UNIVERSITY OF FLORIDA

Honoring the past, shaping the future

GATOR Engineering®

FALL 2003

Civil & Coastal Engineering

Message from the Chair

Dr. Joseph W. Tedesco

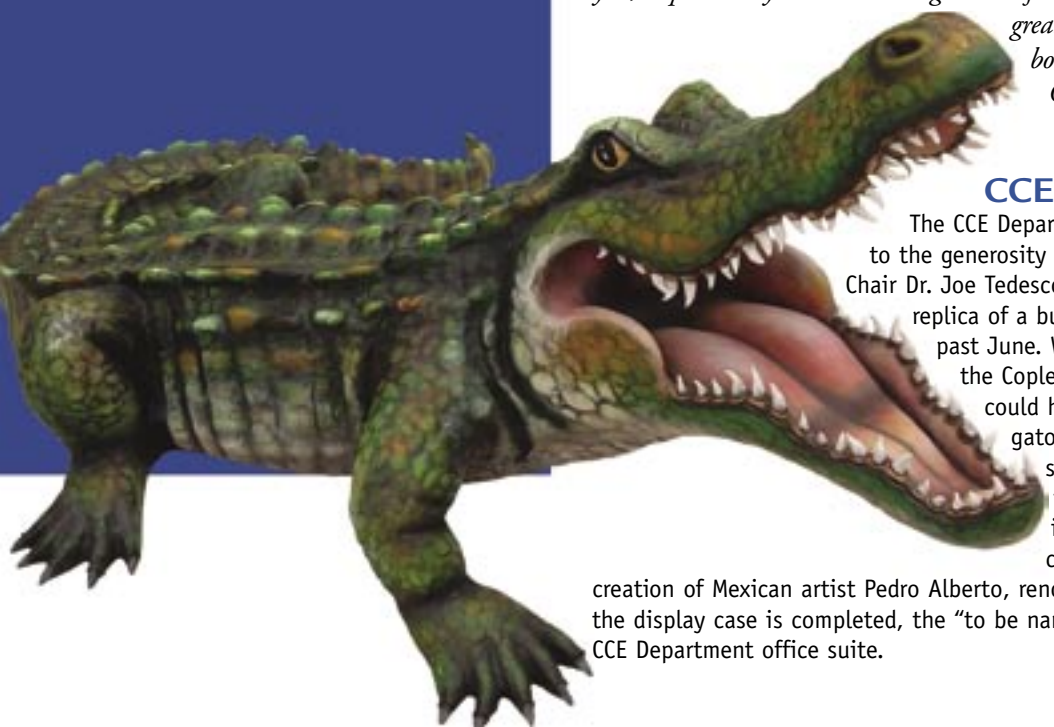
It is my pleasure to present the Fall 2003 issue of the CCE Department Newsletter. I am always very excited to bring you good news about the accomplishments and state of the CCE Department. This newsletter continues with that very enjoyable role, both in my letter and in the feature articles. The CCE Newsletter serves as a vital link to our alumni, industry affiliates in Florida and beyond, and other friends of the Department, as we constantly endeavor to strengthen and broaden ties, as well as promote the excellence and prestige of our program.

Our academic and research programs continue to grow at a dizzying pace. For the Fall 2003 semester, our student enrollment swelled to 704, including 519 undergraduate students and 185 full time graduate students. This impressive increase in our enrollment was accompanied by an equally impressive increase in the quality of our incoming students. The average high school GPA of incoming freshmen this fall exceeded 3.9! GO GATORS!!

The CCE Department Research Program is the most comprehensive in the College of Engineering. Current active research contracts are in excess of $33 million, representing sponsors from a myriad of federal and state agencies, as well as industry. The Department recently achieved a research milestone with the establishment of the National Center for Airborne Laser Mapping (NCALM) by the National Science Foundation last July (please see the accompanying article). This serves as a testament to the high quality of our research programs.

In closing, I strongly encourage CCE Department alumni and friends to keep us informed regarding career achievements and other stories of personal success and fulfillment. We are eager to hear from you! Among other things this newsletter can serve as a virtual bridge to unite our past and present students and friends. We are here for you, so please stay connected. Regardless of where you are now, or when you attended this great university, there will always be that common bond we all share…It's great to be a Florida Gator!

