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Wetlands and Aquatic Ecosystems

contents

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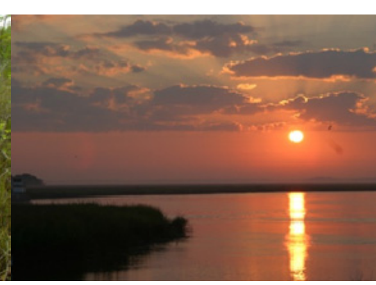
From the Chair...

Globally, wetlands can be found in all climates ranging from the tropics to tundra, with the exception of Antarctica. Approximately 6% of Earth's land surface which equals about 2 billion acres (approximately 800 million hectares) is covered by wetlands. The United States of America alone has about 12% of the global wetlands (about 274 million acres or 111 million hectares) most of which are in Alaska. Non-point source pollution of streams, rivers, groundwater, lakes and estuaries, as well as wetlands is often the result of management practices within the watershed of these ecosystems. In addition, wetlands are often affected by changes to the hydrology, fire regime and other important factors that shape the vegetative structure and biogeochemical processes. The question of immediate concern is: *Are the current watershed management practices compatible or adequate to sustain, protect and preserve the ecosystem services provided by wetlands?* Many current practices are compatible and directionally correct, but not all are adequate to sustain water quality and the protection of all wetland functions under changing climatic conditions and sea level rise. Although wetlands are one of the most productive ecosystems on earth, their functions and values have only been relatively recently recognized by society and yet even with this improved understanding and legal protection many of the more subtle impacts to wetlands continue. The Soil and Water Science Department (SWSD) has established strong teaching, research, and extension programs in the area of wetlands and aquatic systems, with a number of faculty working on various topics including: biogeochemistry, hydrology, microbiology, and modeling. Continuing to understand the critical role wetlands play on our planet, and finding a balance between society's needs while protecting the vital ecosystems services wetlands and aquatic systems provide is a significant focus area of the department. In this newsletter we present a few examples on research and extension programs the department is engaged in the "Wetlands and Aquatic Ecosystems" thrust area. (http://wetlands.ifas.ufl.edu)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Phosphorus Memory for Wetlands and Aquatic Systems: Implications for Ecosystem Restoration

Wetlands and aquatic systems such as lakes are often the final recipients of nutrients discharged from adjacent terrestrial ecosystems. Phosphorus memory is the result of legacy phosphorus in soils and sediments. Since many freshwater systems are phosphorus limited, loading of this nutrient is of particular concern to environmental managers. Nonpoint sources of phosphorus dominate eutrophication processes of many wetlands and aquatic ecosystems. Thus, in many situations, alternative land use management practices in the watershed are implemented in an effort to reduce the overall load to receiving water bodies. The key questions often asked are: (i) will wetlands and aquatic systems respond to phosphorus load reduction?; (ii) if so, how long will it take for these systems to recover and reach its background condition?; (iii) what biogeochemical processes regulate the mobilization of legacy phosphorus; and (iv) are there any economically feasible management options to hasten the recovery process? Once the external phosphorus loads are reduced, the internal memory of phosphorus can extend the time required for a wetland or an aquatic system to recover from eutrophic status to more background levels. The lag time for recovery can be in the order of decades and should be considered in developing management strategies to restore wetlands and aquatic systems. In addition, systems downstream of the initially impacted water body can be the recipient of the phosphorus release and therefore management efforts must be on a holistic watershed scale. Faculty and graduate students in the Wetland Biogeochemistry Laboratory (WBL, http://wetlands.ifas.ufl.edu) have been conducting research in a number of ecosystems including: the Okeechobee Drainage Basin, Lake Okeechobee, Everglades Stormwater Treatment Areas, and the Everglades Protection Area. Research is funded by the Florida Department of Agricultural Consumer Services and the South Florida Water Management District. For additional information, contact K. Ramesh Reddy at: krr@ufl.edu.

Biomarker Tools for Quantifying the Microbial Consortia in Wetland Soils: Phospholipid Fatty Acid and Polar Lipid Ether Lipid Analyses

In an ecosystem, elucidation of the microbial community structure and establishing linkages with biogeochemical functions allows insight into the 'Black Box' of ecosystem functioning. Over time, several approaches have been adopted to address this topic. One of these approaches widely used is the use of lipid biomarkers to study the microbial fingerprints in soils, sediments and water. Phospholipid fatty acid analysis (PLFA, eubacterial and eukaryotic) and phospholipid ether lipid (PLEL, archael) are some of the lipid biomarkers that we are using to assess the basic viable microbial community structure and information about the metabolic and nutritional status bacterial groups.

