



## Florida Coastal Everglades Long Term Ecological Research

# News from the Sloughs

News from the researchers,  
students, and educators of FCE  
LTER

## Volume 2, Number 2

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## FCE Reviewed!

Lead Principal Investigator Dr. Evelyn Gaiser has captained the FCE program for a renewal of NSF funding for FCE. A huge congratulation goes out to Dr. Gaiser and all of the FCE people who worked so incredibly hard to make this possible. FCE researchers are already deep in the forests, prairies, wetlands, prairies and rivers of the Everglades working toward collecting data to address the new goals detailed in the renewal proposal. The unofficial good news arrived shortly after FCE had its 12<sup>th</sup> Annual All Scientists Meeting at The Deering Estate in Miami, Florida where there were over thirty new faces joining the meeting, including researchers, technicians, students, partners, educators and artists. Thank you to Jennifer Tisthammer and the Deering Estate for hosting our FCE ASM!-*Note from the editor and photo above by Franco Tobias*

For more of Franco Tobias' stunning photos visit:  
<http://francotobias.smugmug.com/>

Remember to submit your working group proposals for the triennial 2012 LTER ASM at Estes Park, CO



# Mangroves Get a 5 Star Rating- in Ecosystem Services

Florida Coastal Everglades LTER researchers Drs. Jordan G. Barr, Jose D. Fuentes and Vic Engel have been studying coastal mangrove forests on the west coast of Florida for over a decade. And yes- they do hug the trees- as part of the fieldwork to determine the stem density of the forests. Hugging trees is just one aspect of the field sampling. Other sampling techniques by these scientists require the latest in technology and range from massive computational processing of satellite imagery to building and processing data from towers that measure atmospheric exchanges of carbon dioxide.

Red Mangrove or *Rhizophora mangle* line the coastal zone of the west coast of Florida and provide critical ecosystem services. The new knowledge gleaned so far by these researchers reveals that Everglades National Park (ENP) mangroves provide many services, including shoreline protection, soil

conservation, and reduced atmospheric warming (Figure 1). The reduced atmospheric warming is because they assimilate large amounts of greenhouse carbon dioxide.

Red mangrove trees appear to walk across the edges of South Florida and in other tropical and

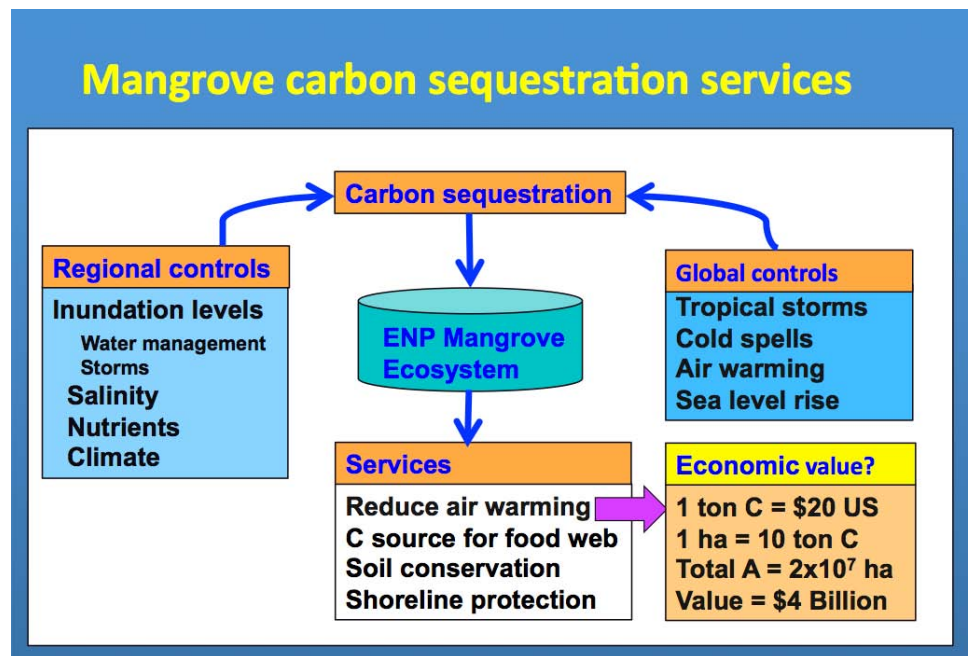


Figure 1: (above) Mangrove Ecosystem Services

semitropical coastal zones around the belt of the planet with “legs” called prop roots. The trees themselves can grow to be giants of 20 meters on the seaward end of the Shark River that opens into the Gulf of Mexico.