Dr. Joseph W. Tedesco



CCE Acquires Gator Mascot

The CCE Department has it's very own gator mascot thanks to the generosity of Susan Tedesco, wife of CCE Department Chair Dr. Joe Tedesco. Mrs. Tedesco purchased the life-sized replica of a bull gator on a visit to Boston, MA this past June. While browsing in the Pavo Real Gallery in the Copley Square section of Boston, Mrs. Tedesco could hardly avoid noticing the papier maché gator. Upon realizing that her husband, who suffers from terminal gatormania, would trade his University of Notre Dame diploma in exchange for such a prize, the sale was consummated. The art deco gator is the creation of Mexican artist Pedro Alberto, renowned for his exotic animal sculptures. Once the display case is completed, the "to be named" gator will be proudly displayed in the CCE Department office suite.

CCE Faculty Activities

Dr. Bob Dean, Professor, was granted Emeritus status in rank of Professor with full support of the Civil & Coastal Engineering faculty upon his retirement in June. Dr. Dean also presented a Keynote paper at the Thirtieth Congress of the International Association of Hydraulic Engineering and Research held in Thessaloniki, Greece during the week of August 25. The title of the paper was "Sustainability of the World's Beaches".

Dr. Ralph Ellis, Associate Professor has been elected to serve as Director of Education and Research Directorate and member of the Board of Directors of the Construction Institute of the American Society of Civil Engineers.

Dr. Scot E. Smith, Associate Professor was awarded a six-month Fulbright Scholarship to Hungary. He visited Hungary in the fall 2002 and worked on several water quality related projects at the Technical University of Budapest and the Hungarian Remote Sensing Centre.

Dr. Thomas Sputo, P.E. Lecturer, was appointed Chairman of the Test Procedures subcommittee of the American Iron and Steel Institute (AISI) Committee on Specifications. The AISI Committee on Specifications is responsible for the North American Specification for the Design of Cold-Formed Steel Structural Members, used by structural engineers in the United States, Canada and Mexico. Dr. Sputo has also been appointed as our department's ASCE Student Section advisor.

Kenneth Courage, Professor was granted Emeritus status in rank of Professor with full support of the Civil & Coastal Engineering faculty upon his retirement in August.

Dr. Fazil T. Najafi, Professor was appointed to the Transportation Research Board Committee on Structures Maintenance for a 3-year term and to the Committee on Bridge Management Systems.

Dr. Ashish Mehta, Professor was selected as the first recipient of the Florida Shore & Beach Preservation Association's Bob Dean Beach Research Award. The award is presented for outstanding contributions to beach preservation research. Dr. Mehta was cited for over three decades of research contribution.

Dr. Ronald A. Cook, Professor was appointed to the Working Commission on Concrete Structures of the International Association of Bridge and Structural Engineers. Dr. Cook is the US representative on the Working Commission with members from eighteen other countries.

Dr. Joseph W. Tedesco, Civil and Coastal Engineering Department Chair, was appointed Senior Managing Editor for the ASCE Journal of Structural Engineering and was also selected as Chairman of the ASCE Technical Administrative Committee (TAC) on Dynamic Effects. Dr. Tedesco also edited a book, Advances in Computational Fluid and Solid Mechanics, in honor of M.I.T. professor Klaus-Jurgen Bathe. Dr. Tedesco presented the book to Professor Bathe at the opening ceremony of the Second M.I.T. Conference on Computational Fluid and Solid Mechanics held at M.I.T. this past June.

University Consortium Awarded Major Research Contract For Homeland Security

A university consortium, consisting of the University of Florida, Pennsylvania State University, the University of California at San Diego, New Mexico Institute of Mining and Technology, Florida A&M University, and North Carolina A&T University, was recently awarded a major research contract by the Defense Threat Reduction Agency (DTRA). DTRA's mission is to safeguard America and its allies from weapons of mass destruction (WMD), including chemical, biological, radiological, nuclear, and conventional high explosives, by reducing the present threat and preparing for the future threat. DTRA's strategic partnership objective with the university consortium is to obtain innovative ideas and products related to its mission. Such ideas and products will address issues in technology, policy, strategy and related infrastructure considerations.

Dr. Joseph W. Tedesco, Chairman of the Department of Civil and Coastal Engineering, and Dean Pramod P. Khargonekar, will serve as Technical Director and Administrative Director, respectively, for the University of Florida. The initial 3-year award is for $51M, with two consecutive 3-year awards at $51M each pending, for a total of $153M over 9 years.

