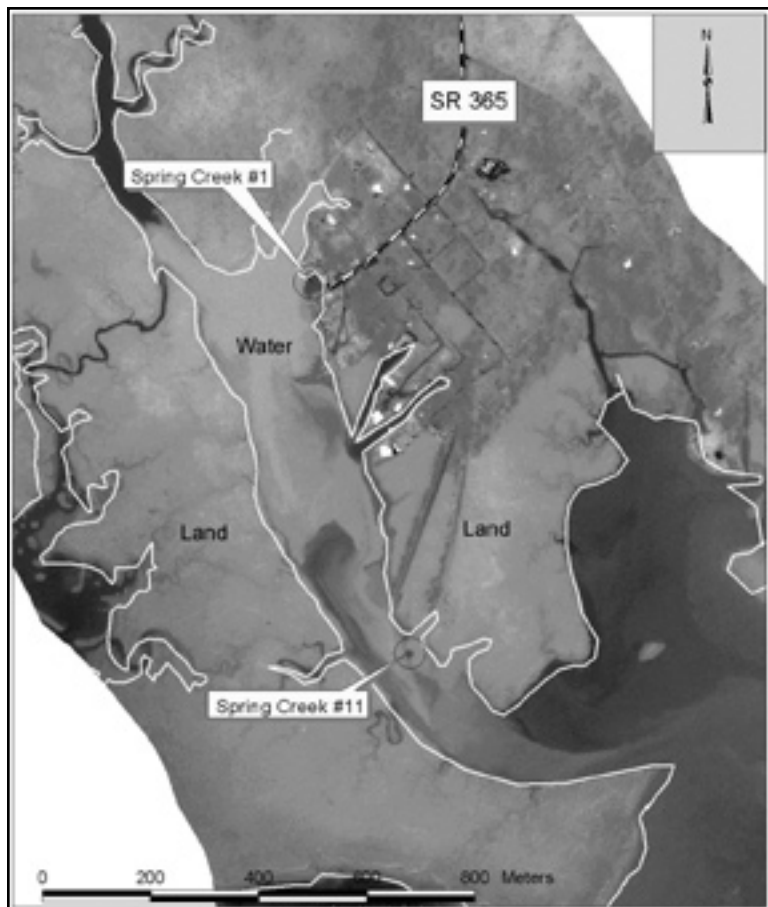
In an effort to find a quick and reasonably economical way of quantifying such interaction, we investigated two remote-sensing techniques, namely aerial thermography and boat-towed electric resistivity. Using SenSyTech and Zonge Engineering respectively as contractors, we surveyed about a dozen water bodies throughout the State including rivers, lakes and estuaries. Thermography located temperature differences between ground and surface

water exhibited on the surface, while resistivity will locate areas below the sediments that exhibit differing conductivities (inverted to resistivity values) due to salinity gradients or pollution. Using the two surveys, we hope to identify "hot spots" of potential ground water discharge that will be "ground truthed" using conventional techniques such as seismic profiling, side scan, coring, water quality analysis and Doppler acoustic measurements of discharge. A large volume

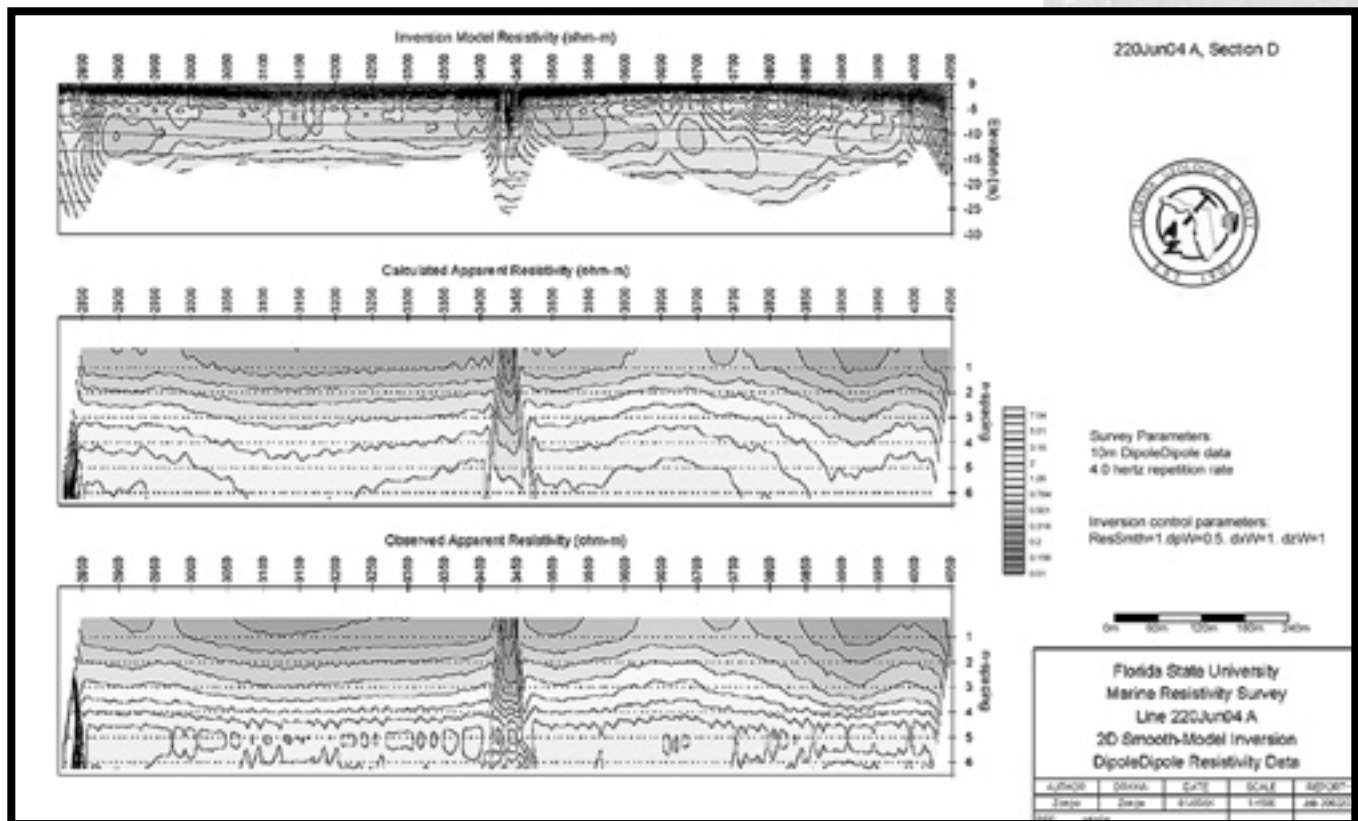
of data is currently being processed in-house for the thermography survey while Zonge Engineering is processing the resistivity data. Examples of processed data are shown in the figures below and on next page.