Mangroves also have an extensive root system below the prop roots and are highly successful in surviving hurricanes and extreme weather events. In this way, they protect the shoreline and decrease the amount of soil eroded, which in this case, Everglades mangrove peat can be as thick as six meters. In the March issue of *Agricultural and Forest Meteorology* [http://fcelter.fiu.edu/publications/request\\_reprint.epl?pubid=534](http://fcelter.fiu.edu/publications/request_reprint.epl?pubid=534),

these scientists and their colleagues present a wealth of data showing that the mangrove forests recovered quickly; both in structure and mass



Figure 2: (left) Red Mangrove prop roots in Shark River, ENP



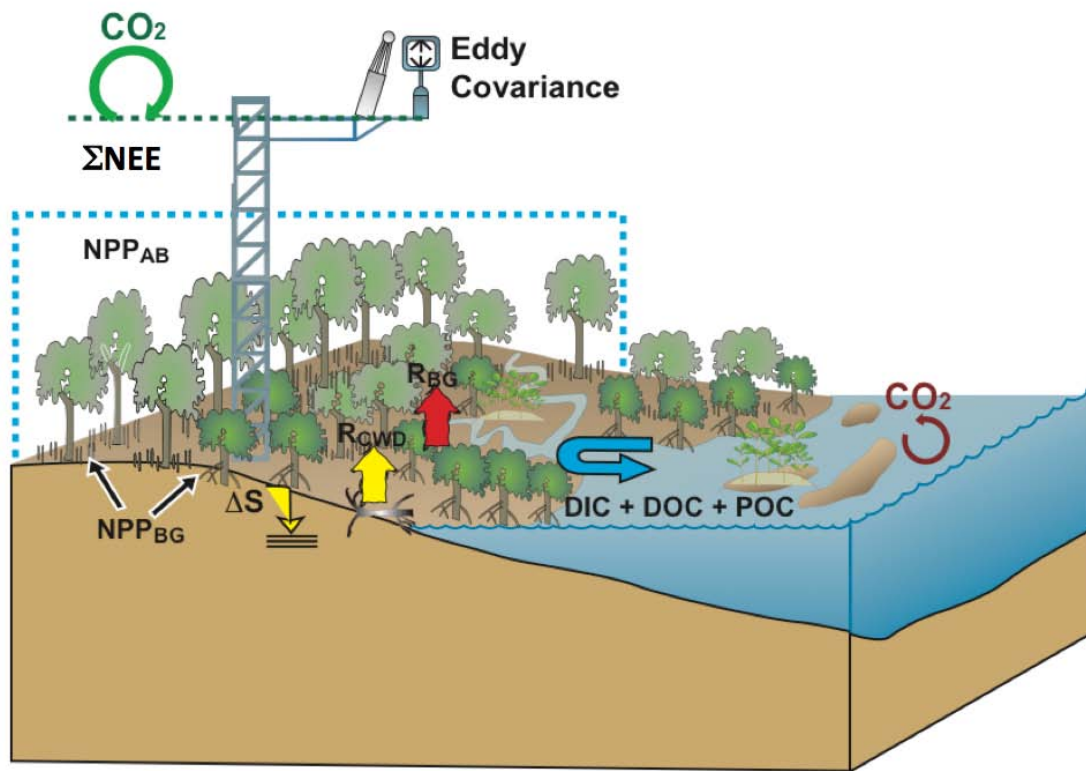
**Figure 3:** (above) The canopy and stem density recovery in mangrove forest along Shark River, Everglades National Park

Photo by Dr. Jordan Barr

(Figure 3), and their ecosystem services, from the damage caused by Hurricane Wilma in 2005.

In the budget of the nation, we use dollars to measure productivity yet productivity in forest ecology is the amount of carbon made per unit area over time -in this case tons of carbon per hectare per year. These FCE researchers and their colleagues have found that mangrove forests are extremely efficient at cycling and storing carbon. At the global scale, the tangles of mangrove forests are revealing a story that in carbon units these forests could provide a service totaling over \$4 billion, assuming that one ton of carbon can be purchased at the price of \$20 US.

Determining how mangroves cycle carbon and how productive they are is not a simple task and involves many facets of sampling and analysis at many scales over time and space (Figure 4).