This award elevates the University of Florida into a nationally recognized leadership position for homeland security research. It is anticipated that University of Florida researchers from the College of Liberal Arts and Sciences and the College of Medicine, in addition to the College of Engineering, will participate in this major research initiative.

Real Time Hurricane Info Can Now Go Public

Hurricane wind damage mitigation research conducted jointly by UF and Clemson has gone real-time. Students and faculty from both schools converged in North Carolina on Sept. 15th to place wind measurement devices in the path of Isabel. The four portable wind towers are now able to transmit peak values of wind speed every 15 minutes to a public web site as the storm is passing. NOAA researchers use the data to help their wind-field models, giving emergency managers better and quicker information on the storm behavior over land. The web site is www.ce.ufl.edu/~fcmp/

NCALM

NSF supported Center for Airborne Laser Mapping

NSF Creates a Research Center

by Ramesh L. Shrestha and Bill Carter

The National Science Foundation (NSF) recently awarded a grant to create a research center to support the use of airborne laser mapping technology in the scientific community. The NSF supported Center for Airborne Laser Mapping (NCALM) will be operated jointly by the Department of Civil & Coastal Engineering, College of Engineering, University of Florida (UF) and the Department of Earth and Planetary Science, University of California-Berkeley (UCB). NCALM will use the Airborne Laser Swath Mapping (ALSM) system jointly owned by UF and Florida International University (FIU), based at the UF Geosensing Engineering and Mapping (GEM) Research Center. The state-of-the-art laser surveying instrumentation, GPS systems, which are installed in a Cessna 337 Skymaster aircraft, will collect data in areas selected through competitive NSF grant review process.

The ALSM observations will be analyzed both at UF and UCB, and made available to the Principal Investigator (PI) through an archiving and distribution center at UCB-building upon the Berkeley Seismological Laboratory (BSL) Northern California Earthquake Data Center system. The Center will contribute to software development that will increase the processing speed and data accuracy. NSF supported researchers will contact UF during proposal preparation to obtain guidance on cost estimates, scheduling and related issues. Once funded, PIs and their students will be able to participate in all phases of the work.

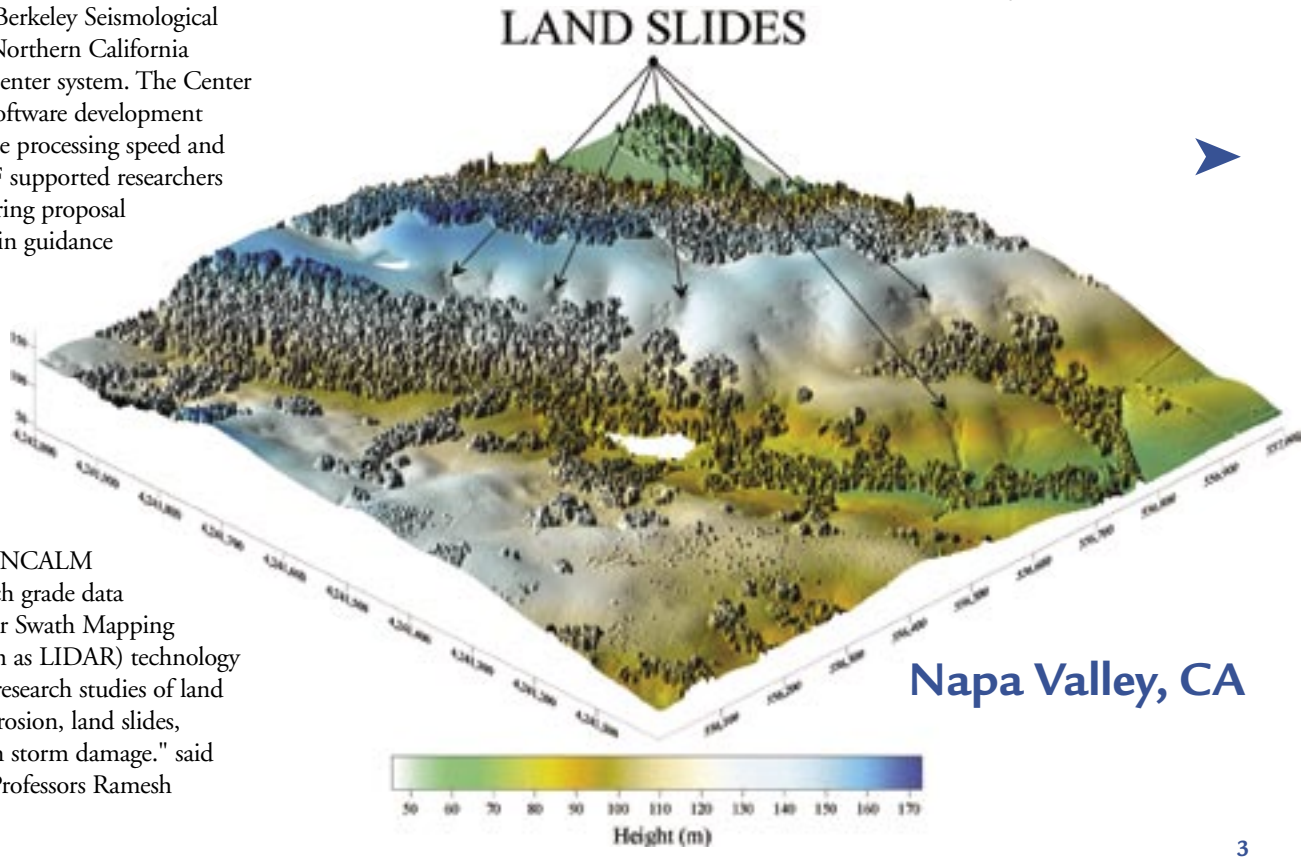
"The purpose of NCALM is to provide research grade data from Airborne Laser Swath Mapping (ALSM, also known as LIDAR) technology to NSF supported research studies of land forms, hydrology, erosion, land slides, sinkholes and beach storm damage." said Ramesh Shrestha. Professors Ramesh Shrestha and Bill Carter at UF, and Bill Dietrich from UCB are the Principal Investigators for the NSF supported Center. Initial funding for a two-year period is $1.2M.