Springs Workshop

In May of this year and in cooperation with the Florida State University and the Hydrogeology Consortium, the FGS sponsored and led a workshop in Ocala which focused on "Developing Blueprints



Spring Creek, Wakulla Co. FL.
Night Thermography
10 May 2002



for the Management and Protection of Florida Springs.” Three panels met concurrently during the Workshop: 1) Inventory of Springs in Florida, 2) Delineation of Springsheds, and 3) Management and Protection of Springs.

The FSU team (Florida Resources and Environmental Analysis Center) is currently putting the final touches on a CD ROM (which will be available for distribution to the public) that will contain the workshop’s proceedings and recommendations from the three panels.

Karst Database

To help in understanding the dynamics of water flow and behavior under multi-porosity conditions, the FGS contracted with

FSU and with Hazlett & Kincaid Inc. to develop a karst database to be populated with cave, sinkhole and springs data. Such data, along with ground-truth information, age of water and dye tracing data will eventually help in the development of analytical and numerical models for use in environmental management and protection. The FGS also tasked this team with developing a mobile exhibit and video designed to educate non-scientists, teachers, their students and the general public on the role of hydrogeology in environmental management and protection.

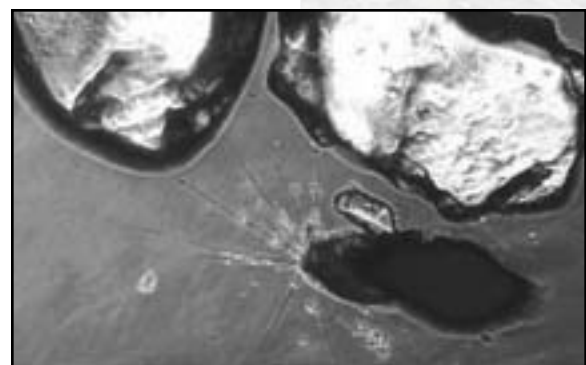
Environmental Indicators

A special project to evaluate the potential of

using benthic foraminifera as indicators of salinity gradients and of pollution was undertaken by faculty and students of the Department of Geology at FSU. Data generated from two pilot sites (Spring Creek and St. Joseph Bay) hold the promise of potentially using

foraminifera as environmental indicators of both natural and anthropogenic changes.

Questions or additional details on any of these outsourced projects may be directed to **Dr. Rodney Dehan**, FGS Hydrogeology Program.



Microphotograph of benthic foraminifera provided by The University of California Museum of Paleontology

The Spring Nomenclature Committee

One of the recommendations at the May workshop in Ocala, "Developing Blueprints for the Management and Protection of Florida Springs," involved establishment of a committee, led by the Florida Geological Survey (FGS) to develop a glossary of spring-related terms to be used by both the scientific community and the general public.

The Spring Nomenclature Committee not only

consists of representatives from FGS and the Hydrogeology Consortium, but also from the Florida Department of Environmental Protection's Division of Water Resource Management, the Water Management Districts, the U. S. Geological Survey, the state university system, Florida's hydrogeological consulting industry, and the general public.

The goal of the committee is to define terms

commonly used in Florida regarding springs. The glossary consists of the most commonly used spring terms in Florida, along with their synonyms. Whenever possible, terminology was taken from professional dictionaries and glossaries.

Closely related to the development of the glossary, is the development of a spring classification system. The classification system will act as a

model that enables one to envision the relationship of one spring to all of the others within Florida. In effect, a classification system assists us in better understanding our springs. It is anticipated that the glossary and classification system will be completed by December 2002. Please direct any questions about this committee to **Dr. Rick Copeland**, FGS Hydrogeology Program.