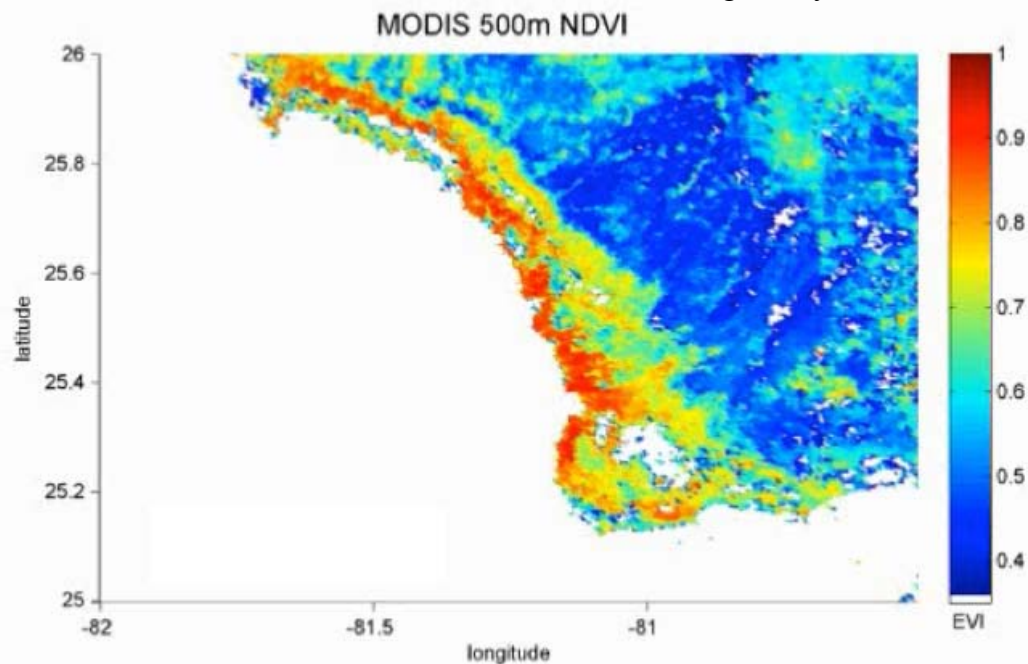
**Figure 4:** (above) Schematic Model of Mangrove Carbon Cycling showing components involved in determining productivity (Figure by Dr. Jordan Barr and Dr. Jose Fuentes)

These researchers determine the exchange of carbon dioxide from the mangrove forests to the atmosphere with an instrumented ninety-foot tall tower (Figure 5). The CO<sub>2</sub> that is measured by the tower- pictured as Eddy Covariance is a combination of vertical exchanges of carbon resulting from photosynthetic uptake and respiratory processes. These exchanges ( $\Sigma$ NEE) result in accumulation of carbon through net primary productivity (NPP) both above (AB) and below ground (BG). But unlike terrestrial forest, much of the carbon eventually exits the forest and enters the waters of the estuary as dissolved inorganic (DIC) organic (DOC) and particulate (POC) carbon.

Dr. Barr gave a talk this month at the 9<sup>th</sup> Annual INTECOL (International Association for Ecology) meeting in Orlando, FL on Light Use Efficiency Modeling from the mangrove work he and Drs. Engel and Fuentes are conducting in the Everglades. As he described it in simple terms, Light Use Efficiency is Gross Primary Production divided by PAR (Photosynthetic Active Radiation) or in simpler terms- how efficient the mangroves are at harvesting carbon. Figure 5 shows a simplified snapshot of normalized difference vegetation index (NDVI) which is correlated with seasonal gross primary production. The red areas



Figure 5:(above) Dr. Barr Scaling the Shark River Sough Eddy Covariance Flux Tower



**Figure 5:** (above) Florida Everglades' West Coast mangrove NDVI related to seasonal productivity. Figure by Dr. Jordan Barr

(where mangroves are found) reveal how much more productive (on a relative scale ranging from zero to 1) the mangroves are compared to rates of any of the other terrestrial communities of the Everglades.

FCE researchers Drs. Fuentes, Barr and Engel are not alone in their extensive endeavors to determine the ecosystem services of mangroves. Their work complements the research of other FCE scientists including Drs. Victor Rivera-Monroy and Edward Castaneda.

Combined, their research helps to define characteristics that give new value to these mangrove forests. With the emergence of The United Nations Collaborative initiative on Reducing Emissions from Deforestation and forest Degradation- UN REDD- in recent years, it has become more urgent to quantify and communicate the contributions of mangrove forests to both the carbon budget and in terms of ecosystem services.



From left to right- Up the tower you go with Dr. Jordan Barr. He can see for miles along the Shark River from the apex. The boardwalks into the mangrove forest (center) look like popsicle sticks from 90 feet in the air.

For more information and original research publications see:

Barr, J.G., V. Engel, J.D. Fuentes, J.C. Zieman, T.L. O'Halloran, T.J. Smith, G. Anderson. 2010. Controls on mangrove forest-atmosphere carbon dioxide exchanges in western Everglades National Park. *Journal of Geophysical Research* 115: G02020.