The Technology

ALSM can produce a highly accurate three-dimensional, digital topographical map of a large area of land surface. The major component of the system is a laser that emits tens of thousands of short pulses of light per second. The laser is mounted in a small twin-engine aircraft and the laser pulses are directed towards the ground by a scanning mirror. Each pulse illuminates an area, or footprint, of about one foot in diameter and the light is scattered back to a sensor in the aircraft. The round trip travel time of the laser light allows researches to compute the precise three-dimensional locations of the points on the ground. The resulting set of latitudes, longitudes and heights of many millions of points on the ground is then transformed into a highly accurate map.

UF and Florida International University (FIU) jointly own and operate the ALSM system. When it was purchased almost five years ago, it was the first ALSM system owned and operated by any academic institution in the world. The UF has had a research program for more than five years in the application of ALSM to a wide variety of problems, and has completed more than 50 research projects funded by federal, state and local agencies. These include a collaborative effort to map the World Trade Center site in the wake of the Sept. 11 attacks, landslide detection and monitoring, sinkhole assessment and the damage of coastal areas by hurricanes.

"The new NSF research center will have two main areas of focus: assisting NSF-supported researchers with mapping projects and further enhancing and perfecting the mapping technology." Carter said. He also noted that "Traditional mapping techniques such as surveying, photogrammetry and GPS are either impractical or extremely expensive when it comes to mapping large areas spanning tens or hundreds



Napa Valley, CA

of square miles." The result is that current topographical maps do not have the resolution often needed for earthquake scientists, for example, or landscape ecologists, to draw meaningful conclusions. Once perfected, the laser mapping technology has the potential to change that, with potentially radical results.

NCALM Workshop

As a part of NCALM, a workshop sponsored by NSF was held in Gainesville, FL, April 24-26, 2003. About 50 scientists, researchers and students from universities, government agencies, national laboratories, and private industry participated in the workshop to learn about the current capabilities of ALSM, share their experiences in using ALSM for a wide variety of research applications, outline research made possible by research grade ALSM data, and discuss the operation and management of NCALM. The program included 33 verbal presentations, 10 poster presentations, a field visit to the Gainesville Regional Airport to examine the UF ALSM data collection system, and a half-day of open discussions covering all aspects of NCALM. The workshop was jointly convened by UF and UCB and the extensive effort made to inform the community of the workshop succeeded in attracting an excellent cross section of researchers. A wide range of basic research problems in geo-sciences and geo-surficial processes were described that would exploit ALSM technology.

