

Florida Geology Forum

A Newsletter from the Florida Geological Survey Vol. 21 No. 1 July 2007

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Florida Geological Survey Celebrates Centennial

Walt Schmidt, State Geologist and Chief

Editor's Note: The photograph above was taken during the recovery of mastodon bones from Wakulla Springs in 1930. Mr. Clarence Simpson (far right) of the Florida Geological Survey assisted with the recovery efforts.

The year 2007 marks the 100th anniversary of the establishment of the Florida Geological Survey (FGS). Currently a Bureau within the Division of Resource Assessment and Management in the Department of Environmental Protection (DEP), the DEP/FGS in earlier years has been a part of the Department of Natural Resources, the Board of Conservation and initially an agency that reported directly to the Governor. The DEP/FGS continues as the oldest state agency functioning under both its original legislative enabling statute and its original title.

The work of the Florida Geological Survey has been shaped by the needs and concerns of the state over the course of its existence. Its original assignment to the Office of State Geologist was to map soils and near-surface geology in order to assist with drainage of wetlands (then seen as a liability) and facilitate land development. Later, as Florida grew, locating and mapping of mineral resources was necessary to support the construction that accompanied economic development throughout the state. In recent decades private enterprise has extended the search for mineral resources. The focus of the DEP/FGS has shifted as the needs of Florida have evolved. As the state grew in population it became increasingly important to understand its complex environment. That understanding led to the realization that the environment should ideally be viewed holistically as a series of interconnected ecosystems. The geological underpinnings of these systems are fundamental in understanding their differences.

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As Florida has grown, the need to conserve valuable natural resources has become essential. Fresh water is increasingly recognized as one of our most precious natural resources. Staff research has focused on the definition of aquifer characteristics to facilitate the protection and conservation of ground water. The research of our staff has been dominated by the need to document and understand groundwater flow in Florida's karst terrain. The FGS cooperates in its ongoing research with other groups within DEP, state government and universities. This cooperation has increased over the years and resulted in improved knowledge and protection of our state's water resources and its environment. Mapping of Florida's swallets (openings through which sinking streams lose water to the subsurface) along with springs and springsheds, has improved our ability to protect groundwater resources. The analysis of trends in geochemical data collected from Florida waters is also providing valuable insight into activities that impact the state's water resources over time.

The DEP/FGS maintains Florida's only state-wide geologic sample repository which contains more than 18,000 sets of stratigraphic core tests and well cuttings. Geophysical wireline logs for many wells are maintained at the Gunter Building and geologist's descriptions (logs) of these samples are available online and also in hard copy. The dedicated Geosciences Research Library, available to professional researchers and the public, is a Florida treasure. The FGS headquarters is currently housed in the Herman Gunter Building (named for the 2nd State Geologist) on the Florida State University (FSU) campus. The Oil and Gas and Drilling Operations Programs are located at the DEP Warehouse on Commonwealth Boulevard. Two Oil & Gas district field offices are located in Ft. Myers and Jay, Florida.

The head of the State Geological Survey is designated the "State Geologist" by statute. Five State Geologists have headed the FGS during its first 100 years. The stability and continuity provided by that leadership has built an irreplaceable resource that becomes more valuable as Florida grows. In 1919, the FGS began archiving well samples with the receipt of cuttings from an oil test well. The well is located four miles south of Chipley in Washington County and was drilled to a total depth of 4,912 feet. Before the advent of modern oil exploration methods a number of deep "wildcat" wells were drilled in locations scattered across Florida. Samples from these wells are priceless--both because of the expense involved in drilling and their location in areas that are now known to be barren of oil. These samples and numerous others also obtained by donation over the years are archived, stored at the DEP/FGS core repository and made available to qualified researchers.