Barr, J.G., V. Engel, T.J. Smith, J.D. Fuentes. 2012. Hurricane disturbance and recovery of energy balance, CO<sub>2</sub> fluxes and canopy structure in a mangrove forest of the Florida Everglades. *Agricultural and Forest Meteorology* 153: 54-66.

Rivera-Monroy, V.H., E. Castaneda-Moya, J.G. Barr, V. Engel, J.D. Fuentes, T. Troxler, R.R. Twilley, S. Bouillon, T.J. Smith, T.L. O'Halloran. (In Press). Current Methods to Evaluate Net Primary Production and Carbon Budgets in Mangrove Forests. In Delaune, R.D., K.R. Reddy, P. Megonigal, C. Richardson (eds.) *Methods in Biogeochemistry of Wetlands*. Soil Science Society of America Book Series.

Story by Susan K. Dailey, Ph.D

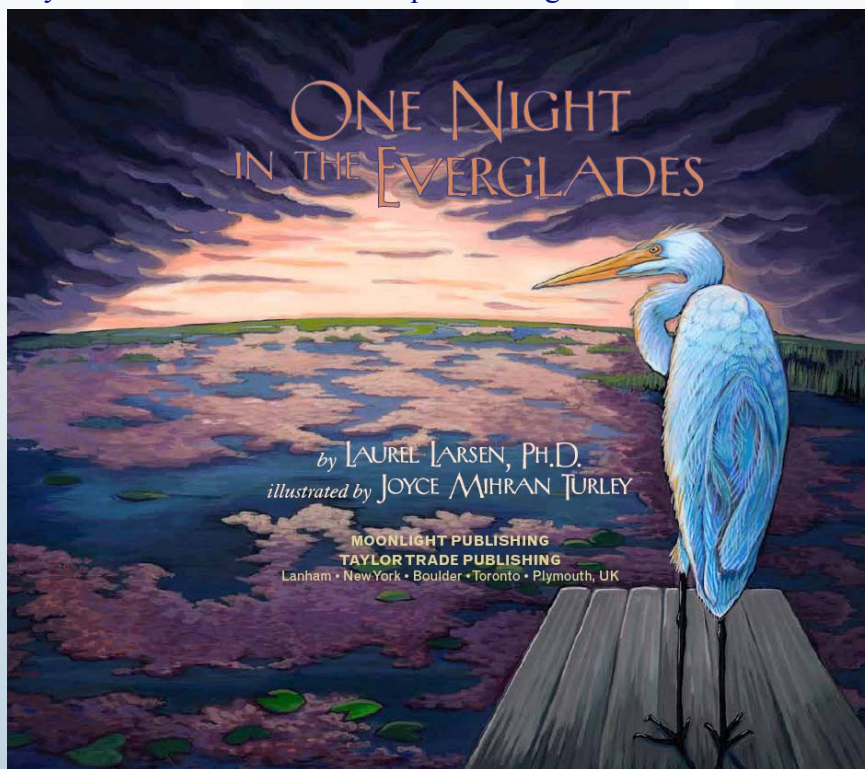
# FCE Story Time! One Night in the Everglades

The Florida Coastal Everglades LTER program has joined the ranks of the LTER sites that have produced a children's book! Dr. Laurel Larsen, an affiliate of FCE, who did her dissertation work Everglades marsh ridge and slough systems, cleverly

authored the book, *One Night in the Everglades*, and it is now available though Amazon. Joyce Mihran Turley is the illustrator and filled the book with vibrant, colorful and informative pictures that track the story line brilliantly. Dr. Rudolf Jaffe, a Principle Investigator of the FCE program was instrumental in the production of this book. Dr. Jaffe attended the LTER Network's Children's book workshop several years ago and has followed through with great effort from start to finish to make the book a reality.

*One Night in the Everglades* is a combination of an Everglades research field tale and educational resource written at a level that all ages can enjoy. The breath of material that Laurel covers in the story ranges from

history of the Everglades to current restoration efforts and leaves the reader with an action message of how they can assist in Everglades conservation. Laurel received helpful feedback and input from FCE's Lead Principle Investigator Dr.



Evelyn Gaiser and Principle Investigator Dr. Laura Ogden while working on the manuscript. In the margins of the book Dr. Larsen has provided the reader with explanations of sampling equipment and their uses, descriptions of plants and animals they encounter on their night of data collection, and information about the Everglades ecosystem and its restoration. Readers can also

enjoy learning about the Everglades food web all the way from the detrital flocculent layer of loose sediments that overlay the Everglades peat soils to alligators and ibis'.