The topography of the earth's surface contains signatures of tectonic and erosional processes. It structures hydrologic pathways, soil moisture distribution and ecosystems, it reveals the mechanics of glaciers and faults, and it must be used to predict vegetation assemblages, soil development, local climate, runoff or landslide and flood plain hazards. Until recently, it was not practically possible to obtain topographic data over broad areas with sufficient resolution and accuracy that could be reliably used to advance our basic understanding of earth surface processes. With the capability to generate ground surface data points every 1 m (or closer) at a vertical accuracy of 5 to 10 cm and a horizontal accuracy of 15 to 20 cm, ALSM now makes it possible to obtain such research-grade data.

For the first time, airborne laser swath mapping can provide high resolution topographic data over broad areas. "If research grade ALSM data can be made widely available at cost effective rates to researchers, it will literally revolutionize fields associated with earth surface processes, from ecology, to geomorphology, hydrology and earthquake geophysics," Dietrich said. For example, high resolution topography are needed to advance and test new theories for the erosional mechanics controlling the linkages between tectonics and climate, to develop reliable observations and predictions of regional soil moisture dynamics for regional climate models, and to develop accurate landslide and flooding forecasting using precipitation forecasts. Despite considerable effort, PIs have not been able to get research grade topographic data from commercial companies. Furthermore, there is a need for basic research to advance the use of the technology, especially in the software for optimizing the speed and accuracy of data reduction.

Recent Projects

The UF-UCB team recently successfully completed a field campaign that included mapping of the Napa Valley watershed and Gabalin Mesa in California, alluvial fans

CCE Faculty Member Honored with Prestigious NSF Career Award

The quality of the faculty members in the Department of Civil and Coastal Engineering was again recognized in 2003 when another young professor received the Faculty Early Career Development (Career) Award. Assistant Professor, Donald Slinn, was named recipient of the Career Award, which is sponsored by the National Science Foundation (NSF). The award provides $454,000 over five years and is the most prestigious honor presented to junior faculty by NSF. Previous winners of this award in the CCE Department include Dr. Kurt Gurley in 2001.

NSF established the CAREER program in 1995 to help top-performing scientists and engineers early in their careers to simultaneously develop their contributions and commitment to research and to education. The CAREER program recognizes and supports the career-development activities of those teacher-scholars who are likely to become the academic leaders of the 21st Century. CAREER awardees are selected on the basis of creative, career-development plans that effectively integrate research and education within the context of the mission of their institution.

Slinn received the award in recognition of his research and teaching activities. The project associated with the award continues a line of work that he began with the study of alongshore currents over barred beaches. He continued the study by examining the behavior of rip currents caused by breaking waves in the surf zone, and the next step will be to introduce nonlinear, three-dimensional, time-dependent, non-hydrostatic, large-eddy simulation modeling to nearshore circulation studies. Progress in understanding coastal waves and currents is needed to develop improved engineering solutions for coastal erosion, port and harbor designs, and for a host of environmental (dispersion of pollution) and ecological problems (impact on ecosystems). Significant public safety (rip currents) and national security issues (e.g., mine burial) are also relevant to the research project. Dr. Slinn teaches courses in wave and fluid dynamics, environmental modeling, and coastal dynamics. Two graduate students and two undergraduate research assistants are working on the CAREER project. Dr. Slinn also has active projects focusing on storm surge from hurricanes, tides, and air-sea interaction. He received his Ph.D. from the University of Washington and taught Ocean Engineering at Florida Atlantic University for three years before joining the Coastal Engineering group in CCE at the University of Florida in 2001.

bordering Death Valley in Nevada, and the San Pedro riparian corridor and Walnut Gulch in Arizona. A total of more than 500 square miles was mapped in a four-week field campaign and preliminary results were delivered to researchers within a few weeks of collecting the data.

The Bureau of Beaches and Coastal Systems (BBCS), Florida Department of Environmental Protection (FDEP) is also using this state-of-the-art technology to map and monitor Florida's coastline. Each year approximately 150 miles of beaches and upland extending about a third of a mile inland, will be mapped routinely. In addition, the UF/FIU system will be on "stand-by" to immediately map beaches damaged by severe storms and hurricanes. FDEP expects to realize significant savings and improve its ability to respond rapidly after hurricanes, reducing the impact of natural disasters on the residents of Florida.

Acknowledgment

NSF's Division of Earth Sciences, Instrumentation and Facilities, under the leadership of Director Dr. Russell C. Kelz, is providing the funding for the center.

