USGS

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Fieldwork

USGS Center in Lafayette, LA, Provides Aid in the Aftermath of Hurricane Katrina

By Gaye Farris

The U.S. Geological Survey (USGS) was among the many Federal agencies called upon to assist people and other agencies in the devastating aftermath of Hurricane Katrina.

Katrina slammed into southeastern Louisiana and coastal Mississippi and Alabama on August 29, causing historic flooding in the New Orleans area and wind and flood destruction along the three coastal States.

One of the first USGS centers to respond to the disaster was the National Wetlands Research Center (NWRC) in Lafayette, LA, about 185 km (115 mi) west of New Orleans. The center received independent requests for boats and personnel from the Louisiana State Police, the Louisiana Department of Wildlife and Fisheries, and the Louisiana Governor's Office of Emergency Preparedness on the morning of August 30 for use in search and rescue in the New Orleans area. The NWRC maintains a large fleet of field vehicles, including various types of boats. When they received the requests for assistance, administrators and scientists at NWRC acted quickly, providing the necessary equipment and volunteer personnel in less than 24 hours.

Center director **Greg Smith** said, "Our first efforts at this time are to assist in any way in the saving of human lives during this unprecedented disaster."

Joining the center in search-and-rescue efforts were volunteers from the USGS Louisiana Water Science Center in Baton Rouge and from additional organizations, including the U.S. Fish and Wildlife Service, the National Oceanic and Atmospheric Administration, the USDA Natural Resources Conservation Service, the Louisiana Department of Natural Resources, and Ducks Unlimited. More than 250 persons were rescued with the assistance of USGS volunteers, and a total of about 400 people in all were rescued through the other partner efforts. Descriptions and photographs of these activities are posted online at URL **http://www.nwrc.usgs.gov/hurricane/katrina-help.htm**.

USGS scientists rescue a stranded woman from the New Orleans floodwaters. The volunteers are (left to right) ***Scott Wilson***, ***Clint Jeske***, *and* ***Bob Keeland****.*

Interagency group of volunteers from Lafayette, LA, for Hurricane Katrina search-and-rescue efforts in New Orleans posing for a photograph on Monday, September 5, 2005. The group consists of personnel from the U.S. Geological Survey, the U.S. Fish and Wildlife Service, the National Oceanic and Atmospheric Administration, the USDA Natural Resources Conservation Service, Ducks Unlimited, and the Louisiana National Guard.

In addition to assisting with search and rescue, NWRC employees collected thousands of dollars, food, water, toys, and clothing for hurricane evacuees being sheltered in the Cajundome sports arena, six blocks from the center. Staff members are housing more than 60 friends and family members as well as scientists evacuated from hurricane-ravaged areas.

The center combined its humanitarian and scientific efforts by providing, at the

(Katrina Aid continued on page 2)

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Contents

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Fieldwork, continued

(Katrina Aid continued from page 1)

request of the Louisiana Governor's Office of Emergency Preparedness, technology and mapping for hurricane recovery.

To help find residents needing rescue in the New Orleans area, scientists supplied rescuers with longitudinal and latitudinal coordinates to supplement street addresses provided during 911 calls from or for stranded hurricane victims (a process known as geocoding). The USGS accomplished these tasks by working closely with the Louisiana Department of Wildlife and Fisheries, the Louisiana Geological Survey, and the Louisiana State Police. More than 20 agencies have used the coordinates.

Additionally, USGS scientists are helping various agencies by providing data and maps on a 24/7 basis. For example, they have provided the U.S. Army Corps of Engineers with up-to-date maps of the New Orleans levee system and geocoded addresses for water pumps in the city. The USGS is also assisting the Federal Emergency Management Agency by supplying maps and spatial data to various task forces involved in recovery operations. More information about the center's geospatial support is posted at URL **http://www.nwrc.usgs.gov/hurricane/katrina-gis.htm**.

To help assess Katrina's impact on ecosystems, scientific researchers from the center conducted pre- and post-hurricane reconnaissance flights over barrier islands along Louisiana's coastline. The first post-hurricane flight on August 30 examined the Louisiana coast eastward from Raccoon Island to Port Fourchon, an important oil port, to Grand Isle, a recreational area for sport fisheries, and then to Venice, the Chandeleur Islands, and back westward to Fort Pike, Slidell, and Mandeville.

The flight revealed that an estimated 50 percent of the Chandeleur Islands has been destroyed. The islands' lighthouse is no longer visible. This chain of barrier islands is historically New Orleans' first line of defense against tropical storms and hurricanes and is also an important habitat for wildlife.

Since the August 30 flight, NWRC biologists have flown two additional reconnaissance flights along the Louisiana and Mississippi coasts to assess damages to biological resources and properties on Federal and State lands. Visit URL **http://www.nwrc.usgs.gov/hurricane/post-hurricane-katrina-photos.htm** for photographs and additional information. (Also, see article "Before-and-After Aerial Photographs Show Coastal Impacts of Hurricane Katrina," this issue.)

Carroll Cordes, acting chief of the center's Forest Ecology Branch and Wetlands Ecology Branch, said, "As more boats and personnel become available for scientific research, the center will begin an assessment of the effects of Hurricane Katrina on the plant and animal communities."

The NWRC has been devoted to research on wetlands and coastal-land loss for 30 years. Coastal wetlands are critical in helping to absorb storm waters and buffering inland areas from winds.

For more information and updates on NWRC's response to Hurricane Katrina, visit URL **http://www.nwrc.usgs.gov/hurricane/katrina.htm**.

Part of Venice, LA, on August 30, 2005. The southernmost permanently inhabited area on the Louisiana coast, Venice is located within a ring levee on the Mississippi River. The levee was ineffective during Hurricane Katrina. The entire town was flooded, oil-field vessels and barges were strewn haphazardly, and huge deposits of wrack were left on both sides of the ring levee on the west side of town.

Before-and-After Aerial Photographs Show Coastal Impacts of Hurricane Katrina

By Ann B. Tihansky

Hurricane Katrina was a category 4 storm with winds as high as 140 mph when it struck the Gulf Coast at about 5 a.m. on August 29. On the basis of its barometric pressure, Katrina was the third-most intense hurricane to hit the United States since reliable records began in 1851 (exceeded only by the "Labor Day Hurricane" that hit the Florida Keys in 1935 and Hurricane Camille, which hit the Gulf Coast in 1969).

Katrina's intensity took a heavy toll on coastal landforms, as shown in aerial photographs posted by the U.S. Geological Survey (USGS) documenting conditions before and after the hurricane along the northern Gulf of Mexico coastline. Available at URL **http://coastal.er.usgs.gov/hurricanes/katrina/**, the photographs are one result of a cooperative project being conducted by the U.S. Geological Survey (USGS), the National Aeronautics and Space Administration (NASA), the U.S. Army Corps of Engineers, and the University of New Orleans to investigate coastal change produced by the hurricane. Aerial-video, still-photography, and laser-altimetry surveys of post-storm beach conditions were collected on August 31 and September 1, 2005, for comparison with earlier data. The comparisons will show the nature, magnitude, and spatial variation of such coastal changes as beach erosion, overwash deposition, and island breaching. These data will also be used to further refine predictive models of coastal impacts from severe storms. The data are being made available to local, State, and Federal agencies for purposes of disaster recovery and erosion mitigation.

Among the photographs posted on the USGS Web site are before-and-after photos of the Chandeleur Islands, LA, mainland Mississippi, and Dauphin Island, AL, along with several sets of "quick response" photographs from Bay St. Louis to Biloxi, MS.

Photographs of the Chandeleur Islands show dramatic removal of all the sand, leaving only marshy outcrops barely above sea level. Before Katrina struck, the island chain consisted of narrow sandy beaches and low vegetated dunes. The coastal response is similar to the damage observed in the Isles Dernieres, LA, after Hurricane Andrew in 1992. USGS coastal researcher **Abby Sallenger** said, "I've seen dramatic response in the Chandeleur Islands after a number of storms, but I've never seen it this bad; the sand is just gone."

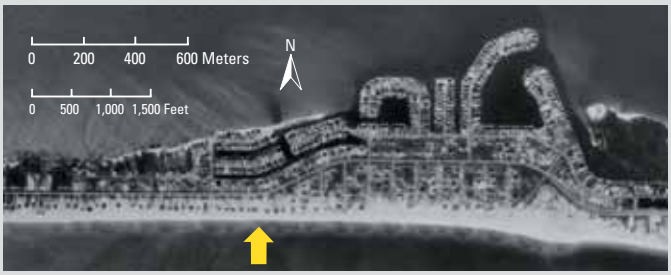
The Chandeleur Islands (imagery acquired in 1998) are a north-south-oriented chain of low-lying islands approx. 100 km (60 mi) east of New Orleans. Yellow arrow points to area shown in pair of photographs below, taken before and after Hurricane Katrina.