This is the first LTER children's book to be published in two languages. Dr. Jaffe and Alida Ribbi translated the book, *Una Noche de Los Everglades*, and it is also available now from Amazon. The Spanish version of the book provides a playful and informative way to communicate an FCE research experience and Everglades ecology with the majority Hispanic community of South Florida.

Funding for the book was provided by the

Hubbard Brook Foundation, Southeast Environmental Research Center Endowment Fund and FCE LTER.

The ISBN number for the two books is 978-0-9817700-4-8 published by Moonlight Publishing, TAYLOR TRADE PUBLISHING, New York (2012).

Story by Susan Dailey, Ph.D.

# FCE Graduate Students Highlight Novel Research in Everglades

The 9<sup>th</sup> INTECOL International Wetlands Conference is held once every four years, and this year it was held in Orlando, FL. This was a special year because the Society of Wetland Scientists and the Greater Everglades Ecosystem Restoration conference teamed-up with INTECOL to host one of the largest wetlands conferences in the world. Nearly 1,500 scientists



Above: M.S. Candidate Dave Gandy investigating the role canals as potential dispersal vectors for non-native fishes into Everglades National Park

from around the world were in attendance, with over sixty FCE LTER researchers, and a third of those were graduate and undergraduate students. FCE Students from 4 different universities (FIU, UM, USF, and UF), spanning 6 departments presented 11 talks and 10 posters ranging in topics from food webs, predator-prey dynamics, primary productivity, remote sensing, climate change, carbon dynamics, and cultural studies. These numbers do not include the additional presentations that students were co-authors on. The outstanding research being conducted by FCE LTER graduate students was featured in the special session, “Graduate Student Research on Wetland Complexity in the Florida Coastal Everglades”, organized by graduate student, Rebecca Garvoille. Congratulations to the FCE family for highlighting Everglades research on a world stage.

Story by David Lagomasino, Ph.D. Student and FCE Student Group President



Left: Ph.D. candidate Kristie Wendelberger testing salinity levels for her research on effects of sea level rise on coastal plant communities

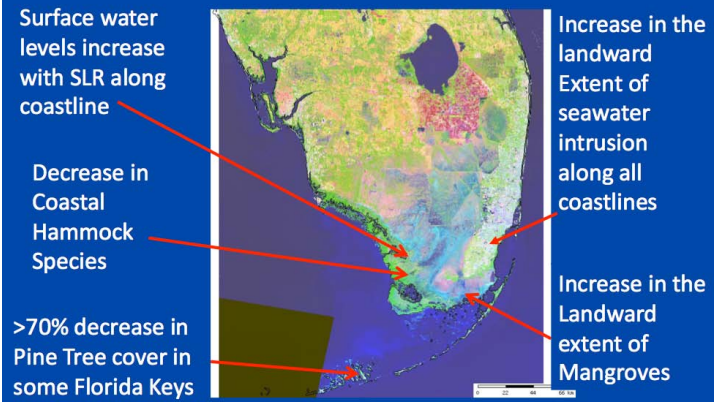
# Dr. Price Elucidates Coastal Resource Sustainability with Sea Level Rise

Dr. Rene Price, a Principle Investigator with the FCE LTER program presented an engaging explanation of the Sustainability of Coastal Resources to the LTER Science Council last month at Andrews Experimental Forest LTER site in May (<http://intranet2.lternet.edu/content/2012-lter-executive-board-and-science-council-meeting>). Dr. Price has a strong background in hydrology and presented an informative picture of the effects that sea level rise (SLR) has on coastal forests and the Southern Everglades. She presented several clear points regarding the effects of SLR on coastal states spanning the east coast.

She compared what LTER sites might be most affected by SLR and these are the east coast LTER sites of Georgia Coastal Reserve, Virginia Coastal Reserve and Plum Island Ecosystem- with FCE observing the greatest effects because of our lower elevation and thus difference from mean sea level (less than 1 meter).

Florida also has the least topography of any east coast state and thus the effects of SLR are first felt here. Dr. Price explained this further; "The most obvious effects of sea level rise in south Florida is the 2-3 times per year flooding by seawater of urban areas in downtown Miami and Miami Beach during the Perigean Spring tides that occur when the moon is either new or full and physically closest to the earth (at Perigee)." In contrast "the less obvious effects of SLR in south Florida is the inland intrusion of seawater into the coastal aquifer, reducing the availability of fresh groundwater. Ecological effects of SLR in south Florida include a landward increase in the extent of mangroves, decrease in coastal

## Observed Changes in South Florida's Coastal Resources in response to SLR



hardwood hammocks, and a significant loss in native Pine trees in the Florida Keys.