Preliminary Springshed Delineation Mapping

Another recommendation stemming from the Springs workshop in Ocala was to compile existing knowledge of springsheds and develop a preliminary springshed map for Florida's first magnitude springs. Led by **Mr. Tom Greenhalgh**, (FGS Hydrogeology Program), a committee was assembled with representatives from the Northwest, Suwannee, St. Johns and Southwest Florida Water Management Districts, as well as a USGS representative. The group has met twice since the May workshop in Ocala and expects to publish the

map by the end of this fiscal year. The map will be regional in scope, with detailed insets, and the basin boundaries will be shaded to reflect their variability based on seasonal and human influences. Simple graphics will illustrate the dynamics of the aquifer and surface-water and groundwater interaction. The map will also include a brief explanation describing why the map was developed and how it should be used. The purpose of the map is two-fold: 1) to inform decision makers (e.g., county commissioners, legislators, and local

and state agency personnel) as well as citizens on the importance of appropriate land use within a springshed, and 2) to serve as a starting point for further refinement of springshed boundaries. The preliminary nature of this map will be stressed and the map is provided to serve only as a guide until more research accurately delineates these boundaries.

At the September 5, 2002, meeting of the Springs Task Force at Blue Springs State Park in Orange City, it was announced that the FGS had agreed to be the reposi-

tory for springshed maps of Florida's springs. Tom Greenhalgh will be the contact person and he can be reached at 850/488-4191 or by email at tom.greenhalgh@dep.state.fl.us. At the meeting, **Mr. Greenhalgh** gave a brief presentation on a collaborative effort between the FGS, the Northwest, Suwannee River, St. Johns and Southwest Florida Water Management Districts and the U.S. Geological Survey to develop and publish a Preliminary Springshed Maps of the First Magnitude Springs.

Hydrologic Assessment of Nitrate Sources to Fanning Springs

Fanning Springs is a first magnitude spring on the east bank of the Suwannee River and center piece of Fanning Springs State Park in Levy County. The spring consistently discharges nitrate-nitrogen (nitrate) in

excess of 4.0 mg/l (parts per million) which is the highest concentration of any of Florida's 33 first magnitude springs. The Department's Division of State Lands and Division of Recreation and Parks

are very concerned about the nitrate pollution in the spring and have asked the Florida Geological Survey's Hydrogeology Program to conduct a hydrologic assessment of the nitrate sources contributing

to Fanning Springs. Within the next few months, the Hydrogeology Program staff will utilize historical and on-going data collection efforts in the spring's recharge basin to define its area of contribution. After

defining the area of contribution, the nitrate sources and relative loadings from the individual sources will be determined. In the future, with isotopic dating techniques and contaminant transport monitoring, staff expect to determine aquifer travel times and identify the spring's contributing nitrate sources. Questions or additional details on this project may

be directed to **Mr. Tom Greenhalgh** or **Dr. Rick Copeland**, FGS Hydrogeology Program.



Photo of Fanning Springs Courtesy of Joe Follman and Richard Buchanan

Preliminary Results of Long Term Trends in Spring Water Quality Reported to Spring Task Force

Over the past several years, independent studies by a variety of groups have demonstrated that the water quality of several of Florida's springs has degraded. For this reason, David Struhs, Secretary of the Florida Department of Environmental Protection, directed the formation of a multi-agency Florida Springs Task Force to provide recommended strategies for the protection and restoration of Florida's springs.

With a desire to estimate how long the degradation has occurred and which springs have been affected, the Florida Geological Survey (FGS), through its Hydrogeology Program, recently began evaluating whether or not long-term trends in spring water quality exist. Long term data (over decades) are relatively scarce. Nevertheless, preliminary assessment of the water discharging from a number of selected first-magnitude springs, indicates that the

median concentration of nitrate-nitrogen (nitrate) has increased significantly (19-fold) since the early 1970s. The increase in nitrate has adversely affected the quality of spring water and the most probable cause is the application of fertilizers in and around the springs.

Although inconclusive at this time, the preliminary analyses also suggest that total dissolved solids (TDS) has increased since the 1980s. Potential causes of the increase in TDS are currently being investi-

gated.

On September 5, **Dr. Rick Copeland**, a professional geologist in the Hydrogeology Program, reported these preliminary findings to the Spring Task Force at a meeting held at Blue Springs State Park in Orange City. He also reported that FGS and the water management districts are currently working together on this evaluation and a final report should be completed either in late 2003 or early 2004.

Florida Aquifer Vulnerability Assessment Model Update

The FAVA Technical Advisory Committee (TAC) reconvened in early June to receive an update on the project. **Richard Deadman** from the Department of Community Affairs was introduced as a new member of the TAC at the meeting. During the meeting FGS staff presented

several methodologies to the committee. The TAC proceeded to then direct the FAVA group to continue model development using three of the methodologies offered. They include Weights of Evidence, Fuzzy Logic and a Travel Time method. Additionally, the committee added Leon and Dade counties to the

list of existing pilot areas, which included Alachua, Hillsborough and Polk counties.