A Novel Technology for Monitoring Our Groundwater

The Direct Passive Technology for Measuring Water and Contaminant Fluxes in Porous Media.

University of Florida professors Kirk Hatfield from Civil and Coastal Engineering and Michael Annable from Environmental Engineering Sciences have invented a new groundwater monitoring technology that provides for simultaneous, direct, in situ, point measurements of cumulative or time-averaged contaminant mass flux and water flux. The invention, referred to as a 'passive flux meter' (PFM), generates the type of data needed by regulators who must address a range of issues pertinent to aquifer and groundwater remediation. Theses issues include; subsurface contaminant source prioritization, risk prediction, compliance monitoring, remediation endpoint evaluation, and contaminant attenuation assessment.

University of Florida holds the patent on a PFM design, which is simply a self-contained permeable unit that is inserted into a well or boring such that it passively intercepts groundwater flow but does not retain it. The interior composition of the meter is a matrix of hydrophobic and hydrophilic permeable sorbents that retain dissolved organic and inorganic contaminants present in the fluid intercepted. The sorbent matrix is also impregnated with known amounts of one or more fluid-soluble 'resident tracers'. These tracers are leached from the sorbent at rates proportional to the fluid flux.

To use a PFM, it is simply inserted into a well or bore hole, where it is exposed to groundwater flow for a period ranging from days to months; after which, the meter is removed and the sorbent is carefully extracted to quantify the mass of all contaminants intercepted and the residual masses of all resident tracers. Contaminants masses are used to calculate time-averaged or cumulative contaminant fluxes, while residual resident tracer masses are used to calculate time-averaged or cumulative groundwater flux.

Figure 1 illustrates the deployment of six PFM's in six wells distributed over two transects located downgradient from a contaminant source but upgradient from a sentinel well. Depth variations of both water and contaminant fluxes can be measured in an aquifer from a single PFM by vertically segmenting the exposed sorbent packing; thus, at any specific well depth, an extraction from the locally exposed sorbent yields the mass of resident tracer remaining and the mass of contaminant intercepted. PFMs installed along a transect perpendicular to the mean flow direction can be used to estimate the integral discharge of water and contaminant mass; that is, the contaminant mass flow is estimated from spatially integrating point measurements of contaminant flux over a subsurface control plane or contaminant source boundary. The magnitude and uncertainty in these contaminant discharge estimates can be used to forecast the likelihood of violating pollutant concentration limits at the sentinel well. Furthermore, under steady-transport conditions, differences in measured contaminant mass flows between transects can be used to estimate natural attenuation.

For the purpose of monitoring subsurface contamination, the PFM possesses several advantages over traditional technologies. For example, the PFM is the only known technology that provides for simultaneous evaluation of vertical variations in both horizontal water and contaminant fluxes under natural gradient conditions. All flux measurements are cumulative; and as a result, are less sensitive to daily fluctuations

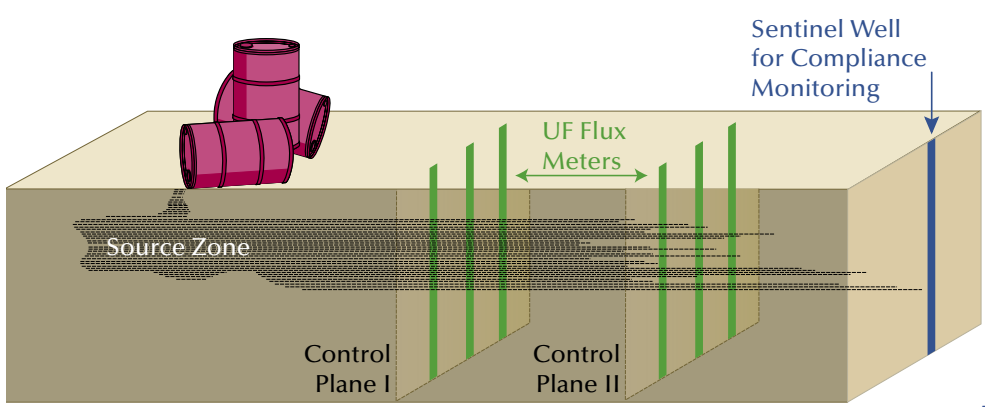


Fig. 1. Deployment of six passive flux meters in six wells distributed over two control planes located downgradient from a contaminant source zone.