Price commented on some of the responses she received from her presentation: "Many people told me they were now afraid to move to Miami, which was not the response I wanted. Instead I was trying to portray our current understanding of the effects of SLR on humans and the ecosystem in south Florida. " Other responses to her presentation showed how important her communications of FCE research were at the meeting: "As an inland resident, I often think that the effects of sea level rise is something to be observed in the future. Your talk brought home to me that there are places living here and now with the effects of sea level rise." Other people wanted to have copies of Dr. Price's slides to be able to educate others on the current effects of sea level rise.

Story by Drs. S. Dailey and R. Price

Another development from the SC meeting is that Dr. Evelyn Gaiser, Lead Principle Investigator of FCE, was rotated onto the LTER Executive Board. We will look forward to updates on this appointment from her in upcoming newsletter issues.

Pictured Right: Dr. Gaiser at the AND LTER site. Photo by Dr. Price





## Linda Powell Presses Through our FCE Data for PASTA

Linda Powell, our FCE information manager, is toiling away the hours of each day converting our FCE datasets to be compatible with a new network search engine. This is important because it means that our site data will now be retrievable and searchable at the network level. The new Network Information System (NIS) is PASTA; which is a lovely acronym and favorite food group but also a powerful new tool, especially for modelers. PASTA-Provenance Aware Synthesis Tracking Architecture (<http://lno.lternet.edu/projects/pasta>) is a tool designed especially for modelers that need to collect masses of data to address broad scale questions and models that require complicated computational processing- or synthesis or LTER datasets. The network system of PASTA has been built already and is in prototype form. Data from some of the LTER sites is already being loaded and the system is being tested.

In simplest verbiage, PASTA it is a system that dynamically harvests and archives our LTER data and metadata. The transition to this new system will allow users to search the entirety of the all LTER datasets with powerful data synthesis programs. Do not fret though, it will still be possible to search and download individual datasets both from individual sites and from the network level once all of the site data has been submitted.

Linda excels at working with our data and practically a family member of the NIS Advisory Committee. She has served a total of 5 years on the committee and has kept FCE and our datasets abreast of the changes in the NIS over the years. The committee is comprised of four information managers, six scientists and two people from the network office. The committee meets regularly to discuss not only datasets but databases and the databases of LTER personnel information and publications and other resources both at sites and network levels. Members

of the committee are elected for three-year cycles and Linda is currently serving on the committee.

With 515 FCE datasets (130 of these are unique and the rest are revised versions of the originally submitted datasets), Linda is furiously making the changes that are required to our datasets. Both Linda and FCE Program Manager Mike Ruggie are sorting through thousand of lines of code and metadata to bring FCE to the newest level of network compliancy standards for data.

Still, Linda wants more data from all of you! She emphasized the importance having your FCE and FCE related data stored in FOREVER form both at the FCE office and in Tallahassee and now at the network office in New Mexico. It is like a safety deposit box, only you can retrieve all your valuables from your computer whenever you want to look at them. Linda knows there are more data to collect from you and I encourage you to send it to her. Her quarterly calls for data are a gentle reminder of the importance of getting your data online and into a system where it is searchable. Also you get the credit for the hard effort that you have put into your datasets from start to finish- just as you do with citations from publications. She pointed out that it is especially important for FCE students to submit their datasets. Whatever the future may bring, your datasets are safely stored and forever retrievable by you or other researchers after a few taps on the keyboard. So please, celebrate this most timeless gift that Linda is providing to you and send her a surprise gift of your own- that dataset you have been waiting to share.