While all three methods yield similar results in the lower and higher ranges of vulnerability, the mid-ranges differ, as do methods for model validation. Each of the methods utilizes the following spatial layers:

thickness of confining unit, soil permeability, and the percentage of an area covered by karst features.

Weights of Evidence quantifies relationships between spatial layers with actual contaminant occurrences in order to support a hypothesis. Using these calculated relationships, interactions

are analyzed to yield a data-driven predictive model. The magnitude of weights depends upon the measured association between predictors and known occurrences.

A Fuzzy Logic model, utilizing the same spatial layers as the weights of evidence model, however, will be estimated subjectively using expert knowledge to approximate the relative importance of each feature. This method is similar to the foundation for the DRASTIC model. Fuzzy memberships are then combined using a range of operators to calculate a knowledge-driven predictive model.

The Travel Time method explained in its simplest form is the estimated time it takes surface water to reach the saturated zone of an aquifer. This estimate

is calculated by adding the time it takes for a unit of water to travel through the soil vadose zone, the near-surface vadose-zone geology, and the confining unit (if present). The output is then multiplied by a factor to account for karst-feature density. Areas with short travel times are then classified as highly vulnerable in the predictive FAVA model.

Other News

During the summer three new employees were added to the project while one departed. The new employees are **Brandon Ashby**, **Rupa Sharma** and **Alex Wood**. Brandon and Rupa are currently enrolled as students at FSU while Alex came to us from the Northwest Florida Water Management District. **Shaun Ferguson**, an OPS Research Assistant

left due to graduation and was recently awarded the Department of Urban and Regional Planning's Best Research Paper for his Master's research paper, "DRASTIC vs. FAVA: A Comparison of Two Available Methodologies for Aquifer Protection in Florida: A Case Study in Orange County".

Upcoming Events

Jim Cichon and **Alex Wood** will be attending the Florida Chapter of the American Planners Association Conference in Key West this September where they will be maintaining a tabletop display for the FAVA project. Meanwhile, Shaun Ferguson has been invited to the conference as a guest speaker by FSU's Department of Urban and Regional Planning to present his thesis work.

[http://](http://www.floridaplanning.org/)

www.floridaplanning.org/

A third TAC meeting will convene on October 1 and 2 in Orlando. To gain a better understanding of weights of evidence and fuzzy logic, the FGS has invited **Gary Raines** to be present at the meeting.

Alan Baker and **Jon Arthur** will attend the Denver GSA meeting in October where Jon will present a workshop on 3-D mapping and Alan will present a paper on FAVA in the Physical Hydrogeology session. The abstract can be viewed at the following web site.

http://gsa/confex.com/gsa/2002AM/finalprogram/abstract_39775.htm



Florida Springs Conference

Florida has over 600 springs, ranging in flows from mere trickles to tens-of-millions of gallons per day. Many are world-famous attractions; others are relatively unknown. The second conference on Florida's springs will bring together experts in geology, water resources, land use planning and government, in addition to elected officials, policy makers and the general public.

The conference will fo-

cus on the natural, historic and recreational values of the springs; research and monitoring that describe their current health; human activities that threaten them; and solutions for their protection.

The conference will also present the results of research, monitoring, restoration and education projects funded by Governor Bush's Florida Springs Initiative.

Pre-conference field

trips will tour the basins of Ichetucknee Springs and the springs of the Santa Fe River to learn of their expansiveness and the human activities that affect groundwater as it flows to the springs. Observe cave divers entering karst windows to reach the spring caves and visit these extraordinary springs.

There will be exhibits, posters and paintings and photographs of springs. If your company or agency

would like to provide an exhibit, please let us know.

The first conference on Florida's springs was a sell-out. Register early.

For further information contact Jim Stevenson

James.Stevenson@dep.state.fl.us

To register: www.cmc-associates.com/springs

See Page 15 for other meetings and conferences.

Natural Gems – Troubled Waters

Presented by the Florida Department of Environmental Protection
February 5-7, 2003 at the Sheraton Hotel in Gainesville, Florida

Coastal Research Program

New Multi-year FGS/ MMS Cooperative Agreement

The U.S Department of Interior Minerals Management Service (MMS) and the FGS Coastal Research



Deep Water Vibra-Coring Offshore
Florida East Coast

Program have commenced a new multi-year cooperative agreement designed to locate sand deposits in federal waters off the northeastern coast of Florida suitable for beach restoration. This includes the area offshore of Nassau, Duval, St. Johns, Flagler and Volusia Counties. Projected duration of this project is 5-6 years. The scope of this study includes the publication of an annotated bibliography describing previously conducted work in the area, a baseline survey character-

izing beach sand in the study area, the collection of subsurface acoustic profile data in federal waters, and the acquisition and analysis of numerous bottom grab samples and vibracores.

Results of this study, which will be published as an FGS publication, will identify sand deposits as well as estimated volumes. The publication will be in an ArcView interactive CD format designed to provide user friendly offshore data/information to state/county officials and planners to assist them in the development of effective plans to restore the area's eroded beaches.