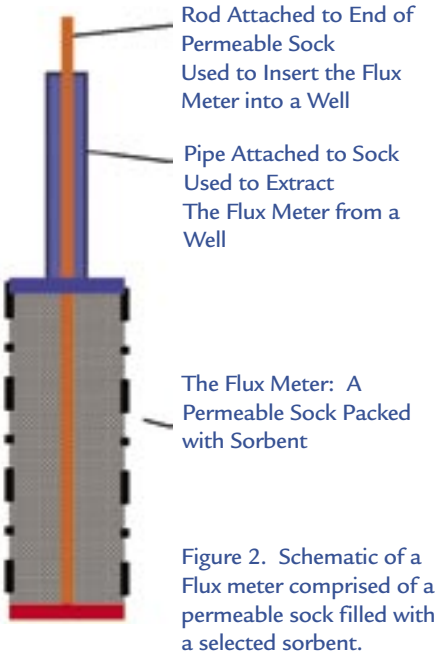


Figure 2. Schematic of a Flux meter comprised of a permeable sock filled with a selected sorbent.

Table 1. PFM components for various target contaminants.

Contaminant Type	Passive Flux Meter Components	
	Sorbent	Resident Tracers
Hydrophobic Organic (i.e., chlorinated solvents, PCBs, Pesticides, petroleum products).	Activated Carbon, Surfactant Modified Zeolite	Non-reactive Food Additives, Branched alcohols, and salts
Anionic Organic, ions, Metal complexes, Nutrient (i.e., Chromate, Nitrate, phosphate, arsenate)	Anion Exchange Resin, Surfactant Modified Zeolite	Non-reactive Food Additives, and various anions and cations
Cationic Organics, Metals, and Ions (Lead)	Cation Exchange Resin, Surfactant Modified Zeolite Non-reactive Food	Additives, and various anions and cations

in groundwater flow or contaminant concentrations as the sampling period increases. Prior knowledge of the ambient groundwater discharge rate is not critical because multiple resident tracers are used to measure water flux. Furthermore, a meter can be designed to operate over a wide range of aquifer hydraulic conductivities; hence, PFM application does not require precise prior knowledge about local aquifer hydraulic conductivities. Finally, minimal waste is generated with the operation of PFMs.

The Department of Defense, is funding a research effort lead by Drs. Hatfield and Annable to demonstrate and validate that the PFM will provide the necessary long- and short-term monitoring data needs of aquifer and groundwater remediation. This research is leading to field demonstrations at several locations across the United States including, Hill AFB, NASA, Port Hueneme, and at the NSWC at Indian head Maryland. These field tests are showing that the PFM generates the water and contaminant flux data needed to address issues pertinent to source strength assessment, site management, and groundwater remediation.

The current PFM prototype being tested is simple in design and requires only a few basic components including; a permeable sorbent (i.e., granular activated carbon), multiple resident tracers that are pre-equilibrated or pre-sorbed on to the PFM sobent; a sock to contain the sorbent that is of a length equal to the desired length of the flux meter and made of open-weave nylon cloth; a stainless-steel rod of a length equal to the desired length of the flux meter, a short piece of stainless-steel pipe, and fasteners. Figure 2 illustrates a simple flux meter design. Alternative PFM designs have been envisioned but for the lack of resources have not been pursued.

Table 1 identifies suitable sorbents that could be used in PFMs to monitor specific groundwater contaminants. For the most part, research at University of Florida has focused monitoring sites located at DoD installations and at Cape Canaveral. For these sites, contaminants were primarily chlorinated solvents; hence activated carbon was used as a PFM sorbent, and branched alcohols were used as resident tracers.

Renovated Structures Lab Gets a STRONG FLOOR

The east end of Weil Hall is currently in the process of a major renovation to the Structures area on the first floor with funds left over from the west end renovation of offices and teaching laboratories. The renovated area includes a four-foot thick strong-floor with four times the capacity of the previous strong-floor that puts our laboratory at the same level as other major structural laboratories. In addition, a strong-wall is also being added that will permit testing of structural wall and beam/column systems that has not been possible in the past and that is only possible at limited laboratories. This new testing capacity will enable our research faculty to expand into new areas of research previously beyond our grasp.

UF-ASCE Student Chapter Begins New Year

The UF American Society of Civil Engineers (ASCE) Student Chapter begins the 2003-2004 academic year looking forward to new challenges under a new group of officers and a new advisor. With over 250 members, UF-ASCE is one of the largest and most active student organizations at the University of Florida, and one of the largest ASCE student chapters in the nation.