Northern Chandeleur Islands. The first image, taken in July 2001, shows narrow sandy beaches and adjacent overwash sandflats, low vegetated dunes, and backbarrier marshes broken by ponds and channels. The second image shows the same site on August 31, 2005, two days after Hurricane Katrina made landfall on the Louisiana and Mississippi coastline. Storm surge and large waves from Hurricane Katrina submerged the islands, stripped sand from the beaches, and eroded large sections of the marsh. Today, few recognizable landforms are left on the Chandeleur Island chain.

Dauphin Island, AL, lies about 50 km (30 mi) south of Mobile and approximately 110 km (70 mi) east of where Katrina's eye came ashore. Sections of Dauphin Island west of the airport and fishing pier look as if an enormous rake has been dragged across the island. Large amounts of beach sand washed over the island, covered roads, and filled canals. Storm surge created numerous temporary inlets

(Katrina Photographs continued on page 4)

(Katrina Photographs continued from page 3)



A developed section of Dauphin Island in 2000. Large yellow arrow points to area shown in trio of oblique photographs at right.

Dauphin Island. ► The top image was taken in July 2001, before Hurricane Lili (2002). The middle photograph was taken on September 17, 2004, immediately after the passage of Hurricane Ivan. The bottom image was acquired on August 31, 2005, two days after Hurricane Katrina. Note the road and two parallel canals in the first photograph. The post-Ivan photo shows overwash deposits covering the road and encroaching on the first canal. The post-Katrina photo shows that the overwash deposit has not only covered the road but also filled the first canal and is encroaching on the second. The beach appears brown in the bottom photograph because of a "deposit" of plant debris.

as the water carved out paths through the sand.

Photographs along the mainland coast of Mississippi show evidence of the destructive power of the storm surge. The surge of water moved inland, carrying with it the debris of structures from the first four or five blocks that had been swept away. The wrack line of debris is a 5- to 8-ft-high pile that ended up several blocks inland. Offshore casino barges are lodged inland, and mere foundations are all that is left of many buildings. Sections of bridges of Interstate Highway 90 have been destroyed, with the remaining pieces toppled like dominoes.

"The past several days have seen remarkable devastation resulting from Hurricane Katrina. Our thoughts and prayers are with everyone who has been affected by this disaster," said USGS Acting Director **Pat Leahy**. "In the aftermath of Katrina, USGS research on hurricanes and natural hazards is no longer just a scientific endeavor—it is a matter of public safety."❁

Hydrologic Impacts of Hurricane Dennis on the Florida Panhandle, July 9-14, 2005

By Stewart A. Tomlinson

Hurricane Dennis brought heavy rain to northwestern Florida, causing moderate flooding in the central panhandle. Storm surge from the hurricane caused heavy property damage along the coast from Carrabelle to St. Marks.

Dennis came ashore along the western Florida Panhandle west of Navarre Beach at 2:25 p.m. CDT on July 10, 2005, as a category 3 storm on the Saffir-Simpson Scale (see URL **http://www.nhc.noaa.gov/aboutsshs.shtml**) with winds as high as 120 mph. Flooding was highest in the Ochlockonee River basin, where stream flow (measured on the Ochlockonee River near Havana) was at levels with recurrence intervals longer than 5 years. Rainfall ranged from 1.47 to 7.08 inches at U.S. Geological Survey (USGS) stream gages in the Florida Panhandle.

The National Weather Service recorded total rainfall of 6.61 inches at Tallahas-

(Hurricane Dennis continued on page 5)

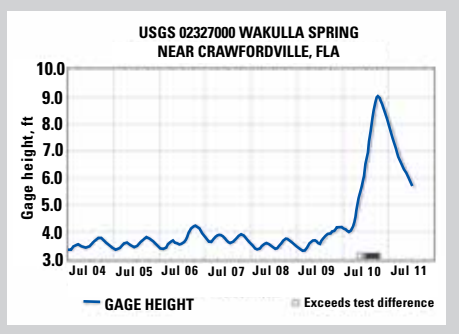
(Hurricane Dennis continued from page 4)

see, 3.46 inches at Panama City, and 2.07 inches at Apalachicola. Several Data Section employees at the USGS office in Tallahassee reported 6 to 8.5 inches in rain gages at their homes in different parts of Leon County. Rainfall was high in the Tallahassee area and lower in other areas because as the hurricane approached land and moved onshore, squalls moving in a southeast to northwest direction provided consistent heavy rainfall to certain areas, whereas areas between the bands of squalls received much less rain.

Total rainfall from USGS gages, July 9-11, 2005

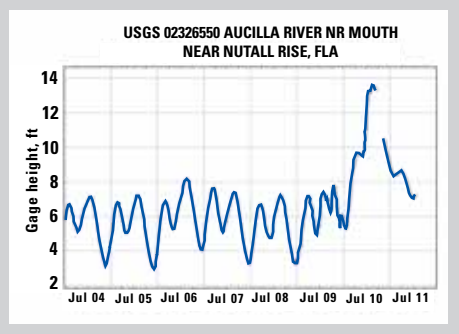
USGS stream-gaging station name	Rainfall (inches)
Withlacoochee River near Lee	4.47
Suwannee River at Dowling Park	3.95
Suwannee River at Luraville	3.38
Santa Fe River near Hildreth	2.16
Ochlockonee River near Havana	5.37
Ochlockonee River near Bloxham	4.67
Chipola River at Marianna	2.54
Chipola River near Altha	1.98
Choctawhatchee River at Caryville	1.47
Choctawhatchee River near Bruce	4.24
Yellow River at Milligan	4.52
Caney Creek Tributary No. 2	1.58
Shoal River near Crestview	2.86
Blackwater River near Baker	4.50
Big Coldwater Creek near Milton	7.08
Escambia River near Molino	4.12

Hurricane Dennis caused a higher than expected storm surge in the St. Marks, Aucilla, and Wakulla River basins, and this storm surge, in combination with runoff from an average of 6 to 8 inches of rain in the vicinity of Tallahassee and the Big Bend area, created moderate flooding. Flows for most streams were in the 2- to 5-year recurrence-interval range throughout the central panhandle. At the St. Marks River near Newport, 14.4 mi upstream from the mouth near the Gulf of Mexico, flows were in the 2-year recurrence-interval range. Near Pensacola, Bayou Marcus Creek rose to levels just shy of those associated with Hurricane Ivan in September 2004 (6.82 ft and 1,500 cubic feet per second [cfs], a record high for the 7 years that gage has been in operation). However, the Ochlockonee River near Havana peaked on July 14 at about 17,000 cfs, a flow with a recurrence interval of about 8 years over the period of record, which began in 1926. On July 14, the highest flow measurement on record at Ochlockonee River near Concord was recorded at a gage height of 41.30 ft and a flow of 21,300 cfs.



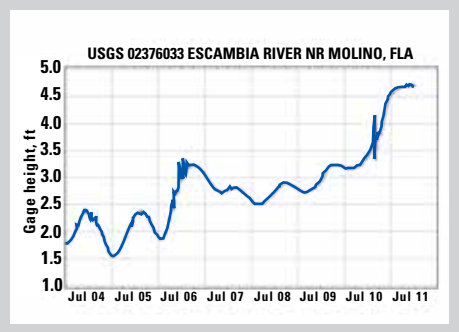
At the gage at Wakulla Spring near Crawfordville (above), the associated storm surge and increase in stage is a representative example of what the Big Bend area underwent.

The storm surge at the gage near the mouth of the Aucilla River near Nutall Rise (below), 2.6 mi upstream from the Gulf of Mexico, was 7 to 8 ft. This gage is adjacent to St. Marks National Wildlife Refuge.



*Storm surge from Hurricane Dennis on July 10, 2005, near Panacea, FL. Photograph courtesy of The Forgotten CoastLine (copyright 2005; see URL **http://www.forgottencoastonline.com/**)*

Surprisingly, there was no significant storm surge at some of the western panhandle gages, at least not in comparison with that produced by Hurricane Ivan. At the Escambia River near Molino, for example (below), a stage increase of about 1 to 1.5 ft was observed, with a sharp spike at landfall; in contrast, Hurricane Ivan produced a stage increase of 6 ft. For more information on the hydrologic impacts of Hurricane Ivan, see USGS Open-File Report 2005-1277, "Hydrologic Effects of the 2004 Hurricane Season in Northwest Florida," by **Richard Jay Verdi**, at URL **http://pubs.usgs.gov/of/2005/1277/**.