Beach Site #1 located on Panama City Beach

FGS Gains a Coastal Research Facility in Panama City Beach

The Navy and the FGS have renewed a Memorandum of Agreement establishing a working relationship to facilitate cooperative efforts, and to leverage mutual expertise in the broad areas of coastal science, engineering and technology. This cooperation now includes a Lease for Use of Beach Site #1 located on Panama City Beach (see photo below). This two story site will be used by the FGS Coastal Research Program as a laboratory, coastal core repository and as a staging area to conduct offshore research along the Panhandle.

For more information on the FGS Coastal Research Program contact **Dr. Ron Hoenstine**

New FGS Employee

The FGS is pleased to announce the recent addition of **Daniel Phelps** to the Coastal Research Program. Dan transferred from the Underground Injection Control (UIC) Section in DEP's Division of Water Resources Management. His education includes an M.S. degree in Geology from Duke University and an M.S. degree in Environmental Management from the University of Houston. Dan has approximately 10 years experience working in the private and public sector as an exploration geophysicist and over 12 years experience in environmental regulation and protection with FDEP. Dan's experience with the U.S. Army Corps of Engineers conducting coastal offshore sand reconnaissance investigations closely parallels the tasks associated with his new position at the FGS. Dan will be a principal investigator of a new multi-year FGS/U.S. Minerals Management Cooperative Investigation to identify new sand deposits suitable for beach restoration in coastal waters offshore Northeast Florida. Dan will be extremely busy relocating his wife and new born daughter to Tallahassee from West Palm Beach as well as preparing for a two week period of offshore seismic profiling at the end of October.

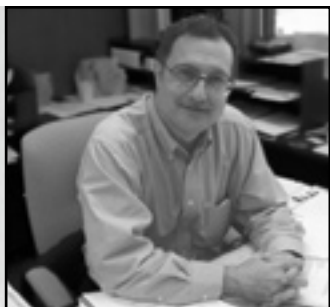
AASG Sponsored Mentorship Program at FGS

In June of 2002, **Mr. Kenji Butler** was awarded an American Association of State Geologists (AASG) mentorship grant of

\$3300.00 dollars to spend six weeks doing field work under the supervision of FGS geologist, **Harley Means**. This program

has sponsored three undergraduate students from Florida State University, Department of Geological

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The Chief's Corner

By Walt Schmidt

Measuring Geologic Research Projects as Productive Outputs Towards the Desired Outcome of Natural Resource Conservation

I have written on several prior occasions of the value of economic rocks and minerals to our society and our very livelihood. Many Federal and State Geological Surveys have active programs in assessing their states mineral resources and reserves and the overall economic impact these commodities have on their States' associated tax base. As we approach another celebration of *Earth Science Week*, I wish to emphasize other aspects of state geologic surveys and how these aspects as well provide critical information supporting the foundation of our lifestyles. We all must come to realize that we depend on earth's natural systems and natural resources to survive. Are these resources finite and is the carrying capacity of various solid-earth and hydrologic systems also finite? Of course! This is why the phrases "environmental preservation" and "natural resource conservation" were devised. In reality, the environment is the dynamic result of a series of differing processes over time and no place on earth is truly static. Our

natural resources cannot be "preserved" unless our species changes it's consumer mentality. Even within our urbanized civilization, every human being and indeed every living thing is dependent on the generosity of nature. We see it daily on the evening news as weather reports – heat waves, droughts, floods, forest fires, tornados, and hurricanes – and as the quality of our environment degrades reported as water, air, soil, and food quality loss. Many of us living in large communities can live totally in air-conditioned comfort, from our home or apartment building to the car stored in its garage, to the garage of a downtown business building and the office itself. Often many buildings are connected to theatres and shopping malls, so we can live for days and nights without ever actually going outside. Who has to worry about the seasons, time of day, weather conditions, natural resources depletion, or environmental pollution? Further, our species is the only one that is not limited to a specific habitat, because we have learned to exploit the resources of our surroundings in ecosystems as varied as des-

ert, arctic tundra, tropical rainforests and wetlands, coastal islands, and prairie grasslands. This "intelligent" exploitation of our resources has resulted in our loss of a sense of connectedness to nature. Something the American Indian has described on numerous occasions. We seldom have the realization that everything we do has repercussions somewhere else in the system. Every item we purchase, every economic transaction has consequences for our planet and all life on it, but we rarely think about it. The earth is the source of everything and it is finite.

Industrialized society is geared towards output measurement. How many televisions, computers, SUVs, or cans of coke can we sell, make, or consume? What we typically don't factor into the equation are the natural services required to support this output. Why? Because we generally think of nature's services as free. Maybe in a strict economic sense they are free. The earth is the source of clean air, water, fertile soil, and minerals with no strings attached. But there have been efforts to quantify the value of nature's service.

One recent assessment (*Science*, volume... 297, p.950) shows that simply in terms of dollar value, conserving natural areas is actually 100 times more profitable than exploiting them. In each case discussed, the economic value of the conversion activity – the sales of the end product, jobs created etc. – was far less than the value of the services provided by intact natural earth systems nearby – things like sustainable, low impact logging, flood protection, sustainable hunting and fishing, and provision of clean water.