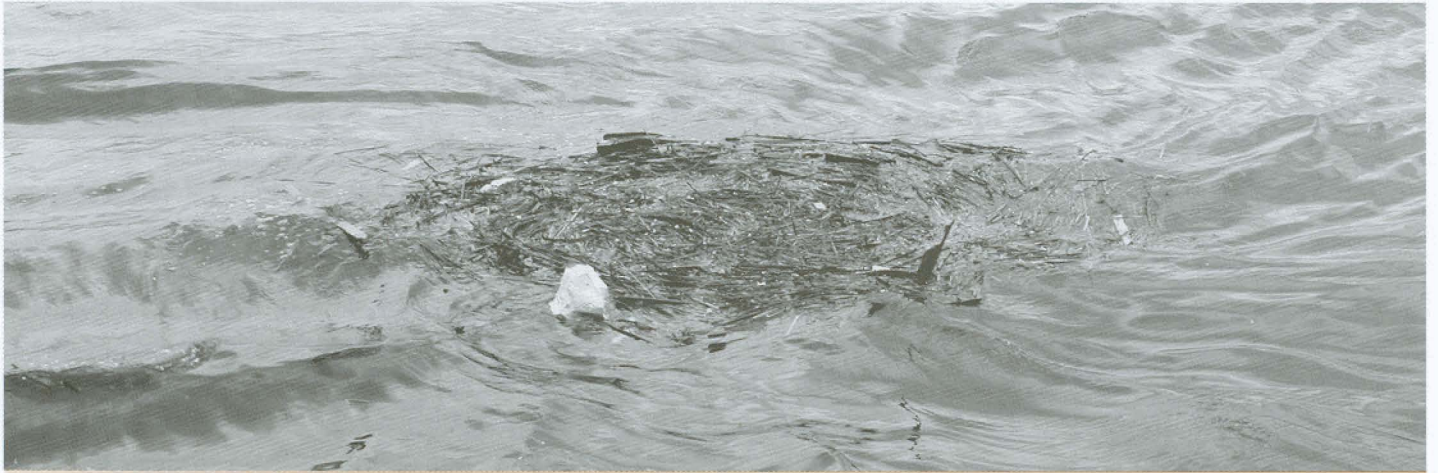
Geologic data along with interpretations are made available in various publications series and serve as the foundation for mineral resources assessments, geologic mapping and the characterization of aquifers. This data is also useful in delineating areas of aquifer recharge and discharge and assessing the potential for geologic hazards such as sinkholes, flood-prone



SCUBA Diver
Silver Springs, Marion County

areas, radon and coastal erosion. The information is vital in land use planning, zoning decisions, contamination clean-up, the location of injection and water wells, landfills, and the promulgation of environmental regulations.

In recognition of its centennial anniversary, in June 2007 the DEP/FGS hosted the 99th annual meeting of the Association of American State Geologists in Key Largo. The AASG is composed of the 50 State Geologists and the director of the Puerto Rico Bureau of Geology. The meeting's location in Key Largo allowed geologists from all over the nation to attend field trips to Everglades National Park, Windley Key Fossil Reef Geological State Park and John Pennekamp Coral Reef State Park. The field trips were of interest to geologists from the modern perspective of environmental issues surrounding the Everglades and the Florida reef tract. They also provided a geological perspective of the Everglades as a modern model for ancient coal forming environments with Windley Key as an easily accessible, exquisitely preserved ancient coral reef.



Debris Accumulation Resulting from Reversal of Flow at Spring Creek

Cessation of Flow at Spring Creek

The Spring Creek Springs Group is located along the Gulf coast of Florida in southwest Wakulla County and is one of Florida's 33 first magnitude springs. It is comprised of 13 known vents and may include other smaller, undiscovered vents. The water that discharges from Spring Creek is generally high in chlorides and total dissolved solids which suggests that fresh groundwater and saltwater are mixing in this system. While cave systems are known to be associated with the vents, divers have been unable to enter because of the high flow volume, tannic (dark) water, oyster growth around the vents and other hazards.

One of the largest discharges ever recorded from Florida's more than 700 known springs was measured at the Spring Creek Springs Group. On May 30, 1974, discharge was measured at approximately 1.3 billion gallons per day (2,000 cubic feet per second). In stunning contrast, flow recently ceased at this same group of springs and waters were observed to backflow into a vent as evidenced by an accumulation of debris at the water surface, on June 12, 2006. This demonstrates the enormous variability in discharge that is observed in at least some of Florida's springs.