Coastal basins in the Big Bend area showed significant surge, whereas those near the hurricane's landfall did not, probably because of (1) the angle at which Hurricane Dennis approached in comparison with that of Ivan, (2) the relative shallowness of Apalachee Bay, and (3) the occurrence of hurricane landfall near high tide in Apalachee Bay. Hurricane Ivan came straight up from the south, and so the storm had a chance to push water well ahead of it, whereas Dennis came in at an angle from the southeast and, as is often the case with the east side of the storm being more severe, affected the Big Bend area more severely than areas farther west. Hurricane landfall occurred between Santa Rosa Beach and Navarre Beach an hour and a half before high tide in Apalachee Bay.

The USGS office in Tallahassee lost data at two gages as a result of the storm—at Brushy Creek near Bratt, a 25-mi^2 basin site northwest of Pensacola, and at Escambia River near Gonzales, an auxiliary-stage gage for the Escambia River near Molino. ❁

Along-Track Reef-Imaging System (ATRIS) Used to Survey the Sea Floor in Dry Tortugas National Park, Florida

By Don Hickey

The Dry Tortugas, a cluster of islands approximately 65 mi due west of Key West, FL, encompass the coastal and marine environments where pioneering researchers conducted baseline studies of south Florida coral-reef organisms at the remote Carnegie Tortugas Marine Laboratory, located on Loggerhead Key, until its closure in 1939. U.S. Geological Survey (USGS) employee **Thomas Wayland Vaughan** spent summers from 1908 to 1915 and 1922 to 1923 conducting coral-reef research at the laboratory. The history and visual aesthetics of the low-lying carbonate keys bring hundreds of visitors every day to tour the Civil War-era Fort Jefferson on Garden Key and to snorkel in the clear tropical waters.

To build on previous research efforts, a team from the USGS Center for Coastal and Watershed Studies in St. Petersburg, FL, led by **John Brock** participated in the first comprehensive surveys in the Dry Tortugas using the Along-Track Reef-Imaging System (ATRIS) from June 13 to 26. ATRIS combines high-resolution bathymetry, underwater digital photography, underwater video, vessel-heave compensation, and differential Global Positioning System (GPS) data to provide photographic and video transects of the sea floor keyed to precise geographic locations and water depths.

Loggerhead Key Light serves as a navigational beacon warning mariners of the keys and shallow carbonate banks fringed with coral reefs in Dry Tortugas. View toward the northeast.

*Satellite image of (left to right) Garden, Bush, and Long Keys, Dry Tortugas, and the surrounding shallow-marine habitats commonly associated with tropical conditions. Fort Jefferson's unnatural hexagonal shape stands out when viewed from above. Image courtesy of Space Imaging® (URL **http://www.spaceimaging.com/**).*

The field team, composed of **John Brock**, **Phil Thompson**, **Russ Peterson**, **Jerry Butcher**, and **Don Hickey** (all from the St. Petersburg office) and **Ramon Lopez** (Ph.D. candidate from the University of Puerto Rico, Mayagüez), monitored real-time collection of imagery (digital photography and analog video) and bathymetric, GPS, and heave data. They also conducted quality-assurance procedures in the evening to ensure successful data acquisition and backup for the day's efforts. They processed thousands of images in the field each day, using the ATRIS Data Analysis and Processing Tool (ADAPT) software developed by **David Nagle** (St. Petersburg).

The USGS has engineered the ATRIS to acquire continuous digital still images of the sea floor during transects across shallow-water reefs for use in the creation of benthic-habitat maps. This tool gives scientists the ability to combine field observations from the along-track vessel-mounted sensor package with IKONOS and QuickBird commercial satellite imagery to monitor and map in detail an area's bathymetry and benthic-habitat composition. **Ramon** has already completed his preliminary Dry Tortugas benthic-habitat-characterization analyses by resolving available IKONOS and QuickBird imagery with the newly acquired ATRIS data set.

William Longley and **Charles Martin** at the Carnegie Tortugas Marine Laboratory obtained the world's first recorded underwater color photographs in the 1920s. Since then, the significance of underwater imagery for research and management has continued to grow. Clearly, underwater photography has advanced considerably over the past century, and this progress was emphasized daily throughout this field exercise. The ATRIS components effectively functioned concurrently, compiling approximately 50,000 underwater digital images and 50 hours of underwater video footage of the various marine benthic habitats within the boundaries of Dry Tortugas National Park.

(Dry Tortugas continued on page 7)

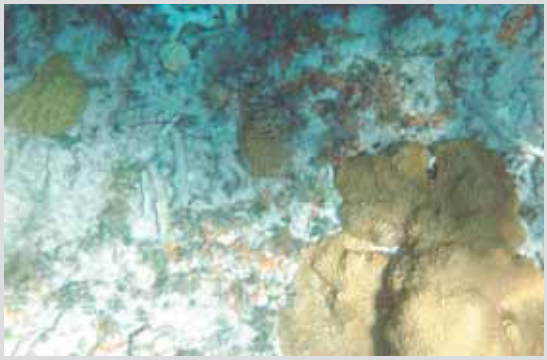
ATRIS survey underway. Ashtech Z-Surveyor antenna (bottom of photo) receives geographic signals for accurate positioning of the precision bathymetric system. The CSI MiniMAX antenna (top of photo) sits atop the along-track vessel-mounted sensor package. The sensor package mounted to the base of the pole under the sea surface collects photographs, video footage, depth data, and headings.

(Dry Tortugas continued from page 6)

The successful data acquisition will provide a complementary data set to a National Aeronautics and Space Administration (NASA) Experimental Advanced Airborne Research Lidar (EAARL) survey of Dry Tortugas National Park completed by NASA and USGS researchers in August 2004, before Hurricane Charley. The high-resolution lidar (LIght Detection And Ranging) data set includes marine-topography and subaerial-elevation information, providing researchers and managers with centimeter-scale bathymetric and geographic information to assist in current and future studies, as well as management planning. Though not a primary objective of this ATRIS survey, comparison of the two data sets (lidar and ATRIS) may be possible in order to identify modification of coastal and marine environments by several strong storms that passed through the region during the data-acquisition period (August 2004-June 2005).

Many logistical difficulties with work in this remote location were alleviated by the support offered by Dry Tortugas National Park employees Ranger **Willie Lopez** (Site Supervisor), **Brion Shaner**, **Niki Ryan**, and **Captain Linda Vanaman**. We also appreciate the efforts of the other Dry Tortugas National Park employees and volunteers. We were fortunate to participate in a lantern tour of Fort Jefferson during the first week of our field trip. Park Volunteer **Mike Ryan**, dressed in a Civil War-era Union soldier's uniform, led a captivated audience through the fort while relating 150 years of historical highlights.

We conducted our fieldwork approximately 100 years after the first investigators arrived at the newly established Carnegie Tortugas Marine Laboratory. A century of Dry Tortugas coral-reef research is a milestone worthy of recognition, and so a Centennial Celebration of the Carnegie Tortugas Marine Laboratory is scheduled for October 13-15, 2005. **Gene Shinn** (St. Petersburg) is a member of the Centennial Organizing Committee and has been instrumental in the inception and development of the event. The Centennial Celebration includes a field excursion and symposium on the past, present, and future of research in the Dry Tortugas. Visit URL **http://www.rsmas.miami.edu/conference/tortugas/** for more information.❁



Two of approximately 50,000 images captured during the Dry Tortugas ATRIS surveys. Identifying the health and development of benthic habitat with geographically positioned ATRIS data gives scientists and managers with a wealth of information to guide research and administrative planning. Note that much of the habitat's biology and geology are clearly identifiable for mapping and monitoring.

Using Genetic Modeling to Assess the Health and Status of Manatee Populations

By Elise Cortina

Although progress has been made in the protection of manatees against threats from human activities, many populations continue to exhibit limited growth or decline, and so the West Indian manatee (*Trichechus manatus*) remains an endangered species. Visible threats, such as fatal propeller wounds and habitat depletion, are not the only causes for concern when it comes to protecting the Florida manatee (*Trichechus manatus latirostris*), a subspecies of the West Indian manatee. Scientists have determined that animals of this subspecies face the additional threat of low genetic diversity, a trait that could make them more susceptible to diseases and more sensitive to climate changes.