Experimental mesocosms set up in the WCA-2A area to study the carbon flow within the autotrophic and heterotrophic microbial groups within periphyton mats

We have used PLFA to monitor shifts in the microbial communities in addition to measuring other biogeochemical parameters (microbial enzymatic activities, nutrient concentrations and transformations) to assess the success of restoration efforts in the *Hole in the Donut* region of the Florida Everglades. Coupling of stable isotopes with lipid biomarkers allows us to study food web structure as it traces the carbon flow across various microbial groups (heterotrophs and autotrophs). A similar approach has also been used in Water Conservation Area 2a that focused on investigating periphyton mats as the basis of food web dynamics in the Everglades. For additional information, contact Kanika Inglett at: kanika@ufl.edu

Restoration of Wetlands and Aquatic Ecosystems

Nutrient limitation is often a critical component of the health of many ecosystems, and our group is investigating macronutrient cycles as they apply to the restoration of nutrient impacted systems. Among these are springs impacted by nitrogen, large portions of the northern Everglades affected by phosphorus, and one system of former agricultural lands in the southern Everglades which has been invaded by the invasive exotic shrub Brazilian Pepper. In these systems, we not only evaluate impact, but also predict the success of restoration techniques as well as propose new techniques (such as soil amendments) to speed recovery. Most recently my research group has begun to focus on the fate of nitrogen in a variety of ecosystems. Excess nitrogen is a growing problem here in Florida (springs, coastal algal blooms) and globally (hypoxic/dead zones, greenhouse gas emissions). Work continues in three main areas: measurements to determine the extent, significance and causes of the problem, natural ways that ecosystems respond to excess nitrogen, and man-made technologies and solutions to help reduce the effects to downstream systems. Our research uses traditional biogeochemical techniques supported by advanced chemical fractionation approaches and state of the art techniques, such as stable isotopes (both at natural abundance and enriched levels). For additional information, contact Patrick Inglett at: pinglett@ufl.edu

Floating Wetlands to Improve Treatment in Stormwater Ponds

Efforts to address nonpoint source nutrient loads associated with urban stormwater runoff have resulted in a wide range of alternative stormwater management strategies being developed. Many of these practices focus on a "treatment train" approach that starts with source reduction, then focuses on treatment and retention along the conveyance path and finally enhances treatment processes within the more conventional stormwater pond. Integration of wetland vegetation along the shoreline of wet detention basins have often been promoted to improve water quality, vegetative diversity, wildlife habitat, aesthetics and reduce the development of filamentous algae along the littoral shelf. However, many stormwater ponds have a limited area available for establishment of emergent plants due to steep slopes or bulkheaded shorelines and the middle of the ponds are often too deep for most emergent wetland plant species to become established.

Floating Wetland Treatment System after 8 months deployment in stormwater detention pond

Initial deployment of Floating Wetland Treatment System with artificial substrate and bare root seedling of Pickerelweed, Common Rush and Golden Canna Lily

In many natural wetlands and water bodies some species of aquatic plant have overcome these depth limitations by simply developing adaptations to float on the surface thereby minimizing inundation stress while maintaining optimal access to light. By providing an artificial floating substrate, just about any plant that can tolerate their roots being inundated can become established. The only limitation for growth then becomes the nutrient concentrations in the water column and that is the premise behind using artificial floating substrates planted with wetlands species to take up nutrients from the water column into plant tissue, harvest the plant biomass and thereby remove nutrients from the water column.

In an ongoing study sponsord by ACF Environmental, three Floating Wetland Treatment Systems also referred to as Managed Aquatic Plant Systems (MAPS) were deployed in stormwater detention ponds around Gainesville including one in Lake Alice on the University of Florida Campus. Results of the study are still being evaluated, but the potential for these systems to improve nutrient treatment potential in some stormwater ponds is promising as well as enhancing other ecological functions within the basin. For more information on this project, contact Mark Clark: clarkmw@ufl.edu or Neal Beery: nbeery@ufl.edu, master's student working on the project.