So where am I going with this? The Florida Geological Survey spends much of its research effort in inventorying and assessing Florida's solid-earth resources. This includes collecting data on our ground water resources and the aquifers that hold this precious life giving resource. We collect geologic data and provide professional interpretations on this information to aid policy makers, developers, and land owners in their decisions on aquifer recharge issues, on aquifer vulnerability characteristics to contamination and

transport, to understanding geologic hazards including sinkholes, pipeclay, coastal and fluvial erosion or accretion, underground waste injection, landfill siting, aquifer storage & recovery well design and processes understanding, land-use zoning / planning, mineral resource reviews, ecosystem and wetlands understanding, municipal water well location and design, contamination clean-up and remedial action plans, building foundation or bridge design, highway corridor planning, surface water / ground water interaction assessments to support water quality regulations, for quarry and dam construction design, for geologic education and prehistorical development of Florida understanding.... To name a few! Now, how does one “measure” the value to society of assessing or inventorying these solid earth natural resources? Maybe we should look at the cost to society if we did not do such geologic assessment. The cost of *not* having clean water protected from natural or anthropogenic contamination, the cost of *not* having building materials to build our homes, malls, and roads, the *increased cost* of building over pipeclay or erosion areas, the *increased cost* or liability of building in flood prone areas and *not* understanding how wetlands or surficial water tables function, the cost of *not* understanding how our surface water

interacts with our aquifers and unknowingly and ignorantly placing septic systems, industrial developments, landfills, injection wells, water wells, residential communities, or poor farming practices over our vulnerable fresh groundwater resources, or the *consequences* and *costs* to taxpayers of building too close to an eroding coast or river flood plane, or developing over an important sand / gravel deposit thereby causing *increased cost* to the public to transport materials for cement and concrete for home building. Do we adequately understand how land-use changes in a drainage basin can change the water quality and sedimentation (and therefore habitats) of downstream estuaries? One properly done geologic report can be used over and over again to provide assistance to solving many different problems by state, county and local governments, as well as environmental consultants, industry, land and mineral owners, and the public. The same report can be updated with additional data and “value added” derivative maps produced to again provide answers to a selected topical need or problem. A state geologic survey provides a “library” of geoscience data available for any user as needed. It provides a corporate memory of solid earth activities and data to avoid duplicative expense over and over again.

While it may be difficult to “measure” and compare the productivity of geologic research projects with one another or from year to year, they surely and intuitively have clear value to the people of the state. In fact, one study by another state geological survey, found that geologic map products return between 7 and 55 times their initial cost to the taxpayer. What other Government program can make that statement?

So, this years Earth Science Week (ESW) is October 13th through the 19th. National Water Quality Monitoring Day (the 18th) is also planned during that week, celebrating the 30th anniversary of the passage of the Clean Water Act. This years ESW theme is “Water is All Around You.” In Florida, this is a theme we can identify with, from our Peninsula being surrounded by the Gulf of Mexico and the Atlantic Ocean, to our numerous wetlands and vast amounts of groundwater, to our substantial annual rainfall. Our Peninsula (the exposed part of the Florida Platform) is a model for the Hydrologic Cycle and our state is a haven for hydrogeologic studies. In fact, I have referred to our Peninsula as a “hydrogeologic engine” as these processes continually modify and support our water dominated physiography. So, get involved this Earth Science Week, and share your geoscience expertise,

and don’t worry about “measuring the impact” of your success, just do it!



Earth Science Week at the Florida Geological Survey

The Florida Geological Survey will hold an open house on Wednesday the 16th of October. Middle and High Schools along with Home schooled students have been invited to tour the building . Staff Geologists will also give talks to interested students. (See related story page 13) for additional information on this year’s National Earth Science Week Celebration go to www.earthsciweek.org

FGS GEOLAB at EARTHDAY at the Capitol

Established in 1970, our country observed its 32nd Earth Day on April 22, 2002. It was celebrated in Florida at the Capitol in the courtyard outside of the Capital rotunda between the House and Senate buildings. Displays were setup by various agencies of the Florida Department of Environmental Protection. The Florida Geological Survey displayed its GEOLAB, in which various earth science functions were provided for hands-on use. Posters and brochures about the Survey and Florida geology were distributed to the interested public. The Governor did a walk-through of the Capitol Courtyard viewing the displays on his way to an appointment. The Lt. Governor presided over the event, announcing an enhanced State program for recycling.

National Cooperative Geologic Mapping Program AASG Mentoring Program



John Phillips (left) and Will Evans (right) standing on fractured Alum Bluff Group sediments in abandoned pit in Washington County, Florida.

The Florida Geological Survey recently finished field mapping the western portion of the USGS 1:100,000 Marianna quadrangle and is currently in the process of completing the final maps and geologic cross sections. The completed maps and geologic cross sections will be available in December, 2002 as part of the FGS Open-File Map Series (OFMS-91). This mapping is part of an ongoing cooperative effort through the STATEMAP component of the National Cooperative

Geologic Mapping Program (NCGMP). This program, which is cooperatively funded by the NCGMP and the Florida Geological Survey, has produced geologic maps, geologic cross sections, and surficial sediments maps for four and one-half 1:100,000 quadrangles in Florida during the last nine years. Under this program, FGS geologists

map approximately 1,000 square miles per year. This requires extensive field work and includes coring in areas where data are lacking. The 2002-2003 study area will be the eastern portion of the USGS 1:100,000

Marianna quadrangle.