Biologists in the Sirenia Project (URL **http://cars.er.usgs.gov/Manatees/manatees.html**) at the U.S. Geological Survey (USGS) Florida Integrated Science Center (FISC) in Gainesville, FL, are currently identifying and mapping the genetic material of manatees. Their goal is to better understand and predict the animals' ability to react to environmental stimuli, such as prolonged periods of cold weather, red tides, and viral diseases. The information obtained from genetic testing will ultimately be used to assist in making sound management decisions regarding the protection and restoration of the Florida manatee.

Limited population growth coupled with changing environmental conditions

(Genetic Modeling continued on page 8)

(Genetic Modeling continued from page 7)

over time has altered the degree of genetic variation among Florida manatees, posing a threat to the health and vitality of current animals and future generations. "We know that in sexually reproducing organisms, genetic diversity is necessary for long-term survival," explains **Bob Bonde**, a biologist with FISC. "It's how we ensure that our offspring are armed with the appropriate mechanisms to adapt to a changing environment."

Historically, the warm waters of south Florida and the Everglades provided an ideal habitat for manatees. Coastal development in the past century, however, has forced the manatees northward, and they have now come to depend on artificially warm waters expelled by power plants to survive the winters. They are restricted in their movement by the loss of natural habitat and, as a result, make contact with fewer individuals.

"The limited distances manatees can travel because of water-temperature requirements restrict contact with a diverse group of animals. Over time, if a species is unable to move about and relocate because changing environmental characteristics force them to exist within a relatively confined space, inbreeding can occur," explains **Bonde**.

Bonde uses cytogenetic research and DNA fingerprinting to map the population structure of the Florida manatee—much like drawing a family tree. Early genetic studies of these animals revealed a high degree of genetic homogeneity within the Florida population. In addition to the physical abnormalities associated with inbreeding, genetic homogeneity jeopardizes a species' ability to adapt or adjust to changing environments and can also make a species susceptible to disease.

The average adult manatee is about 10 ft long and weighs 1,000 lb or more. (Photograph courtesy of USGS Sirenia Project.)

Having originated in the warmer waters of the Caribbean, West Indian manatees, for example, specifically adapted over a period of many years to the colder water temperatures of the Florida peninsula, making them hardier than their Caribbean or Central and South American counterparts. Genetic homogeneity, however, may compromise the manatees' ability to make similar adaptations in the future.

Genetic research arms scientists with more conclusive evidence about the vitality of the species and is a tool used to support or refute their hypotheses about manatee behaviors. "We aren't trying to influence the manatee population with this particular investigation," explains **Bonde**. "We're really trying to learn as much as we can about the way these animals respond to environmental stimuli, so that later on, other people can be more effective in their decision making and in the management of manatee habitats."

Manatees are air-breathing marine mammals. Here, a manatee surfaces to take a breath. (Photograph courtesy of USGS Sirenia Project.)

Genetic research can help determine, for example, whether it is healthy to introduce a captive manatee into a population without regard to genetic differences. Scientists are examining the feasibility and desirability of supplementing depleted manatee populations with animals from other areas. "If we don't pay attention to their genetic composition, we could inadvertently do a disservice to the population we're trying to recover by relocating captive animals into a wild population with similar genetic content. We want to discourage instances of inbreeding and preserve genetic diversity. These models help us do that," says **Bonde**.

Only time will tell whether a compromised gene pool will further threaten the existence of the Florida manatee, but **Bonde** remains hopeful that the genetic investigations carried out by USGS scientists and researchers with the University of Florida, the Florida Fish and Wildlife Conservation Commission, Mote Marine Laboratory, and other organizations will help protect future generations of these Florida treasures.

*USGS Sirenia Project biologists are working to develop interagency protocols for archiving and analyzing manatee genetic tissues. At the Florida Integrated Science Center laboratory in Gainesville, **Bob Bonde** searches an archive of blood and tissue samples collected from both free-ranging and captive manatees. (Photograph by **Elise Cortina**, USGS.)*

USGS Activities Rock the Waquoit Bay Watershed Block Party on Cape Cod

By Julia Knisel

The Waquoit Bay National Estuarine Research Reserve, located on the south shore of Cape Cod, MA, hosted its annual Watershed Block Party on August 2, 2005. U.S. Geological Survey (USGS) contractors (**Liz Beaulieu**, **Brian Buczkowski**, **Erin Heffron**, **Julia Knisel**, and **Dirk Koopmans**) and employees (**Chris Polloni**, **Kathy Scanlon**, and **Nancy Soderberg**) from the Woods Hole Science Center joined volunteers from the reserve and many other local organizations to educate more than 400 of their watershed neighbors.

Chris set up his flight simulator to provide virtual rides over Waquoit Bay. Children and adults waited in line to ride over the bay, and to fly though the Puerto Rico Trench in three dimensions with the "bat mouse" (see related article in *Sound Waves*, November 2004, at URL **http://soundwaves.usgs.gov/2004/11/outreach.html**). **Kathy** entertained patient passengers and pilots with sea stories. After landing, visitors browsed numerous USGS maps and publications on local geology, ground water, and watersheds, which were provided by **Nancy**. Many visitors were intrigued by a tunicate sample that **Erin** had collected earlier in the day; **Erin** showed visitors a species of tunicate that is a nuisance around Cape Cod.

Julia Knisel, Kathy Scanlon, Erin Heffron, Brian Buczkowski, Liz Beaulieu, Nancy Soderberg, Dirk Koopmans, *and* ***Chris Polloni*** *pose before packing up for the night. Photograph by* ***Laura Catanach****.*

Julia Knisel *and* ***Brian Buczkowski*** *point out features along a beach profile to prepare enthusiastic children for a grain-size-analysis activity. Photograph by* ***Liz Beaulieu****.*

At another USGS table, **Liz**, **Brian**, and **Julia** conducted a grain-size-analysis activity. Children first learned to identify features along a beach profile and then sieved three samples that had been collected across a local beach. The power of wave and wind energy became clear as the three samples were compared.

Dirk led eager visitors down to the beach, where he had installed wells to teach about ground water. Visitors drew water from the wells and took salinity readings. Quartz pebbles were provided as souvenirs to all who were interested in seeing them glow!

Rita Sherwood*, daughter of USGS employee* ***Chris Sherwood****, examines the grain size of two beach samples, while* ***Brian Buczkowski*** *sieves a third sample. Photograph by* ***Chris Polloni****.*

Public Lecture on Balancing Wildlife Needs and Wetland Restoration in San Francisco Bay

By Gloria Maender

"A Delicate Balance: Salt Ponds, Wetland Restoration, and Wildlife in San Francisco Bay" was the topic of the monthly U.S. Geological Survey (USGS) Western Region Evening Public Lecture Series on August 25, 2005, in Menlo Park, CA. USGS scientists **A. Keith Miles** and **John Takekawa** introduced the audience to the largest tidal-wetland-restoration project in the Western United States, begun when approximately 15,000 acres of salt ponds were purchased in 2003 for restoration by a partnership of Federal, State, and nonprofit organizations.

Research wildlife biologists with the USGS Western Ecological Research Center, **Miles** and **Takekawa** discussed questions that their research seeks to help answer for the wetland restoration, such as: How important are the salt ponds for migrating, wintering, or breeding waterfowl and shorebirds? What may be the impact of concentrated salts, low dissolved oxygen, or toxicity of mercury on wildlife as pond levees

(Wetland Restoration continued on page 10)

(Wetland Restoration continued from page 9)

are opened? What may be the impact of invasive species, such as smooth cord grass, while restoring wetlands?

The evening public lecture was attended by about 120 to 150 people. Earlier in the day, USGS employees on the Menlo Park campus got a preview of the presentation. A video-stream archive of the lecture is available for viewing online (using Windows Media Player) at URL **http://online.wr.usgs.gov/calendar/2005.html**.

Additional information about the restoration project is available in USGS Fact Sheet 2004-3135 (URL **http://sfbay.wr.usgs.gov/access/bibliography/pdf/fs2004-3135.pdf**) and at the South Bay Salt Pond Restoration Project Web site (URL **http://www.southbayrestoration.org/**).

The salt marsh harvest mouse (left) and the California clapper rail (below) are both endangered species that are found only in tidal marshes of San Francisco Bay.

Journalism Interns Help Get the USGS Word Out

By Ann B. Tihansky

This summer, the U.S. Geological Survey (USGS) received some assistance in educating the public about USGS science and the ongoing research that takes place in the USGS Center for Coastal and Watershed Studies in St. Petersburg, FL. Hoping to develop links to local press and other media, center director **Lisa Robbins** initiated the first intern program for journalism students through an agreement with the University of South Florida, St. Petersburg (USF-SP). **Ann Tihansky**, a USGS hydrologist, coordinated efforts with **Mark Walters**, a USF-SP journalism professor, to offer a summer journalism intern program.