Earth, Water, and Fire

In Florida, the sight of wildfires or controlled burns from the late winter through the summer months is not an uncommon sight. As one of the natural processes that shape the landscape, the role of fire in influencing vegetation communities and habitat structure is well documented in the Southeastern United States. Ecosystems that are commonly found in Florida, such as pine flatwoods, grass and shrub savannahs, and even wetlands are quite fire tolerant. In many cases, fire is a critical component for maintenance of healthy ecosystems by controlling invasive and exotic vegetation and creating open areas that support wildlife. From a biogeochemical standpoint, fire is extremely interesting as it provides an opportunity to investigate nutrient cycling in the environment at an accelerated rate. Fire, in its most simplistic definition, is the rapid chemical oxidation of organic matter under aerobic conditions. A significant function of both standing vegetation and surface soil organic material with respect to nutrient cycling is one of short-term storage of nutrients. Upon normal biologically mediated decomposition of organic matter, there is a relatively slow release of nutrients (P, N, K, S, as well as micronutrients) necessary for continued growth of vegetation on Florida's sandy soils. In the case of fire, this process is accelerated and nutrients bound up in some live vegetation and surface organic materials are rapidly mineralized.

Fire, as a significant modulator of nutrient cycling processes, is currently being studied by Todd Osborne and Patrick Inglett in several ecosystems of Florida. This research is focused on nutrient cycling in the Florida Everglades where cycling of phosphorus, a limiting nutrient, is at the forefront of scientific interest and political attention. Recent investigations in the Arthur R. Marshall Loxahatchee National Wildlife Refuge suggest fire is a necessary component of ecosystem maintenance, helping to sustain native vegetation communities and redistribute limiting nutrients across the landscape. With respect to Everglades Restoration, this research indicates that fire does not conflict with water quality mandates under the Comprehensive Everglades Restoration Plan (CERP), which requires background total phosphorus levels to be at or below 10 ppb. Additional research in the *Hole in the Donut* (HID) restoration area of Everglades National Park is targeted at investigating the physical and chemical effects of fire on soil nutrient cycling and vegetation community structure. For additional information on these and other fire-related projects, contact Todd Osborne at: osbornet@ufl.edu or Patrick Inglett at: pinglett@ufl.edu.

Prescribed fire in Austin Carey forest consumes Saw Palmetto and other ground cover, releasing organically bound nutrients to the surrounding soil as ash and disburses nutrients to other areas as particulates in smoke

Microbial Ecology and Biogeochemistry Linkages

Researchers in the Soil Microbial Ecology Laboratory and Wetland Biogeochemistry Laboratory are investigating the impacts of nutrient enrichment in the Everglades on the pathways through which methane is produced. With our collaborators at Florida State University, we have found that the majority of methane in nutrient impacted soils of the northern Everglades is produced by reduction of CO_2, whereas most of the methane produced in unimpacted soils comes directly from acetate. This could have important implications for the rates of methane produced as temperature increases due to global warming. As part of this project, we are also investigating the role that methanogens may play in nitrogen fixation. Hee-Sung Bae, shown here sampling in WCA-2A of the Everglades, has found that nitrogen-fixing methanogens may play an important role in soils that are in the initial stages of nutrient impact. These findings will be compared with other wetlands, such as the Chianguinola River wetland in Bocas del Toro, Panama, with SWSD Courtesy Professor Ben Turner. This project is funded by the National Science Foundation. For additional information, contact Andy Ogram at: aogram@ufl.edu.

Putting Microbes to Work

Over the last few decades, US fertilizer consumption has increased many fold and today anthropogenic nitrogen fixation has surpassed bacterial fixation. Demands for food, biofuels and other crops ensure that nitrogen demand will continue at an elevated level. At the same time impairment of surface waters due to nutrient enrichment have increased pressure to regulate nitrogen and phosphorus from nonpoint sources. Minimizing inputs of nutrient to the landscape will be part of the solution, but in many production systems limiting nutrients below some point will directly impact yield. Finding ways to minimize leaching and runoff as well as treating nutrients at the edges of the production area will also be a critical component to allow the production system to maintain viability while minimizing downstream impacts. One novel approach to the reduction of nitrogen at the edge of the production system is being investigated at a container plant nursery in the Santa Fe River watershed north of Gainesville. Nitrate that leaches through the pot and into surficial groundwater during irrigation and rainfall events intercepts a lower permeability clay formation and then moves laterally until it seeps out at the edge of an escarpment to form a tributary that flows into the Santa Fe River. Nitrate levels in the range of 6-8 mg L^{-1} were not uncommon in the main tributary when the project started.