The cessation of flow at the Spring Creek Springs Group grabbed local media attention in late 2006. Newspapers reporting on the event speculated as to the cause. Spring Creek Springs Group has been known to cease flow historically as reported by area residents. One hypothesis put forward to explain this latest cessation of flow in the system involved a magnitude 6.0 earthquake recorded in the Gulf of Mexico on September 10, 2006. It was postulated that the earthquake resulted in a collapse in the cave system that supplied water to the springs. This

hypothesis is considered unlikely given that the springs had not been flowing since at least June 12th of 2006, based on observations by the DEP/FGS springs water quality sampling crew.

A more reasonable, but prosaic, explanation for the springs mysterious behavior is that drought conditions lowered the water level in the Floridan Aquifer System enough to reduce the pressure that drives spring flow. A number of karst features known as swallets are located in the western part of Wakulla County. Streams like Lost Creek and Jump Creek flow east out of the Apalachicola National Forest and disappear underground into swallets when they reach the Woodville Karst Plain. In late summer and throughout the fall, this region received little rainfall and these creeks dried up. This corresponded with the cessation and reversal of flow at Spring Creek. During 2006 the city of Tallahassee recorded a 13 inch deficit of rainfall.

The Spring Creek Springs Group is of particular interest to hydrogeologists because of its close proximity to Wakulla Spring, another first magnitude spring, and its possible underground connection to that system. Cave divers have mapped a cave starting at Wakulla Spring that appears to be oriented in the general direction of the Spring Creek Spring Group. There also appears to be a groundwater divide in this cave as divers have reported that flow direction reverses to the south. Understanding the complicated interconnected nature of these two springs will ultimately lead to better protection of the groundwater and surface water that provide flow to these springs.

Flow has now returned to the Spring Creek Springs Group and has been restored in Lost Creek and Jump Creek. Later this year, a dye trace will be conducted in Lost Creek to document the path of water flow once it disappears underground. It is considered likely that most of the water from Lost Creek, once it enters the aquifer, will travel fairly rapidly to some of the vents that discharge at the Spring Creek Springs Group. Completion of the dye trace will provide an important clue as we seek to improve our understanding of the interaction between surface and groundwater within the Woodville Karst Plain.



Stalactites at Florida Caverns State Park, Marianna, Jackson County

New Publication on Caves and Karst

In April 2003, the DEP/FGS sponsored a symposium, along with the Hydrogeology Consortium and Hazlett-Kincaid, Inc., to facilitate discussion among scientists, resource managers, cavers and the public on the significance of caves and springs to the State of Florida. It was apparent during the meeting that cavers with experience in dry caves (caves above the water table) and those with experience in wet caves (caves that are below the water table) have substantial practical knowledge. Scientists conducting cave research bring a theoretical perspective to their work.

It was also noted that cavers did not necessarily use the same words to describe the same features even when talking among themselves. Communications between the caving and scientific communities have also been affected

by the lack of a common vocabulary. One product of this meeting was a recommendation for the development of a glossary of hydrogeologic and cave-related terms used in and near Florida, including the Caribbean. Based on this recommendation, **Ms. Sandra Poucher** of the National Speleological Society and **Dr. Rick Copeland** of the Florida Geological Survey have recently completed a cave and karst hydrogeology glossary. The Speleological and Karst Glossary of Florida and the Caribbean was published by the University Press of Florida in the fall of 2006. For further information regarding the glossary contact the University Press of Florida, 15 NW 15th Street, Gainesville, FL 32611 or visit <http://www.upf.com>.

Big Dismal Sink, Leon Sinks Geological Area, Leon County

Hydrogeology Section Update

The Woodville Karst Plain (WKP) lies south of Tallahassee (Leon County) extending east into Jefferson County and south into Wakulla County. In Jefferson and Wakulla counties it is bounded by the Gulf of Mexico. Surface waters can be observed as they enter the underlying aquifer system and the locations of sinkholes where this occurs (swallets) have been documented. The contribution of sinking streams to the aquifer system is also being investigated. The discharge of ground water is being documented at Wakulla Springs and the Spring Creek Springs Group. Characterization of ground water flow in karst areas is notoriously difficult but vital for both scientific understanding and effective environmental protection of these areas.