Walters and **Tihansky** both participate in a newly formed community forum, the "Community, Science, and Environmental Policy Brown Bag Discussion" group. The Brown Bag Discussion group, consisting of scientists, university professors, conservation groups, students, and the local community, recognized the need for better links between scientists and their community news outlets. To address this need, they organized a monthly forum to help scientists become more aware of each other's work and to develop links to media that will share scientific information with the local community. (See related articles in *Sound Waves*, July 2005, at URLs **http://soundwaves.usgs.gov/2005/07/outreach4.html** and **http://soundwaves.usgs.gov/2005/07/outreach5.html**.)

*Journalism intern **Vanessa Espinar** interviews local television meteorologist **Dick Fletcher** at the USGS after a June 2005 presentation about hurricanes and the importance of relaying accurate scientific information to the public.*

Because few journalism students have scientific backgrounds and few scientists have media backgrounds, effectively communicating scientific information to the public is a challenge. In response, the journalism department at USF-SP recently established a science-writing program. Through this program, the department will provide the missing tools to both sides. Among the new courses to be offered at various times are "Communicating Science to the Public," "The Art and Craft of Science Writing," and "Writing About the Environment."

"By having both scientists and journalism majors in class together, we will be able to develop better lines of communication and mutual understanding," said **Walters**, who directs the new program. "We believe that the USGS will be an enormous resource for this program. We also believe that journalism faculty and students will become a growing resource for the USGS. The new internship program is just the beginning of this cross-pollination."

Two journalism students—**John Kucek**, an undergraduate, and **Vanessa Espinar**, a graduate-level journalism major pursuing her Master's degree—were selected to participate in the new program. Both **Kucek** and **Espinar** were interested in gaining real-world writing experience, expanding their portfolios, and learning more about science in their community. They spent their summer learning about what scientists do and how to explain it to the general public through various media forms. Writing projects included press releases, internal articles about important events and scientific findings, and even a maga-

(Journalism Interns continued on page 11)

*(Left to right) USGS journalism intern **John Kucek** meets with Florida Center for Ocean Science Education Excellence (COSEE) representatives **Dave Bethany** (webmaster) and **Barbara Spector** (director). While the USGS hosted a hurricane presentation, COSEE broadcast it live via Webcam to students throughout the world.*

(Journalism Interns continued from page 10)

zine article. The interns attended meetings and events and reported information through internal communications or USGS publications that relay scientific findings to USGS communication offices. In addition to learning about the science itself, the students learned about the importance of an objective writing style and internal USGS review. Both interns learned the value of photographs and figures to help illustrate concepts.

Along with her other assignments, **Vanessa** tackled an article about a new sampling technology dubbed "the UAV—Unmanned Aerial Vehicle" that was submitted to the magazine *GPS World*. Tracking down scientists with busy schedules, working with various editors, and coordinating graphics gave **Vanessa** experience that made her appreciate what it takes to get something technical into print. "Scientists have all the technical knowledge but find it difficult to communicate it to the public," said **Vanessa**. "Journalists, on the other hand, have a link to the public but don't necessarily possess the technical expertise. This internship provided an opportunity for me to work together with scientists to get information out to the public. It also helped me see how journalism can be applied outside of a news organization."

Through the internship, **John** hoped to disseminate USGS information to the public. He relayed information about an upcoming congressional briefing by coastal scientist **Abby Sallenger** to USGS headquarters. "I, personally, enjoyed the small 'newsy'-type assignments, like the highlights, because, while it required a lot of digging, it went quickly into press, and the rewards were easy to see," he said. He also found that the internship exposed him to real-world reporting conditions and deadlines and that there are difficulties associated with the editing and review process. He commented, "None of these concepts had been taught to me in a classroom setting, so this was certainly a valuable experience for me."

Both **Vanessa** and **John** made numerous contributions to USGS communications, many of which are still in the publication mill, so keep your eyes out for their bylines.❁

USGS Scientists Participate in 2005 Annual Meeting of the Digital Library for Earth System Education

By John Kucek

A diverse group of scientists from the U.S. Geological Survey (USGS) participated in the Annual Meeting of the Digital Library for Earth System Education (DLESE) in St. Petersburg, FL, July 9-12. The theme of the meeting was "We are DLESE: Enhancing Library Quality for Our Diverse Community." Participants discussed various aspects of Earth-system education and presented reports on the digital library's current state, as well as plans for building and evaluating the quality of the library. The meeting program included keynote and science speakers, workshops, field trips, discussion groups, and design-review sessions.

Participants from the USGS included **Robert Ridky**, the National Education Coordinator from the Office of the Director, along with **Theresa Burress**, **Jim Flocks**, **Dennis Krohn**, **Kristine Martell**, **Chris Polloni**, **Kathryn Smith**, **Yvonne Stoker**, and **Ann Tihansky**, representing offices in Reston, VA, Tampa and St. Petersburg, FL, and Woods Hole, MA. The USGS participants brought a wide range of expertise to the meeting, with backgrounds in such diverse areas as geology, hydrology, geographic information systems (GIS), and outreach education. USGS GIS resources presented at the meeting included the Tampa Bay Data and Information Management System (DIMS) and the National Water Information System (NWIS). Methods for providing standard geologic information in a digital format for the DLESE library were also presented, along with standard Web resources for topics that include karst geology, marine and coastal geology, and geophysics. The USGS also hosted a session on three-dimensional (3-D) visualization techniques for viewing geologic and geographic data.

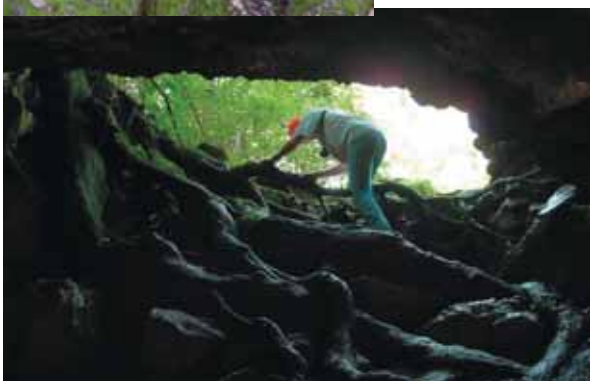
Participants "fly" through projected three-dimensional representations of the Puerto Rico Trench at the GeoWall presentation.

Chris Polloni, **Ann Tihansky**, **Theresa Burress**, and **Dennis Krohn** presented a workshop entitled "3-D Visualization Techniques," which gave participants hands-on experience in 3-D visual-imagery software. The visualization tool, known as the GeoWall (see URL **http://geowall.geo.lsa.umich.edu/**), provides users with a better understanding of geologic features through its depiction of 3-D imagery. Users of the program don 3-D ChromaDepth® glasses and control a motion-sensing joystick to "fly" through vivid landscapes that are color coded by depth.

(DLESE continued on page 12)

(DLESE continued from page 11)

Landscapes created using data from the Puerto Rican deep-sea trench provided a spectacular example of how data can be converted to a spatial image for data analysis, as well as for education about tectonic and submarine Earth processes. Those who navigated their way through the extreme terrain of the deep trench earned a certificate of accomplishment. The interactivity of the GeoWall creates an immersive learning experience that increases understanding of spatial concepts.



The Karst and Hydrogeology in West-Central Florida field trip visited a dry cave in Citrus County, Florida.

Ann Tihansky and **Bob Ridky** led a group of 25 teachers to Citrus County to show them how ground-water resources function in karst regions. The group visited caves and sinkholes in the upland recharge area and explored the swamps and springs of the discharge area along the coast. Participants learned about ground-water movement and enhanced porosity of the limestone due to dissolution processes. They also witnessed firsthand effects of seasonal rainfall associated with Hurricane Dennis. Water levels were higher than usual, and storm surge in combination with the heavy rainfall caused minor flooding that made for a truly memorable hike through the coastal swamp.

Kathryn Smith and **Kristine Martella** introduced DIMS—a Web site, digital library, and Internet map server that provides information about the Tampa Bay estuary and ongoing science and data-collection efforts. DIMS is part of the larger Gulf of Mexico Integrated Science project (see URL **http://gulfsci.usgs.gov/**), which combines data about the ecology, hydrology, chemistry, and biology of local habitats along the coastline of the Gulf of Mexico. Web-site users can browse through data and maps from many individual areas along the coast, including the bay estuaries of such cities as Tampa, Sarasota, and Pensacola, FL, Mobile, AL, and Galveston, TX. The maps can show things as simple as political boundaries and streets and highways, as well as more complex information, such as oil-and-gas data and depositional systems.