Denitrification wall with Casey Schmidt standing on 1.7 meters of sand sawdust mix prior to backfill

In conjunction with a BMP efficacy evaluation project funded by the Florida Department of Environmental Protection, a pilot scale "Denitrification Wall" was placed in the flowpath of the nitrate rich groundwater. The denitrification wall was constructed upgradient of a seepage headwater by digging a 55m long by 3.5m deep by 1.7m wide trench and backfilling it with a mixture of sand and waste pine sawdust. The added carbon source provided by the sawdust results in the development of anaerobic conditions and subsequent denitrification process as microbes utilizing the carbon in the wall start utilizing nitrate for respiration. The denitrification wall has been monitored for over a year utilizing three well transects and a paired watershed comparison. Within the well transects, nitrate decreased by 79% when comparing groundwater upstream and downstream of the wall. Nitrate loads in the paired watershed indicated a decrease in nitrate nitrogen of 73%. Several small-scale denitrification walls utilizing a variety of carbon sources at varying nitrate concentrations are also being monitored to determine overall performance of this technology. Casey Schmidt is a doctoral candidate within the department investigating the use of denitrification walls and recently gave a seminar on the subject that can be viewed at http://mbreeze.ifas.ufl.edu/p88474246. For further information about the denitrification wall or nursery BMP efficacy study, contact Casey Schmidt at: cschmidt@ufl.edu or Mark Clark at: clarkmw@ufl.edu.

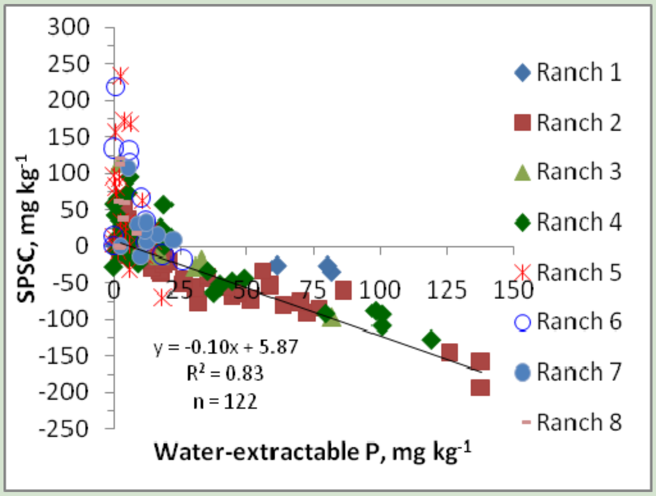
Finished denitrification wall looking downstream with three monitoring well transects identified by white PVC pipe. Monitoring transects are perpendicular to the wall with the middle well of each transect demarcating the center of the wall. Bare soil in foreground is a road

Wetland Biogeochemistry Core Laboratory

The Wetland Biogeochemistry Laboratory (WBL) is a NELAC certified facility (certification # E72949) in the category of General Chemistry for water and soil samples. The WBL is equipped with four flow analyzers for nitrogen and phosphorus analysis, a new discrete analyzer, 6 gas chromatographs, ion chromatograph (Dionex), CNS analyzer, dissolved carbon analyzer, and other routine instruments such as spectrophotometer, centrifuge, Eh/pH controllers, EC meters, and incubators. The laboratory provides specialized services (analytical and experimental) to our collaborators working on joint projects. Yu Wang (Lab Manager) and Gavin Wilson (Chemical Analysis) maintain the WBL analytical services. For additional information and price list for range of services, contact Patrick Inglett at: pinglett@ufl.edu or visit http://wetlands.ifas.ufl.edu.