Story by S.K. Dailey

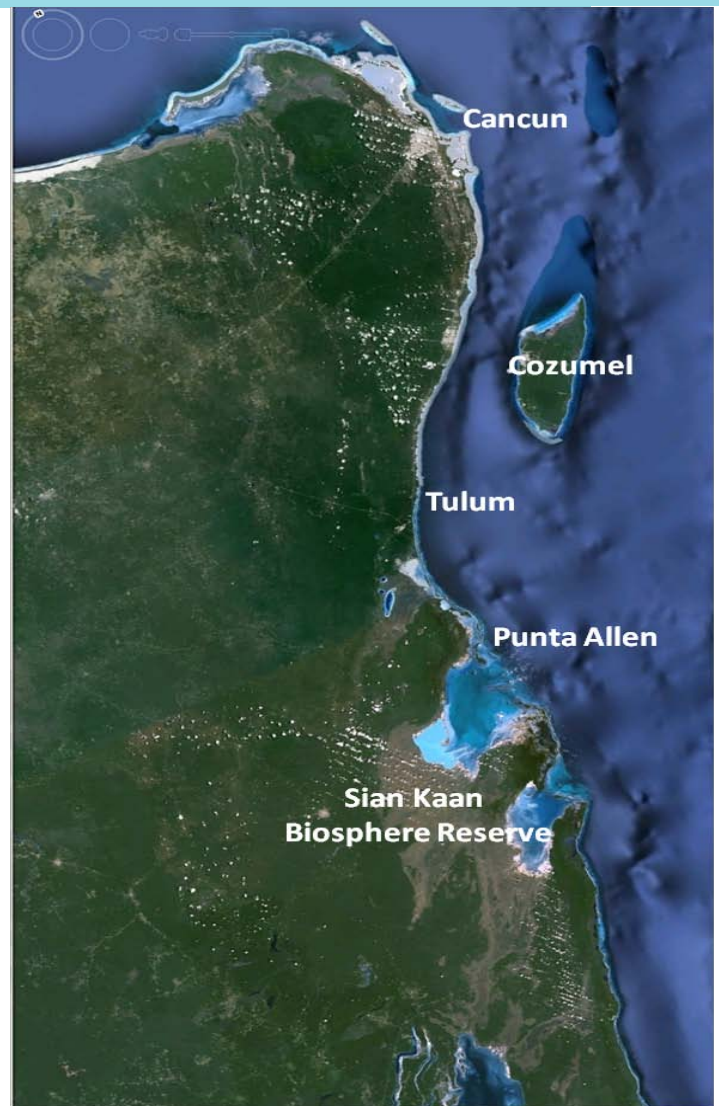
# FCE and the Caribbean Connection

A few weeks ago, FCE researchers, Dr. Rene Price and graduate student David Lagomasino, returned from their second successful field campaign in the Sian Kaan Biosphere Reserve (SKBR).

The SKBR is a pristine wetland on the eastern end of the Yucatan peninsula that is very similar to our own backyard wetlands, the Everglades (Fig 1). The two environments share a similar karstic geology, climate, and similar vegetation communities and structures which include; extensive sawgrass marshes and coastal mangroves, and pentenes (tree islands) dotted throughout the landscape. Though the two hydrologically-controlled ecosystems have similar features, they are controlled by potentially different water flow pathways and nutrient transport mechanisms.

The Yucatan is experiencing a large growth in population and tourism because of the development of the eastern corridor south of Cancun, the Riviera Maya. A combination of these factors as well as others, are of growing concern for the area as there has been a decline natural areas and changes to the hydrology and vegetation communities caused by the recent urbanization.

The research being conducted by Rene and David is a part of the NASA WaterSCAPES (Water Science of Coupled Aquatic Processes in Ecosystems from Space) project at FIU and is closely related to the ongoing research of the FCE LTER. This project seeks to address the stocks and fluxes of water, nutrients, and vegetation biomass through modeling, remote sensing, and field experiments. Other FCE researchers closely associated with this project are Dr. Fernando Miralles-Wilhelm (FIU), Dr. Shimon Wdowinski (UM), and Emanuelle Feliciano (graduate student-UM).



**Figure 1:** (above):Map showing the SKBR site



Above: Dr. Price and David Lagomasino (Pictured from Left) at the SKBR site with their colleagues

Cont. from page 10

Rene and David are working closely with collaborators from the University of Merida, the Comision Nacional de Areas Naturales Protegidas, and the Amigos de Sian Kaan (Fig. 2). With their help, the various groups have helped with travel logistics and sample analysis. On their most recent trip in May, Rene and David collected water samples from various places in the coastal mangroves, bay, and interior cenotes (sinkholes) representing pristine and human-impacted conditions (Fig 3, 4 & 5). This data will help to address more specific research objectives such as 1) calculating a water budget for the SKBR, 2) understand the variability in hydrological and ecological process between the pristine and modified areas of the Reserve, and 3) to

explore relationships between water chemistry and the mangrove spectra using satellite imagery. Concurrently, similar research is being conducted in the Florida Coastal Everglades using water chemistry and remote sensing in order to develop relationships that can be extrapolated to the coastal mangroves in Sian Kaan to help estimate and monitor water quality changes in response to man-made hydrological modifications, climate shifts, sea-level rise and tropical disturbances

Story by David Lagomasino, Ph.D. Student and FCE Student President



**Figures 3, 4, and 5** showing sampling activities and sites for water collection across the SKBR that range from pristine to human-impacted conditions. *Above-* interior sinkholes or cenotes, *Right-* coastal mangroves