"The idea is to let scientists share data with each other, as well as with the public," said **Martella**. "The IMS [Interactive Mapping System] is helpful because you can overlay different data sets and come up with your own map [of an area]." The IMS Web sites (see links at URL **http://gulfsci.usgs.gov/**) allow users to view, query, and analyze data. Web users can overlay different data layers to develop customized views suitable for printing.

Jim Flocks presented a workshop entitled "Accessing Information—Making Scientific Data Available to Researchers and the Public." The goal was to broaden participants' knowledge of how to add information to database and GIS systems, as well as how to search for resources within them. Participants were also taught how to extract data from non-digital figures and maps for use in digital formats.

Yvonne Stoker led a group through a live access of the USGS National Water Information System (NWIS), where all USGS surface-water, ground-water, and water-quality information is stored. Her lecture, entitled "USGS NWISWeb—Water Resources Data for the Nation," taught participants to navigate through NWISWeb (see URL **http://waterdata.usgs.gov/nwis/**), which provides updates

The hiking trail along the coastal swamp was about 6 inches deep with water from Hurricane Dennis.

on water data from more than 1.5 million sites around the country. These data include real-time measurements of water flow and levels in streams, lakes, and springs (surface water), water levels in wells (ground water), and chemical and physical data for stream, lakes, springs, and wells (water quality). Although Hurricane Dennis disrupted the weather for the conference, it also gave participants in **Stoker's** presentation the opportunity to use NWISWeb to track tides and see how much they rose as a result of the hurricane. "They then worked on their own areas of interest," noted **Stoker**. "One participant from Alaska wanted to know if the USGS had water-quality data for a particular stream; another was interested in data in the New Hampshire area."

Although the workshops were geared toward educators and scientists, all who attended gained knowledge about some

(DLESE continued on page 13)

Participants in the Karst and Hydrogeology in West-Central Florida field trip.

(DLESE continued from page 12)

intriguing and progressive science subjects. Many of the programs were focused on expanding public knowledge. "All of the activities encouraged participation," said **Chris Polloni**, "so it was difficult to be shy around this group of Earth-science educators and data providers." The USGS provided some great tools and information and new ways to approach scientific learning. Along with the lab presentations, field excursions gave participants memorable and unique experiences. With their passion about Earth science, USGS employees certainly are helping to stir interest in Earth education.

Workshop on Integrating Modeling and USGS Laboratory Studies of Gas Hydrates

By Debbie Hutchinson

On August 2-3, the U.S. Geological Survey (USGS) hosted a workshop in Denver, CO, to determine how its gas-hydrate laboratory studies could be more closely aligned with a growing number of modeling studies that simulate gas hydrates within geologic and petroleum systems. This strategic focus on specific models is a response to several gas-hydrate-related computer-modeling codes currently being used in the hydrate community (for example, TOUGH-Fx/hydrate from Lawrence Berkeley National Laboratory; CGM STARS from commercial hydrocarbon exploration; MH21 from the University of Tokyo, Japan; and STOMP-HYD from the Pacific Northwest National Laboratory). The workshop was intended not to suggest that laboratory results are relevant only to constraining or validating these types of models, but rather to identify those key parameters that USGS laboratory experiments could provide to help further our understanding of gas hydrates in the natural environment.

***Fred Wright** (Geological Survey of Canada) presents his thought-provoking ideas summarizing the issues and linkages between gas-hydrate modeling and laboratory research. The workshop took place at the USGS Energy Resources Team Conference Room at the Federal Center in Lakewood, CO. Photograph by **Bill Winters**.*

The workshop was convened by USGS scientists **Debbie Hutchinson** (Coastal and Marine Geology, Woods Hole, MA) and **Tim Collett** (Energy Resources, Denver). Twenty-nine scientists representing the USGS, the Geological Survey of Canada, the U.S. National Laboratories, industry, academia, the U.S. Department of Energy (DOE), and the Minerals Management Service (MMS) participated in the meeting. Covering a broad range of expertise, they included laboratory experimentalists, numerical modelers, field scientists, and Federal research managers.

The day-and-a-half meeting began with a day of presentations and discussions about modeling approaches, laboratory knowledge, and how laboratory and modeling studies are linked. Here is a sampling of some of the key themes that emerged from these indepth discussions:

- Confidence in current modeling results is constrained by an incomplete understanding of some key processes and uncertainties regarding appropriate values for model inputs.
- Heterogeneity is rarely adequately modeled (at micro-to-macro spatial scales and short-to-long temporal scales).
- Understanding transport properties is a critical need (especially fluid-flow characteristics, the role of fractures, changing permeability, and so on).
- Despite years of study, the research community still cannot reliably quantify gas-hydrate saturations from seismic data.
- Scaling between millimeter-to-centimeter laboratory sizes (with simple, well-characterized experiments) and hundreds of meter-to-kilometer model results (with large heterogeneity and complexity) remains a major challenge.
- A newly developing research challenge is to understand the biogeochemical processes in sediment associated with gas hydrate (that is, linking physics, biology, and chemistry).

The last half-day of the workshop involved brainstorming and synthesis, in which all participants identified the five highest-priority hydrate-research topics they felt were required to advance laboratory, field, and modeling studies, within the context of understanding the natural gas-hydrate system. The priorities generally followed the major themes summarized above.

Of particular note is that the primary knowledge gap that repeatedly arose was in characterizing transport and transient phenomena in the gas-hydrate system. The nature of this gap shows that, in the 45 years since gas hydrates have been recognized in the natural environment, the study of natural gas hydrates has finally matured from characterizing the simple, static situation (that is, how to identify and characterize gas hydrates in the Earth) to understanding the time-dependent processes that control their formation and dissociation. A better understanding of these transport and transient phenomena will go a long way toward clarifying and refining the role of gas hydrates as a potential future energy resource, as a hazard within the shallow sea floor, and as an agent of climate change.

Steven Schwarzbach Appointed Director of USGS Western Ecological Research Center

By Gloria Maender

The U.S. Geological Survey (USGS) has appointed **Steven Schwarzbach** to serve as center director of the USGS Western Ecological Research Center, headquartered in Sacramento, CA.

Schwarzbach joined both the USGS and the Western Ecological Research Center in 2002 as one of the center's research managers. In July 2004, he became the center's first deputy director, and he has been acting center director since the retirement of **Deborah Maxwell** in spring 2005.

Anne Kinsinger, USGS western regional chief of biological research, said that **Schwarzbach's** expertise and background are great assets in his new position because of the complex, often synergistic ecological challenges of California. "**Steve** not only brings his ability as a manager to this position, but he also brings his considerable wealth of knowledge about a multitude of important natural-resource issues facing the region."

At the Western Ecological Research Center, **Schwarzbach** oversees a wide variety of research, including such topics as contaminants, fire ecology, invasive species, avian ecology, global climate change, wetland restoration, and amphibian declines. He has conducted numerous field studies of contamination impacts to fish and wildlife and their habitats, working on mercury, selenium, petroleum spills, hazardous waste, agricultural drainwater, pesticides, acid mine drainage, and halogenated compounds of many origins. **Schwarzbach** is particularly known for his work with mercury and California clapper rails (endangered birds) in San Francisco Bay.

***Steve Schwarzbach** is the new director of the USGS Western Ecological Research Center. Photograph taken by **Steve's** daughter, **Laurel**, as they climbed Pacaya volcano in Guatemala.*

Schwarzbach was born in Tennessee but is a long-time resident of California. He graduated in 1976 from the University of California, Santa Barbara, with a B.A. in environmental biology and environmental studies. In 1983, he graduated with an M.A. in education from San Francisco State University. At the University of California, Davis, he earned both his M.S. and Ph.D. in ecology, in 1986 and 1989, respectively.

Before joining the USGS, **Schwarzbach** worked for the U.S. Fish and Wildlife Service for nearly 14 years, serving for 6 years as the chief of the Environmental Contaminants Division in the Sacramento Fish and Wildlife Office. While in the Fish and Wildlife Service, he worked on linking science to the agency's policy on numerous environmental-contaminant issues affecting Department of Interior trust resources. Previously, **Schwarzbach** worked as a seasonal ranger with the National Park Service, built trails for the U.S. Forest Service, and gained experience as an elementary school teacher. In his spare time, he enjoys whitewater canoeing and telemark skiing.