The DEP/FGS, cave divers of the Woodville Karst Plain Project and scientists from FSU and the private firms of Hazlett-Kincaid Inc. and Technos Inc. have combined their resources to understand and quantify the interaction of surface and ground water in WKP karst watershed. The work of the cave divers combined with the results of dye tracing experiments is allowing the WKP watershed to be characterized as a three dimensional system. The ultimate objective is the development of predictive models that can anticipate the effects of natural and anthropogenic events on the health of the watershed. This would provide a valuable tool for managing and/or lessening the impacts of these events rather than dealing with them after the fact. The projects described below are part of an ongoing effort to develop such a model for the Woodville Karst Plain with the possibility of extrapolation to similar watersheds elsewhere.

- Dr. Eric Chicken** of FSU's Department of Statistics and **Dr. David Loper** of FSU Department of Geological Sciences are taking the lead in the statistical analysis of data from flow and water level meters deployed in Wakulla Spring.

- Dr. Tim Hazlett** and **Dr. David Loper** have finalized models for predicting groundwater flow in karst systems.

- Instrumentation will be deployed in the Spring Creek Springs Group submarine system in preparation for dye tracing studies to investigate the possibility that water flow may be split into two flow paths, one going to Wakulla and the second





Wakulla Springs, Wakulla County

to Spring Creek. It is thought that this splitting depends on rain fall, storm events and tidal action among other factors. Five new flow meters will be purchased and deployed with monitoring tubing, pumps and other supporting equipment into the vents of five springs within the Spring Creek Springs Group system.

- Dye tracing studies will be conducted to determine whether dyes can be recovered at Spring Creek Springs Group after being injected into Lost Creek and Turner Sink.
- An additional monitoring well will be drilled in the Wakulla Springshed for better documentation of flow dynamics and water quality.
- Monitoring of dye injected into wells at the Tallahassee sprayfield in 2006 will be resumed, supported by funds provided by the Florida Springs Initiative.
- The DEP/FGS is collaborating with Technos Inc. to conduct microgravity surveys along key transects in the WKP with funding provided by the National Oceanographic and Atmospheric Administration (NOAA).
- In collaboration with **Dr. Bill Burnett** and **Dr. Jeff Chanton** of the FSU Oceanography Department, and supported by funding from NOAA, the DEP/FGS will establish a base line for radon and methane concentration in aquifers and surface water throughout the WKP. This data, combined with data obtained from the Spring Creek Springs Group will be used to quantify ground-water discharge into surface waters to assist in the development of a water budget for the WKP. The information will eventually allow development of Minimum Flows and Levels (MFLs) and Total Maximum Daily Loads (TMDLs) for those water resources.
- The DEP/FGS, in collaboration with the Hydrogeology Consortium and Hazlett-Kincaid Inc., will conduct another karst short course and field trip in the Santa Fe River watershed.
- The DEP/FGS will continue its collaboration with the Florida Resources and Environmental Analysis Center (FREAC) in development of the Explore Florida map-based curriculum project.
- The DEP/FGS continues its collaborative effort with a committee of faculty at FSU, the Hydrogeology Consortium and local county officials to establish a Karst Waters Center.

Coastal Program Update

The U.S. Minerals Management Service (MMS) and the DEP/FGS have a long history of cooperative investigations into marine sediment resources in federal waters offshore of Florida. The current project is titled "A Geological Investigation of the Offshore Federal Area along the Coast of Okaloosa and Santa Rosa counties." It is a reconnaissance sand source study of the beaches of Okaloosa and Santa Rosa counties and the inner continental shelf offshore of those counties, extending from 9.0 nautical miles (16.7 kilometers) to approximately the 100 foot bathymetric contour.