In March 2003, the chapter participated in the Southeast Region ASCE Student Conference in Miami, competing with students from 25 schools from around the southeast, Puerto Rico and The Netherlands, in competitions including concrete canoe, balsa wood bridge, environmental, and technical paper competitions. The chapter proved its mettle, finishing a very respectable overall second place.

After winning the regional competition in Miami, the Student Steel Bridge Team competed in the 12th Annual Student Steel Bridge Competition, held at San Diego State University in May. Out of 182 schools that competed at the regional level, only 44 qualified for this national competition. In the most competitive national competition to date, the UF team placed 3rd overall in the nation, highlighting the academic and leadership skills of chapter members. The UF team has a long track record of success at this annual event, qualifying for each annual national competition since it's inception in 1992, placing among the top ten schools ten times, including winning in 1997. The UF team achievement was recognized in an article in the July 2003 issue of ASCE News.

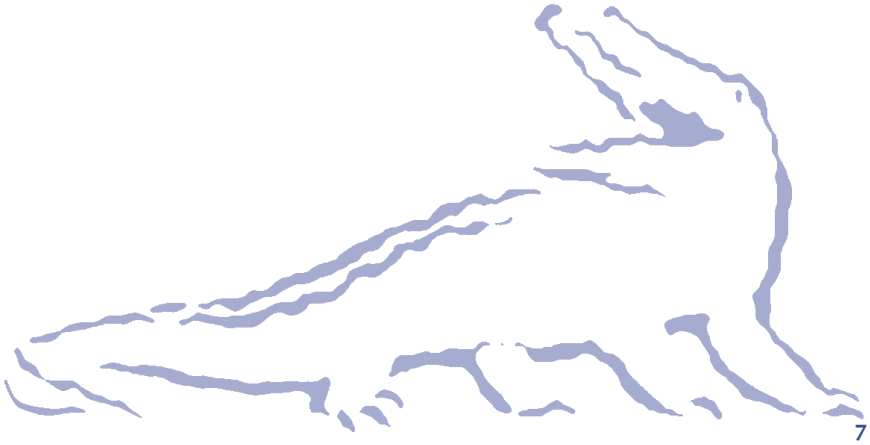
In September, the UF chapter was once again awarded a Certificate of Commendation by ASCE national headquarters, in recognition of its performance as one of the top 10% of all student chapters nationally.

The chapter has plans for an active upcoming year, including service projects such as adopt-a-highway, early engineering education initiatives in area middle schools, and Habitat for Humanity construction, along with the ever popular pre-football game BBQ's and happy hours.

After twelve years as chapter faculty advisor, Dr. Marc Hoit stepped down in April, due to his duties as Associate Dean of Engineering for Academic Programs. Dr. Thomas Sputo, a member of the department structural engineering faculty, has energetically assumed this assignment. The chapter and the department thank Dr. Hoit for his many years of dedicated service.

2002-2003 Steel Bridge Team (left to right): Adrien Lane(Co-Captain), Chet Zabik (Captain), Jereme Williams, Ryan Thrun, Jagath "Jag" Samaraweera, Todd Kelly, Tim Fillbach, Andre Tousignant, and Chris Lee.

The bridge team assembles the bridge in 1 minute 19 seconds at the SDSU Cox Arena in May.



UNIVERSITY OF
FLORIDA

Department of Civil & Coastal Engineering
365 Weil Hall/PO Box 116580
Gainesville, FL 32611-6580

http://www.ce.ufl.edu

GATOR Engineering

CCE Needs Your Support

In this time of receding support from the State Government, we need the help of our loyal alumni and friends. Any donations you can make to the Department will help to sustain the vitality and quality of our education programs. Thank you in advance.

Joseph Tedesco

Yes, I want to donate to the University of Florida Department of Civil & Coastal Engineering. My donation is:

$50 $100 $250 $500 $1000 Other ____

Make checks payable to University of Florida Foundation.

Do we have your current address? Please help us update our records:

Name:_____

Place of Work:_____

_____

Home Address:_____

_____

Perfered Address HOME ( ) BUSINESS ( )

e-mail:_____

UNIVERSITY OF FLORIDA

Department Contact Information

Department of Civil &
Coastal Engineering
365 Weil Hall/PO Box 116580
Gainesville, FL 32611-6580

352-392-9537 (main)
352-392-3394 (fax)
http://www.ce.ufl.edu