Visitor from India Hosted by the Woods Hole Science Center

By Debbie Hutchinson

For most of summer 2005, the U.S. Geological Survey (USGS) Woods Hole Science Center hosted a postdoctoral investigator from Hyderabad, India, **Dr. N. Satyavani**. "**Vani**," as she is known, is a part of the growing gas-hydrates research community in India and came to broaden her expertise in the seismic interpretation of gas hydrates. She comes from the Gas Hydrate Research Group of the National Geophysical Research Institute in Hyderabad. For part of the summer, **Vani** worked with **Debbie Hutchinson** on seismic stratigraphy around the Keathley Canyon drill site in the Gulf of Mexico, using high-resolution seismic data collected in 2003 (see article in *Sound Waves*, July 2003, at URL **http://soundwaves.usgs.gov/2003/07/fieldwork.html**). This site is one of the few sites in the Gulf of Mexico where a bottom-simulating reflection (BSR) has been identified in the gulf. For the latter part of the summer, she worked with **Uri ten Brink** on interpreting ocean-bottom seismometer (OBS) data, using a data set that she brought with her from the Indian Ocean. Because of a workshop held in Denver, **Vani** was also able to visit the USGS Energy Program offices, where she met with **Myung Lee** to discuss an Indian multichannel seismic profile that had an interesting polarity reversal similar to what one might see in a BSR. Good luck, **Vani**, on your return to Hyderabad!

***Dr. N. Satyavani**—"**Vani**"—aboard **Debbie Hutchinson's** sailboat off of Nobska Light, Woods Hole, MA. Photograph by **Debbie Hutchinson**.*

Recently Published Articles

Adams, P.N., Storlazzi, C.D., and Anderson, R.S., 2005, Nearshore wave-induced cyclical flexing of sea cliffs: Journal of Geophysical Research, v. 110, F02002, doi:10.1029/2004JF000217, 2005 [URL **http://www.agu.org/pubs/crossref/2005/2004JF000217.shtml**]

Balaram, V., Banakar, V.K., Hein, J.R., and Rao, C.R.M., 2005, Concentrations of the platinum-group elements (PGE) and gold in manganese nodule samples and their precise determination, *in* Törmänen, T.O., and Alapieti, T.T., eds., 10th International Platinum Symposium, August 8-11, 2005, Oulu, Finland, Extended Abstracts, p. 33-36: Oulu, Finland, Geological Survey of Finland [URL **http://platinumsymposium.oulu.fi/downloads.html#downloads**].

Buynevich, I.V., and FitzGerald, D.M., 2005, Sedimentological signatures of riverine-dominated phases in estuarine and barrier evolution along an embayed coastline, *in* FitzGerald, D.M., and Knight, J., eds., High resolution morphodynamics and sedimentary evolution of estuaries: Dordrecht, Netherlands, Springer, p. 315-334.

Geist, E.L., 2005, Local tsunami hazards in the Pacific Northwest from Cascadia subduction zone earthquakes, *in* Kayen, Robert, ed., Earthquake hazards of the Pacific Northwest coastal and marine regions: U.S. Geological Survey Professional Paper 1661-B, 17 p. [URL **http://pubs.usgs.gov/pp/pp1661b/**].

Hein, J.R., Koschinsky, A., and McIntyre, B., 2005, The global enrichment of platinum group elements in marine ferromanganese crust, *in* Törmänen, T.O., and Alapieti, T.T., eds., 10th International Platinum Symposium, August 8-11, 2005, Oulu, Finland, Extended Abstracts, p. 33-36: Oulu, Finland, Geological Survey of Finland [URL **http://platinumsymposium.oulu.fi/downloads.html#downloads**].

Koschinsky, A., Hein, J.R., and Audroing, J., 2005, The enrichment of platinum and the fractionation of Pt from Pd in marine ferromanganese crusts, *in* Törmänen, T.O., and Alapieti, T.T., eds., 10th International Platinum Symposium, August 8-11, 2005, Oulu, Finland, Extended Abstracts, p. 33-36: Oulu, Finland, Geological Survey of Finland [URL **http://platinumsymposium.oulu.fi/downloads.html#downloads**].

Lee, T.-G., Hein, J.R., Lee, K., Moon, J.-W., and Ko, Y.-T., 2005, Sub-seafloor acoustic characterization of seamounts near the Ogasawara Fracture Zone in the western Pacific using chirp (3-7 kHz) subbottom profiles: Deep-Sea Research I, v. 52, no. 10, p. 1932-1956.

Martini, M., Lightsom, F.S., Sherwood, C.R., Xu, J., Lacy, J.R., Ramsey, A., and Horwitz, R., Hydratools, a MATLAB® based data processing package for Sontek Hydra data [abs.]: IEEE/OES Working Conference on Current Measurement Technology, 8th, Southampton, U.K., June 18-10, 2005, Proceedings, p. 147-151.

Morton, R.A., Bernier, J.C., Barras, J.A., and Ferina, N.F., 2005, Rapid subsidence and historical wetland loss in the Mississippi Delta plain; likely causes and future implications: U.S. Geological Survey Open-File Report 2005-1216, 152 p. [URL **http://pubs.usgs.gov/of/2005/1216/**].

Morton, R.A., Miller, T.L., and Moore, L.J., 2005, Historical shoreline changes along the U.S. Gulf of Mexico; a summary of recent shoreline comparisons and analyses: Journal of Coastal Research, v. 21, no. 4, p. 704-709 [URL **http://www.cerf-jcr.org/**].

Morton, R.A., Peterson, R.L., and Miller, T.L., 2005, Western Louisiana coastal classification maps—Lower Mud Lake entrance channel to Sabine Pass: U.S. Geological Survey Open-File Report 2005-1261 [URL **http://pubs.usgs.gov/of/2005/1261/**].

Pendleton, E.A., Thieler, E.R., and Williams, S.J., 2005, Coastal vulnerability assessment of Virgin Islands National Park (VIIS) to sea-level rise: U.S. Geological Survey Open-File Report 2004-1398 [URL **http://pubs.usgs.gov/of/2004/1398/**].

Rubin, D.M., and Carter, C.L., 2005, Bedforms 4.0; MATLAB code for simulating bedforms and cross-bedding: U.S. Geological Survey Open-File Report 2005-1272 [URL **http://pubs.usgs.gov/of/2005/1272/**].

Sherwood, C.R., and Signell, R.P., 2005, EuroSTRATAFORM—Po and Apennine sediment transport and accumulation experiment (PASTA): U.S. Geological Survey Fact Sheet 2005-3062 [URL **http://pubs.usgs.gov/fs/2005/3062/**].

Sherwood, C.R., Signell, R.P., and Warner, J.C., 2005, Building a community sediment transport model: U.S. Geological Survey Fact Sheet 2005-3061 [URL **http://pubs.usgs.gov/fs/2005/3061/**].

Shinn, E.A., Lidz, B.H., and Hickey, T.D., 2005, 250 miles of reef history; reefs from Ft. Lauderdale to Dry Tortugas: American Association of Petroleum Geologists Annual Meeting, Calgary, Alberta, Canada, June 19-22, 2005, Abstracts Volume, v. 14, p. A128 [URL **http://www.searchanddiscovery.com/documents/abstracts/2005annual_calgary/abstracts/shinn01.htm**].

ten Brink, U.S., 2005, Vertical motions of the Puerto Rico Trench and Puerto Rico and their causes: Journal of Geophysical Research, v. 110, B06404, doi: 10.1029/2004JB003459, 2005 [URL **http://www.agu.org/pubs/crossref/2005/2004JB003459.shtml**].

Weber, K., List, J.H., and Morgan, K.L.M., 2005, An operational mean high water datum for determination of shoreline position from topographic lidar data: U.S. Geological Survey Open-File Report 2005-1027 [URL **http://pubs.usgs.gov/of/2005/1027/**].

Wong, F.L., Geist, E.L., and Venturato, A.J., 2004, GIS development of probabilistic tsunami hazard maps: Eos (American Geophysical Union Transactions), v. 85, no. 47, Fall Meeting Supplement, abstract OS23D-1343 [go to URL **http://www.agu.org/meetings/fm04/waisfm04.html** and search on "venturato"].

(Recently Published continued on page 16)

(Recently Published continued from page 15)

Wong, F.L., Geist, E.L., and Venturato, A.J., 2005, Probabilistic tsunami hazard maps and GIS: ESRI International User Conference, San Diego CA, July 25-29, 2005, Proceedings, 11 p. [abstract at URL **http://gis.esri.com/library/userconf/proc05/abstracts/a2000.html**; paper at URL **http://gis.esri.com/library/userconf/proc05/papers/pap2000.pdf**].