# Student Spotlight: FCE Spring Travel Grant Winner Joshua Breithaupt

Josh Breithaupt is a Master's degree student who will begin the Ph.D. program at the University of South Florida's College of Marine Science this fall. Currently, he is finishing up exciting research on organic carbon burial rates that has global importance. "As coastal wetlands draw increasing attention for their ability to bury and sequester large amounts of carbon, it's important that we understand the mechanisms that drive burial in different locations and that we can quantify both the rates and stocks to establish benchmarks for future studies and conservation efforts. Mangroves don't exist in static environments, and there are a lot of variables to consider with climate change. For example, what happens to the rates and stocks in the sediments if the vitality of the mangroves is compromised by sea level that rises too fast or by increased frequency and intensity of hurricanes?" explains Josh. His expertise on this subject shined through with his explanation of the local importance of his research: "...carbon burial contributes substantially to the sediment floor beneath the mangrove forest...Speaking very roughly, we've found that organic matter contributes about 51% of the sediment material at SRS-6; organic carbon contributes 23%.



That's a very high organic content for mangrove environments (the global median is something like 2.2% OC)." He summarizes that, "without the organic carbon contribution to sediment, it's likely that much of our research area would be under water."

Josh's interest in carbon cycling in mangrove environments was first sparked by conversations with his advisor, Donny Smoak, in addition to hearing and reading about the flux tower at SRS-6. During his time at USF, he has been impressed by the frequency and openness of conversations with faculty members, as well as USGS scientists. He has also been surprised by how much he enjoys teaching the undergraduate geology lab (which he has taught for 4 semesters), especially leading the class field trips.

While FCE activities are often centered at headquarters located at Florida International University, Josh's involvement in FCE highlights the important contributions of collaborators at many different institutions that push the boundaries of FCE science. The tireless efforts of the many students and investigators both in and outside of FIU, even some outside of Florida and the U.S., help bring global involvement and global attention to

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the significance of FCE activities. But coordinating meetings between multiple institutions is not always easy. When asked about recommendations to improve FCE's outreach to non-FIU, Josh says, "Web-mediated conference calls aren't as fun as getting together in person, but maybe we could work on a schedule where we have a remote gathering every couple of months to talk about all things FCE - relevant new publications, upcoming field work, proposals, defenses, new results, etc. Being reminded of the big picture can be energizing and helpful to see the context of how all our research fits together." As if in anticipation of such recommendations, FCE Student Group President, David Lagomasino, has been working to coordinate increased involvement of FCE members that cannot be physically present at FCE-related presentations and meetings on FIU's Modesto Madique campus. David has been working on getting more members to use Ustream, a free online platform for live and recordable webinars. Stayed tuned for more information on how to broadcast your next FCE seminar!

Congratulations to Josh for his many accomplishments, including the FCE Travel Grant! Josh will use the travel grant to fund his trip to the 9th INTECOL Annual International Wetlands Conference in Orlando, FL, held in conjunction this year with the Greater Everglades Ecosystem Restoration (GEER) meeting. Josh first attended GEER in the summer of 2010 in search of a research project. This time around, he is looking forward to bringing the results of two years of work and making a scientific contribution. In the future, Josh hopes to continue his study of carbon cycling and sequestration in coastal environments.

Story by Sylvia Lee, Ph.D. Student and FCE Student Group Vice President

## Dr. Scinto Meets the Vice President of The United States of America



Yes that is our very own FCE Scientist Dr. Len Scinto, out in the Everglades with Vice President Joe Biden!

Biden and, Senator Bill Nelson and Congressman Alcyce Hastings gave a news conference to show their support of Everglades restoration.

It was a "small" invitation only event in April that included representatives mostly from the Federal Agencies working on Everglades Restoration USFWS, DOI/ENP, ACOE, but also NGOs and Foundations. Fellow FCE Scientist Dr. Steve Davis was there also representing the Everglades Foundation. Dr. Scinto, FIU Assistant Professor in the Department of Earth and Environment and Associate Director SERC, was representing FIU, the Southeast Environmental Research Center and FCE-LTER.

FCE Scientist Dr. Scinto is also the recipient of Florida International University's Top Scholars Award for outstanding achievements in research and scholarship and was recognized for his work in the biogeochemistry of freshwater wetlands, especially the cycling and impacts of anthropogenic nutrients.

**Congratulations Dr. Scinto!**



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and

**News-** [http://fcelter.fiu.edu/about\\_us/news/](http://fcelter.fiu.edu/about_us/news/)

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**Please note: FCE ALL**

Please send any comments and contributions for the next FCE Newsletter by September 30<sup>th</sup>, 2012 to [fcslter@fiu.edu](mailto:fcslter@fiu.edu)

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