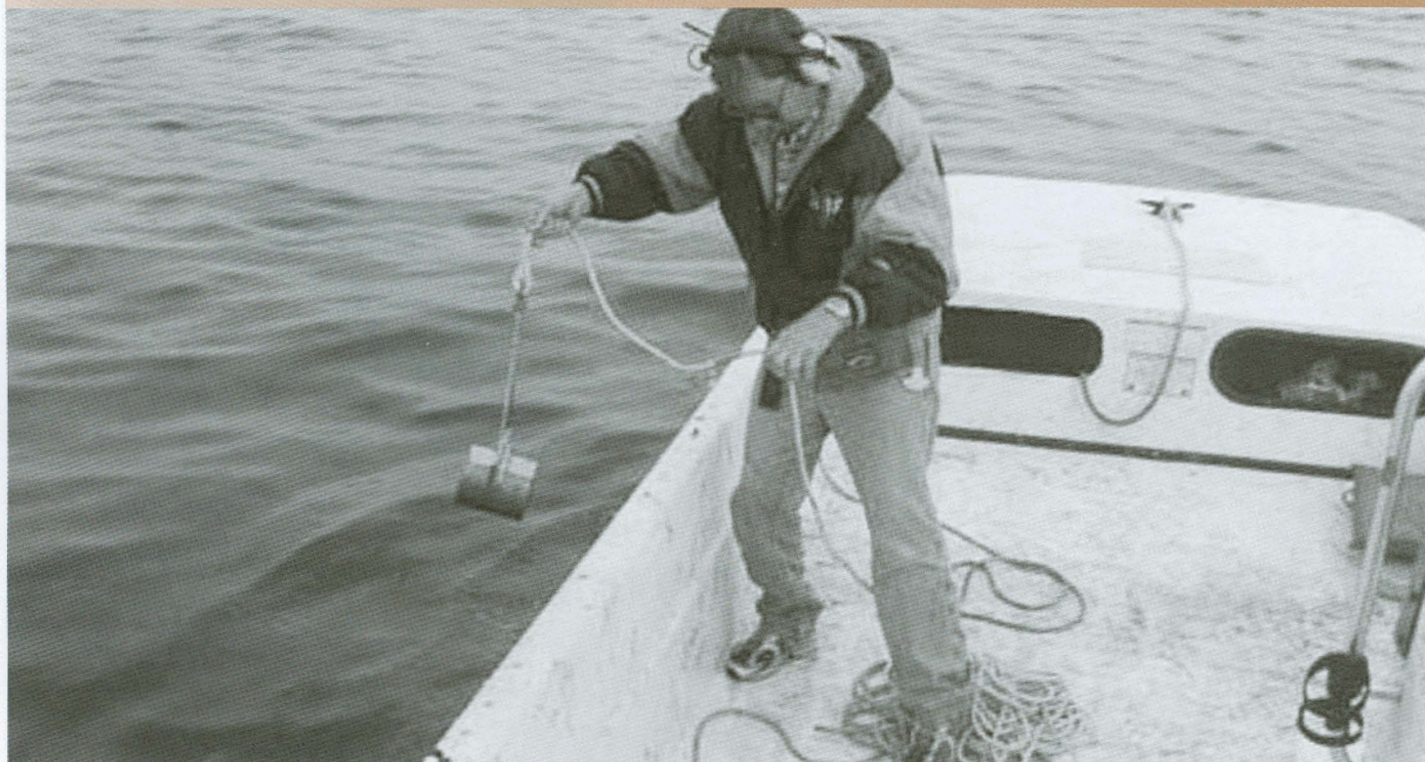
As part of this study, 85 sediment samples were collected from the beaches of Santa Rosa and Okaloosa counties and 12 samples were collected offshore of Santa Rosa, Okaloosa and Walton Counties. These samples were described, photographed and analyzed using granulometric techniques.

Approximately 133 nautical miles (246.2 kilometers) of seismic reflection profile data were collected offshore of Santa Rosa, Okaloosa and Walton counties. Computer processing and a preliminary analysis of the data using the methods of seismic stratigraphy were completed. A feature with the potential to provide beach-restoration quality sand in federal waters offshore of Santa Rosa and Okaloosa counties has been identified. This feature is described as a mantle of reworked sediments of varying thickness overlying an apparently consolidated layer representing a former erosional surface.

A table of 55 seafloor acoustic targets, suspected to be man made objects lying on the seabed, was compiled. Based on the seismic reflection profiler records, the distribution of a significant portion of these objects seems to be non-random. Most, if not all, of the objects are believed to be debris deposited on the seabed during past military training missions in the area.

Analysis of the seismic data also suggests the presence of a submarine spring in the study area. This hypothesis was prompted by an apparent outflow of possibly fresh water (lower density than surrounding seawater in the water column) observed immediately above a seafloor depression. A horizontal layer, interpreted as limonite hardpan, outcrops in the wall of the depression and is associated with the outflow.