Beginning in 1999, the FGS entered into a cooperative agreement with the Association of American State Geologists (AASG) designed to provide mentored field training for students interested in learning geologic mapping techniques. This student mentorship program, which provides funding for the students in the form of a \$3,300 award, is utilized by the FGS in order to hire students for several weeks while they are being trained in various aspects of geologic mapping in the state. Training typically includes several days of "hands on" field work in the STATEMAP field area, training in the use of several computer programs, and laboratory description of cores and well cuttings throughout the study area. Upon completion of the

program the student provides a written report on their mentored experience as well as an oral presentation on the geology of the STATEMAP study area to the FGS staff.



Will Evans with clay filled fracture in Holmes County borrow pit.

Earth Science Week Proclamation



Once again this year, **Governor Jeb Bush** has signed a proclamation recognizing the second full week of October as Earth Science Week. In extending greetings to those observing Earth Science Week, the Governor acknowledged that the earth sciences are integral to finding, developing and conserving our mineral, energy, and water resources needed for Florida's continuing prosperity.

He further recognized the contributions earth science makes to natural hazards mitigation, waste disposal and clean-up, protecting and understanding our aquifers and ecosystems, and providing basic information to support land management and land use decisions. The full text of the Governor's proclamation can be viewed on the FGS website at: <http://www.dep.state.fl.us/>

[geology/newsevents/govproc](#)

The USF Geology Alumni Society Acquires a Rock

by Bob Bretnall

The University of South Florida Geology Alumni Society now has an 8-ton piece of the Ocala Limestone set in our USF GeoPark. The rock comes courtesy of the folks at the Lecanto Pit of Crystal River Quarry, **Tom Scott** of the Florida Geological Survey, and **Dave DeWitt** of the Southwest Florida Water Management District. The rock was transported to the site on a District flat-bed trailer and placed at its current location by Stepps Towing. After washing off loose sediment, the rock revealed numerous surfaces covered with *cav-

ern-coating crystals, including a few soda straws, and indicative fossils. The rock was properly blessed with an adult carbonated beverage and is available for any and all rock hounds to visit. The USF Geology Alumni Society thanks the many folks at the District,

Survey, and USF who directly and indirectly provided their time adding the rock to our slowly evolving GeoPark. The USF GeoPark is located north of the student parking lot at the northwest corner of Magnolia and Alumni Drives on the Tampa campus,

where USF Department of Geology and other students can apply field methods at a sinkhole studied back in the 1980's by John Parker, currently with the District. The USF GAS 5th Annual Equipment Exposition will be held at the USF GeoPark on Friday, February 14, 2003, showcasing equipment used in the field by geologists. Plan now to attend. Please visit the rock and let me know what you think about this easily accessible specimen of Florida geology. You can contact me, Bob Bretnall, at rebret@aol.com or at HSW Engineering, Inc. at (813) 968-7722.



8- ton piece of The Ocala Limestone set in USF Geopark.

In Memorial

Well Known Florida Paleontologist Passes Away

Ms. Muriel Hunter, paleontologist and avid supporter of Florida Geology, passed away July 15, 2002 at the age of 85. Muriel was influential in the geological development of many geologists who continue working in the State. Muriel's extensive collection of invertebrate fossils, collected from the SE USA, Caribbean, and Australia, are now repositied at the Florida Museum of Natural History (FLMNH). Donations may be made in Muriel's memory to the FLMNH, Invertebrate Paleontology Division, P.O. Box 117800, University of Florida, Gainesville, Florida 32611

Botanical and Geologic Tour of Tree Islands in Everglades Wildlife Management Area, Northwestern Miami-Dade County

December 7 & 8, 2002

Sponsored by the Miami Geological Society
& Florida Native Plant Society

Where: Departure and return from the Everglades Holiday Park (954-434-8111) on Highway 27 just north of the Dade-Broward County line. We will travel via a 30-passenger airboat to several tree islands north of Tamiami Trail in northwestern Miami-Dade County.

When: 2 separate dates, December 7 and 8, Saturday and Sunday. Sunday is a repeat of Saturdays trip. Meet at 8 am at the dock and return about 5 pm.

Who: Each day open to only 30 members of the Miami Geological Society or the Florida Native Plant Society or both, and must be at least 12 years old.

Cost: \$35 per person

Registration: MGS members send check made out to the Miami Geological Society to—MGS, POBox 431552-1552, South Miami, FL 33243 and FNPS members send check made out to the Florida Native Plant Society to—FNPS, Also, state if you prefer the Saturday or Sunday trip.

Field Trip: **Tim Towles**, Biologist, Florida Fish & Wildlife Conservation Commission
Guides: **Dr. Debra Willard**, Geologist, US Geological Survey, Reston, Virginia

Purpose: Tree islands are considered key indicators of the health of the Ever-

glades ecosystem because of their sensitivity to both flooding and drought conditions. The trip aims to expose participants to (1) the canopy and herbaceous strata of Everglades tree islands, and their geologic history; and (2) the aquatic plants and geologic evolution of Everglades ridge and slough landscape.