Publications Submitted for Director's Approval

Adams, Peter, and Ruggiero, Peter, Wave energy dissipation by intertidal sand waves on a mixed-sediment beach, *in* International Conference on Coastal Dynamics, 5th, Barcelona, Spain, April 4-8, 2005, Proceedings: Reston, VA, American Society of Civil Engineers Publications [CD].

Barnhardt, W.A., Andrews, B.D., and Butman, B., Geologic mapping of the shallow seafloor offshore of Massachusetts; new techniques and approaches: Geological Society of America Annual Meeting, Salt Lake City, UT, October 16-19, 2005.

Barth, G.A., Scholl, D.W., and Childs, J.R., Methane content and distribution of natural gas hydrate accumulations in the deep-water basins of the Bering Sea [abs.]: American Geophysical Union Fall Meeting, San Francisco, CA, December 5-9, 2005.

Bothner, M.H., and Butman, B., Introduction and overview of the USGS program, *in* Bothner, M.H., and Butman, Bradford, eds., Processes influencing the fate and transport of contaminated sediments in the coastal ocean—Boston Harbor and Massachusetts Bay: U.S. Geological Survey Open-File Report 2005-1250.

Bratton, J., Crusius, J., Cross, V.A., and Koopmans, D.J., Delineation of nearshore freshwater-saltwater relationships in submarine ground water using continuous resistivity profiling and piezometer transects in the Neuse River Estuary [abs.]: Geological Society of America Annual Meeting, Salt Lake City, UT, October 16-19, 2005.

Bratton, J.F., and Corbett, D.R., Recent advances in understanding of the role of fluid flow through continental margins in earth system processes [abs.]: Earth System Processes 2, Calgary, Alberta, Canada, August 8-11, 2005.

Crusius, J., and Bothner, M.H., The effects of bioturbation on sedimentary contaminants inferred from modeling radionuclide profiles in sediment cores from Massachusetts Bay, *in* Bothner, M.H., and Butman, Bradford, eds., Processes influencing the fate and transport of contaminated sediments in the coastal ocean—Boston Harbor and Massachusetts Bay: U.S. Geological Survey Open-File Report 2005-1250.

Draut, A.E., and Rubin, D.M., Measurement of wind, aeolian sand transport, and precipitation in the Colorado River corridor, Grand Canyon, Arizona; November 2003 to December 2004: U.S. Geological Survey Open-File Report.

Espinar, Vanessa, and Wiese, Dana, Transforming a remote-controlled 1⁄4-scale aircraft into a low-cost scientific UAV: GPS World.

Etherington, Lisa, Cochrane, Guy, Harney, Jodi, Taggart, Jim, Mondragon, Jennifer, Andrews, Alex, Madison, Erica, Chezar, Hank, and de La Bruere, Jim, Glacier Bay seafloor habitat mapping and classification; first look at linkages with biological patterns, *in* Piatt, J.F., ed., Integrating multi-disciplinary science for understanding Glacier Bay National Park and Preserve ecosystems, Glacier Bay Science Symposium, Juneau, AK, October 26-28, 2004, Proceedings: U.S. Geological Survey Scientific Investigations Report.

Evans, J.G., Fornari, D., Gilbert, L.Y., Boyle, M., Dougherty, J.A., and Hutchinson, D.R., Archive of raw bottom photographs collected during cruise P1-04-GM, northern Gulf of Mexico, 21-24 June 2004: U.S. Geological Survey Open-File Report 2004-1285, 2 DVD-ROMs.

Fisher, M.A., Langenheim, V.E., Sorlien, C.C., Nicholson, Craig, and Sliter, R.W., Active fault deformation along the south boundary of the Western Transverse Ranges Province, Point Dume to the northern Channel Islands, southern California [abs.]: American Geophysical Union Fall Meeting, San Francisco, CA, December 5-9, 2005.

Greenwood, W.J., Kruse, S., and Swarzenski, P., Extending electromagnetic methods to map coastal pore-water salinities: Ground Water.

Grossman, Eric, Field, Mike, Hart, Patrick, and Kooker, Larry, Evidence of recent sediment storage and transport from shallow seismic stratigraphy on the Cap de Creus shelf, Spain [abs.]: EuroSTRATAFORM-PROMESS Joint Meeting, Salamanca, Spain, October 24-27, 2005.

Jaffe, B., Hutzel, A., Foxgrover, A., Takekawa, J., Athearn, N., Hubbard, J., Samant, M., Martin, C., Hovis, G., Sullivan, S., Vickers, C., and Newby, S., Integrated LIDAR and bathymetric surveys of the south San Francisco Bay region; new data for salt pond restoration planning [abs.]: Biennial State of the San Francisco Estuary Conference, 7th, Oakland, CA, October 4-6, 2005.

Martin, W., and Kalnejais, L., The cycling of Ag, Cu, and Pb in the coastal sediments of Boston Harbor and Massachusetts Bay, *in* Bothner, M.H., and Butman, Bradford, eds., Processes influencing the fate and transport of contaminated sediments in the coastal ocean—Boston Harbor and Massachusetts Bay: U.S. Geological Survey Open-File Report 2005-1250.

Noble, M.A., Rosenberger, Kurt, Xu, Jingping, and Meistrell, Joe, Spatial variation of near-bed currents due to internal bores off southern California [abs.]: Eastern Pacific Ocean Conference (EPOC), 52nd Annual, Stanford Sierra Camp, CA, September 27-30, 2005.

Paull, C.K., Ussler, W., Lorenson, T.D., Winters, W.J., and Dougherty, J.A., Geochemical constraints on the distribution of gas hydrates in the Gulf of Mexico: Geo-Marine Letters.

(Publications Submitted continued on page 17)

Publications, continued

(Publications Submitted continued from page 16)

Ross, S.L., and Zierenberg, R.A., Sidescan sonar imagery of the Escanaba Trough, southern Gorda Ridge, offshore northern California: U.S. Geological Survey Scientific Investigations Map.

Rubin, D.M., Cacchione, D.A., and Puig, Pere, Do observations and modeling support or refute the hypothesis that the Adriatic seafloor crenulations are densiometric antidunes? [abs.]: EuroSTRATAFORM-PROMESS Joint Meeting, Salamanca, Spain, October 24-27, 2005.

Ruggiero, Peter, Buijsman, M.C., Kaminsky, G.M., and Gelfenbaum, Guy, Modeling the effect of wave climate and sediment supply variability on large-scale shoreline change: Marine Geology.

Ryan, H.F., Conrad, J.E., and Sliter, R.W., Quaternary faulting in the inner southern California Borderland offshore San Diego County, California [abs.]: Southern California Earthquake Consortium (SCEC) Annual Meeting, Palm Springs, CA, September 11-14, 2005.

Sayles, F.L., Sediment oxygen profiles, fluxes, and the delivery of organic matter to the sediments, *in* Bothner, M.H., and Butman, Bradford, eds., Processes influencing the fate and transport of contaminated sediments in the coastal ocean—Boston Harbor and Massachusetts Bay: U.S. Geological Survey Open-File Report 2005-1250.

Signell, R.P., Effluent dilution simulations in Massachusetts Bay; assessment of relocating Boston's sewage outfall, *in* Bothner, M.H., and Butman, Bradford, eds., Processes influencing the fate and transport of contaminated sediments in the coastal ocean—Boston Harbor and Massachusetts Bay: U.S. Geological Survey Open-File Report 2005-1250.

Storlazzi, C.D., Brown, E.K., and Field, M.E., Timing, patterns and speed of inter-reef and inter-island coral larval dispersal in the central Hawaiian Islands, USA: Coral Reefs.

Storlazzi, C.D., Russell, M.A., Presto, M.K., and Burbank, J.E., Flow patterns and current structure at the USS *Arizona* Memorial; April 2005: U.S. Geological Survey Open-File Report.

Warner, J.C., Signell, R., Sherwood, C.R., and Arango, H.G., Incorporating nearshore processes into ROMS [abs.]: 2005 ROMS/TOMS Workshop, Adjoint Modeling and Applications, La Jolla, CA, October 24-26, 2005.

Xu, Jingping, Warrick, Jonathan, and Noble, Marlene, Buried in sands—revisiting the February 2004 storm in southern California [abs.]: Eastern Pacific Ocean Conference (EPOC), 52nd Annual, Stanford Sierra Camp, CA, September 27-30, 2005.