Geologist Dr. Ron Hoenstine samples bottom sediment off Fort Walton Beach.



Historical Highlights of the Florida Geological Survey

- 1852, Legislature establishes the office of State Engineer and Geologist. **General Francis L. Dancy**, an engineer, was appointed to the position.
- 1855, Legislature abolishes the office of State Engineer and Geologist when the incumbent requests \$500 for soil tests.
- 1900, First test for oil in Pensacola, Florida, in Escambia County; dry hole drilled to only 1,320 feet.
- 1907, The Florida Geological Survey was established by the Florida Legislature. It continues as the oldest state agency functioning under both its original legislative enabling statute and its original title. **Dr. Elias H. Sellards**, was appointed the first Director of the FGS and Florida State Geologist by then Governor **Napoleon B. Broward**.
- 1909, First State Geologic Map Published by FGS.
- 1919, **Dr. Herman Gunter** was appointed the Survey's second Director and Florida State Geologist.
- 1930, FGS staff discover and recover mastodon bones from deep within Wakulla Springs.
(See photograph on page 1).
- 1933, The FGS was placed under the newly-formed State Board of Conservation.
- 1942, USGS Ground Water Division co-located with the FGS in offices located on the Florida State College for Women campus.
- 1943, Humble Oil Company establishes first oil production in Florida from South Florida Sunniland Field.
- 1945, Florida's first petroleum conservation law is passed, along with a State Lease law, a bill for taxation of oil & gas and a bill to ratify Florida as a member of the Interstate Oil Compact. The FGS is assigned regulatory oversight of oil & gas operations.
- 1953, FGS acquires first mobile auger rig mounted on a new post-World War II jeep.
- 1957, the FGS moved into its newly built headquarters, the Herman Gunter Building on the FSU campus adjacent to the Geology Department.
- 1958, **Dr. Robert O. Vernon** is appointed the third Director of the FGS and Florida State Geologist.



E.H. Sellards, R.M. Harper and
Herman Gunter (left to right) 1909

- 1970, Humble Oil Company discovers state's largest oil field, the Jay Field, in northwest Florida. The field has produced 417 million barrels of oil through the summer of 2005.
 - 1971, The FGS was administratively placed in the Department of Natural Resources (DNR). **Mr. Charles W. Hendry, Jr.**, is named Chief of the FGS and Florida State Geologist. The legislature passes a tax bill encouraging the reclamation of certain mined lands. The FGS creates a Reclamation Regulation Section to implement mined lands reclamation requirements.
 - 1972, Oil & Gas South Florida District Office opened in Ft. Myers.
 - 1973, Oil & Gas Northwest District Field Office opened in Jay, FL. Graduate Student Research Assistant Program formalized.
 - 1978, Florida's annual petroleum production peaks at 48 million barrels and 52 billion cubic feet of gas, which ranks Florida 8th nationally among the oil producing states.
 - 1980, The Florida Legislature assigns regulatory authority to the FGS for oil & gas geophysical exploration operations.
 - 1983, **Mr. Steve Windham** is appointed Chief of the FGS. New three-story State Geologic Sample Repository completed at the DEP (formerly the DNR) Warehouse facility on Commonwealth Boulevard.
 - 1985, **Dr. Walter Schmidt** is appointed Chief of the FGS and Florida State Geologist.
 - 1987, First Issue of the Florida Geology Forum is published as the Florida Geology News.
- Professional Geologist (PG) Licensing Bill takes affect 10/1/87; Chief of the FGS and the State Geologist of Florida is assigned PG #1.
- 1990, Shallow Auger/Coring program is implemented with two Auger Drilling Rigs.
 - 1993, The Florida Legislature merged the Department of Environmental Regulation with the Department of Natural Resources to form the Department of Environmental Protection.

The Herman Gunter Building, home to the Florida Geological Survey since 1957.



- 2001, First digitally-published State Geologic Map.
- 2002, First Digital CD-ROM professional publication and web-based distribution.
- 2005, New Schramm Core Drilling Rig acquired, increasing core depth capability to 3000 feet.