A Tool for Phosphorus Risk Assessment of Wetland Soils

The concept of “safe” soil phosphorus storage capacity (SPSC) developed for upland soils (http://edis.ifas.ufl.edu/pdffiles/SS/SS54100.pdf) has now been extended to wetland soils to evaluate behavior of inorganic phosphorus (P) in soils, where P retention is related largely to iron and aluminum. The SPSC, based on a threshold phosphorus saturation ratio (PSR, a ratio of extractable phosphorus to extractable iron plus aluminum), provides a direct estimate of the amount of P a soil can sorb before exceeding a threshold soil equilibrium concentration, i.e., before the soil becomes an environmental risk. Supported by the Florida Department of Agriculture and Consumer Services, Vimala Nair, Mark Clark and Ramesh Reddy found that soil phosphorus sorption is primarily related to iron and aluminum concentrations, with organic matter playing a minimal role in P retention in wetland soils up to the threshold PSR value, i.e., until SPSC becomes zero. When SPSC becomes negative, phosphorus release from a wetland soil is probably affected by the organic matter in the soil. Additional phosphorous retention in wetlands may occur through biological assimilation of phosphorus and storage in recalcitrant organic compounds. An evaluation of the relationship of SPSC and water-extractable P for eight beef ranches in the Lake Okeechobee Basin, differentially impacted by manure showed that SPSC is an appropriate and promising soil index for the purpose of estimating P storage and release from wetland soils. On-going research will investigate a procedure using SPSC to arrive at equilibrium phosphorus concentrations (EPC_0) in a soil using phosphorus, iron and aluminum concentrations easily available from any soil testing laboratory. For additional information, contact Vimala Nair at: vdn@ufl.edu.



Wetlands: Value & Resource Conservation – Extension & Outreach Program

Mark Clark (left) discusses the installation of water quality sampling equipment at Williamson Cattle Co. with Sarah Lynch, Sonny Williamson and his grandson, John Williamson

Historically almost 60% of Florida was wetlands with only half of that area remaining today. This illustrates the dramatic modifications in hydrology and changes in community structure and habitat that has occurred in Florida in the past 150 years. The most recognized wetland in the state is the Florida Everglades, one of the most unique wetlands in the world and it is also the focus of the world’s largest wetland restoration project that seeks to restore and preserve the ecosystem for future generations. Wetlands provide critical habitat for endangered animal and plants species, as well as providing vital functions for humans including groundwater recharge, improved water quality, flood control, food production and recreational opportunities. Florida is ranked 4th in population, it is in the top 10 for population growth rate, and 2nd nationally in production of vegetables. These development pressures and intensive land use activities can result in significant impacts both directly and indirectly on wetlands causing loss of functions for both human and natural benefactors. Although numerous regulatory mechanisms exist to protect wetlands at the federal, state and local levels, public understanding of the value of wetlands will keep these regulations in place and protect wetlands above and beyond regulatory requirements. This education and awareness task is even more difficult due to our lifestyles becoming increasingly physically disconnected from the ecosystems that provide many of our natural resources. The major outreach tool used to promote wetland resource awareness in the state is the Website http://wetlandextension.ifas.ufl.edu . This website was launched in May 2004 to highlight different aspects of wetland resources, different types of wetlands, and potential threats to wetlands. The site also supports an interactive map of Florida counties allowing users to click on a county to bring up a map of wetlands within the county and identifies several

(Continued on page 7)

Faculty, Staff, and Students

Congratulations to our Faculty and Students ….

James Jawitz was a recipient of the UF Research Foundation Professorship (2011-2013). **Chris Wilson** was selected to receive the 2011 IFAS Superior Accomplishment Award. **Alan Wright** received the Gamma Sigma Delta Junior Faculty Research Award.

Julia Showalter (V Nair & PK Nair) is a recipient of the 2011-2012 Fulbright grant. Julia was selected to carry out her field research on coffee-shade systems in southwestern India as part of her Ph.D. research program.

Rupesh Bhomia and **Lisa Gardner Chambers** (Reddy) were selected by the Everglades Foundation Board of Directors for Everglades Foundation Scholarship. Both Rupesh and Lisa also received student research grants from the Society of Wetland Scientists - South Atlantic Chapter. Lisa was also a recipient of a 2011-2013 Florida Sea Grant Fellowship.

Alexandra Rozin was selected as a 2011 Scholar for the SSSA Golden Opportunities Scholar Institute. Alexandra currently works with Rex Ellis; her undergrad thesis mentor is Todd Osborne. Her research is on "Physiochemical effects of increasing salinity on organic soil structure in the Southern Everglades." Alexandra was also a University Scholars Recipient.

Our 2011-2012 Student Representatives:
President: **Rupesh Bhomia;** Vice President: **Cassandra Medvedeff;** and Vice President (off-campus/DE): **Santanu Bakshi**

The UF Wetlands club was recognized by the UF Office of Sustainability for its various activities aimed towards water conservation. The Second Annual Sustainable Solutions Award was presented to the Club as part of the "40 Days of Change for the Earth" for Earth Day 2010. **Mark Clark** serves as the faculty advisor for the club.
http://ufwetlandsclub.blogspot.com

Rao Mylavarapu has been elected as the Vice-President of the Soil & Plant Analysis Council (SPAC) for a two-year term during the Board Meeting alongside of the 2010 SSSA Annual Meetings in November at Long Beach, CA. The 13th International Soil & Plant Analysis Council is scheduled for March, 2013 in New Zealand, when Rao Mylavarapu will be the President of the Council.