Recommendations: Bring your own lunch and drinks, sunscreen, hat, rain gear, chest waders—that is be prepared for the weather of the day and to get your feet wet.

FGS Geologist takes on Springs Initiative Duties

FGS geologist, **Guy H. (Harley) Means**, was



Guy H. (Harley) Means

recently chosen by DEP to expand his duties to include training under the current Springs Coordinator, Jim Stevenson. This training will include all aspects of the Florida Springs Initiative with the intent of having Means assume the Springs Coordinator position

upon Stevenson's retirement. Stevenson is currently in the DROP program and will be retiring in less than a year from DEP.

Means has been involved with the FGS portion of the Springs Initiative, and has overseen the Survey's efforts to revise Bulletin 31, The Springs of Florida. This Bulletin provides water quality data, location information, and other aspects of Florida's more than 700 currently known springs. This re-

vised volume is due to be published in June, 2004.

Means' new duties will include spending time interacting directly with Stevenson and learning about how the Florida Springs Initiative is implemented. He will be working with all involved Divisions within DEP, and other governmental and non-governmental agencies to implement programs that will aid in accomplishing the goals outlined by the Florida Springs Task Force.

New Publications at the Florida Geological Survey

Reprint of "Florida's Hydrogeologic Environment"
Poster
By Paulette Bond

Florida's population growth creates ever-increasing pressures on the state's springs and other fragile water resources.

This poster illustrates many of the complex relationships that exist between a Florida community and the environment which sustains it.

New printing of "Protecting Florida's Springs"
Poster
By Paulette Bond and Jim Stevenson

Water flowing from a spring begins with rainfall in the spring's recharge area. A small spring's recharge area may be a hundred acres but a large spring's recharge area may

be over two hundred square miles. Rainwater travels through soil and other materials into the limestone and moves slowly through the limestone eventually finding fractures and caves to follow to the spring.

Certain human activities in the recharge area cause pollution that is carried through the soil by rainwater. The pollutants including bacteria, fertilizer, pesticides, gasoline and other chemicals from stormwater will eventually reach the spring. Wells in the recharge area, which pump water for irrigation and drinking water, are reducing the flow of many springs. Careful land use planning and sensitive land stewardship can avoid or reduce pollution in spring recharge areas.

Bulletin 65, "Late Oligocene to Pliocene Evolution

of the Central Portion of the South Florida Platform: Mixing of Siliciclastic and Carbonate Sediments", by Thomas M. Missimer.

This report summarizes the results of a multi-year investigation of the lithostratigraphy, paleoenvironments, and chronostratigraphy of the upper Paleogene and Neogene sediments underlying the central part of southern Florida. The data presented will be useful to scientists, planners, and citizens in understanding the stratigraphy and geologic history of the strata containing Florida's groundwater aquifers.

Open file Report No. 84, Moment Versus Graphic Measures in Granulometry By James Balsillie, Adel Dabous, and Cindy Fischler

This work compares the

two methods using 333 marine sediment samples. It was found that the means show approximate agreement, with graphic means underestimating the moment means by a maximum of 0.6 ϕ . All higher graphic measures however, are not successful in replicating moment measures, the degree of disagreement progressively increases with the order of the moment measure. Standard deviation measures had a correlation $r^2=0.6486$, for the skewness $r^2=0.0865$, and for the kurtosis $r^2=0.0098$. Average ratios between moment measures and graphic measures become increasingly worse as the degree of the moment measure increases. We conclude, therefore, that graphic measures are not good approximations of moment measures, and their use should be discontinued.

Upcoming Meetings

Seven Hills Regional User Group

is holding a GIS Workshop in Tallahassee (for more detail log on to www.shrup-gis.info)

Florida Springs Conference

Natural Gems – Troubled Waters, February 5 – 7, 2003 at the Sheraton Hotel Gainesville, Florida Sponsored by the Department of Environmental Protection

GSA Annual meeting

10/26-10/30, Denver Co.

FAVA Technical Advisory Committee

(TAC) Workshop located in Orlando Florida on 10/1 thru 10/2

Drinking Water Protection in Karst Terrain:

A Groundwater Conference and Field Seminar May 21-22, 2003 located at Southwest Virginia Higher Education Center,

Continued from Page 9

Sciences, and has provided these students with the opportunity to do some hands on field work and get a feel for what might await them upon graduation.

Mr. Butler went in the field with the FGS Springs Initiative sampling crew and learned about sampling for water quality, measuring discharge, navigation using GPS equipment, and other aspects of Springs field work. He became an invaluable part of our sampling team and may

continue to work with FGS after his AASG mentorship is over.

As a requirement of the mentorship program, Mr. Butler will give a presentation to FGS staff on his experience as a spring sampler. He will report on an aspect of the sampling that interested him. This program is an innovative way to give undergraduates some experience in a professional setting and hopefully will help prepare them for their future careers.

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DEPARTMENT OF ENVIRONMENTAL
PROTECTION

JEB BUSH, GOVERNOR
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FLORIDA GEOLOGICAL SURVEY
WALTER SCHMIDT, STATE GEOLOGIST

FLORIDA GEOLOGY FORUM
DESIGNER/EDITOR, PAULA POLSON

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