Earth Science Week 2006

The Florida Geological Survey celebrated Earth Science Week with its annual Open House on Friday, October 13, 2006. Recognizing the importance of the earth sciences, then Governor Jeb Bush joined states across the nation in proclaiming October 8-14 as Earth Science Week. Earth Science Week is organized by the American Geological Institute to promote public awareness of the earth sciences and stewardship of the earth. FGS staff **Cindy Fischler**, **Clint Kromhout**, **Harley Means**, **Carolyn Stringer**, **Brie Coane**, **Frank Rupert** and **Paulette Bond** guided the guests through a variety of interactive activities.

Members of the home-schooling community were special guests at the event. In keeping with this year's theme "Be a Citizen Scientist," DEP's **Katherine Gilbert**, representing the organization Frog Watch participated, explaining the organization's work in documenting frog populations around the country. FGS hydrogeologist Dr. **Rick Copeland** represented Florida Lake Watch. The United States Geological Survey sent a team of volunteers who used an aquifer model to explain ground-water movement and pollution.

The FGS conference room was set up with binocular microscopes and samples of rocks from Florida as well as igneous and metamorphic rocks from elsewhere. A truck-mounted auger rig on the lawn along with core samples allowed guests to view the rocks beneath the surface in our area and gain an understanding of how they are obtained. Our youngest visitors worked on coloring sheets that showed some of Florida's fossil mammals. They also used Play Dough to discover one way that fossils are formed.

In addition, the FGS invited local scouts to the Gunter Building to assist with the completion of their Webelos geology badges. Staff geologists **Tom Greenhalgh**, **Dr. Jon Arthur**, **Dr. Walt Schmidt** and **Paulette Bond** escorted scouts on building tours, explained one way that mountains are made and discussed a group of rocks and minerals common to Florida.



A guest at FGS Earth Science Week Open House examines core.



James Hugh Balsillie December 7, 1946-December 21, 2006

Jim Balsillie, a pioneer in coastal geology, succumbed to lung cancer on December 21. His passing cut short an exceptionally productive scientific career and took from many of us a great friend and colleague. Jim was born in Yakima, Washington on December 7, 1946. He earned a B.S. degree in geology in 1970 from Oregon's Portland State University. Jim's graduate studies were interrupted in late 1970 by induction into the Army where he was invited to work at the U.S. Army Corps of Engineers Coastal Engineering Research Center (CERC), in Washington, D.C. Among his projects at the CERC he carried out research on shore and coastal retention structures beginning a long and prolific career in coastal research. He was honorably discharged in 1972. For his exemplary service he was awarded the Army Commendation Medal, the fourth highest individual decoration the U. S. Army can bestow.

In 1975, Jim obtained a leave of absence from the CERC, but continued in a civilian capacity, to attend graduate school, studying geology at FSU. In 1977, in the midst of his graduate research, Jim accepted a request to become the scientific liaison with the State of Florida DNR's Beaches and Shores Division and the Coastal and Oceanographic Engineering Department at the University of Florida. This decision began a scientific career with the State of Florida that spanned 29 years. Jim also assisted in the regulatory permitting program of DNR's Beaches and Shores Division. In 1982 he was named Administrator of the newly formed Analysis and Research Section of the Bureau of Coastal Data Acquisition. In 1990, Jim moved to the Office of Beach Erosion control in the Division of Beaches of Shores to develop beach restoration management plans for the State of Florida.

In 1994, Jim moved to his final post in the new coastal geology program at the Florida Geological Survey. Jim's expertise in all aspects of geologic field work was frequently put to use in his work at the FGS. He developed methods for offshore sampling and remote sensing in many projects off both the Gulf and Atlantic coasts. He also was a mainstay in the operation of the FGS' research vessels. Jim authored more than 100 publications during a long and productive professional career that spanned more than three decades.

Among Jim's many other professional accomplishments are: founder of the National Hurricane Conference; recipient of the James A. Purpura International Award of the Florida Shore and Beach Preservation Association (FSBPA), for outstanding research in coastal engineering and coastal processes; designated a Florida Beach Pioneer in 1994 by the FSBPA; and he was a longtime member of the Editorial Board of the Journal of Coastal Research.



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Department of Environmental Protection

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Designed by Paulette Bond. Editing by Paulette Bond, Jackie Lloyd and Walt Schmidt.

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