Join us at…

The 12th Annual Soil and Water Science Research Forum

The 12th Annual Soil and Water Science Research Forum is scheduled for September 9, 2011, in Gainesville, Florida. The forum is designed to bring together representatives from state and federal agencies as well as private industry, faculty, graduate students, and prospective students interested in soil and water science. The forum will provide an opportunity to interact with our students, faculty, and administrators on campus. This year's theme for the forum is "Soil, Water, and Climate Change." We look forward to your participation in the forum; please register at http://soils.ifas.ufl.edu/forum.
For additional information, contact James Jawitz at: Jawitz@ufl.edu.

(Continued from page 6) wetlands within the county (where available) that are open to the public. The site also provides an opportunity for browsers to ask questions about wetlands to which I reply on a regular basis. For additional information on wetlands extension and outreach program contact: Mark Clark at: clarkmw@ufl.edu or visit the website: http://wetlandextension.ifas.ufl.edu/.

Congratulations!

Spring 2011 Graduates

BS

Avery Axthelm
Corinne Swagger
Evelyn Fletcher
Kimberly Johnson

MS

Michael Atkin (Daroub)
Luke Gommermann (Ellis)
Nicole Howard (Osborne)
Amy Hylkema (Shober)
Louis Philor (Daroub)
Travis Roberts (Fitz)

PhD

Hiral Gohil (Ogram & Thomas)
Shiny Mathews (Ma)
Carolina Medina (Obreza & Sartain)
Rajendra Pauel (Jawitz)
Manmeet Waria (O'Connor & Toor)

Welcome Incoming Students Summer 2011 !

PhD

Nasiru Mohammed Danmowa (Toor)

MS

Donald Rainey (Shober)
Stephanie Hinrichs (Wright)

Luther Carlisle Hammond

Dr. Luther Carlisle Hammond, "Luke", passed away peacefully at his home in Oak Hammock on March 19, 2011. He was born January 17, 1921 in Seneca, SC, the first child of James Martin Luther Hammond and Selma Craig Hammond. He grew up on a small farm with three brothers and two sisters. Luther graduated from Clemson College in June 1942 with a Bachelor of Science in Agronomy. He was commissioned in the US Army as a 2nd Lieutenant and within a week was off to Fort Hood, Texas for basic training. He served his country for three years in World War II, as a company commander on Okinawa, where he was wounded twice, and as an intelligence officer on Saipan, where he was also wounded. He retired as a Lieutenant Colonel from the Army Reserve in 1986.

Luther received a PhD in 1949 from Iowa State University in Ames, Iowa. During this time, he also met and married his wife Dorothy Swanson Hammond, "Dotty". The couple moved to Gainesville, Florida in 1950 with four sons soon to fill their home. As Professor of Soil Science at the University of Florida, College of Agriculture, he was most often regarded as a friend and mentor to students and colleagues alike. His teaching and research were life long, but his professional career with the University spanned 42 years. Besides his involvement in numerous professional organizations and a stint as president of the UF's Phi Beta Kappa Fraternity chapter, he was a member and past president of the Gainesville Exchange Club for many years. He was a loyal member of the First Baptist Church of Gainesville for 60 years where he served as both a Sunday School teacher and deacon.

Luke was preceded in death by his beloved wife of 50 years, Dorothy Swanson Hammond, two sisters Carmen Ford, Genelle Camp, and two brothers Gary Franklin Hammond, and Leigh Hugh Hammond. In addition, five grandchildren and numerous nephews, nieces, great-nephews and great-nieces will all grieve his passing. Always a faithful spirit, Luther will be remembered by the community he loved in Gainesville and Oak Hammock, by the academia he improved at the University of Florida, and by all of his family and friends who enjoyed his frequent gifts of home grown citrus while listening to his stories.

Dr. Luke Hammond (left) with Drs. Saxena (center) and Dr. Charlie Eno (right) looking at the tensiometer to determine soil moisture status. Picture was taken in 1969 at the Suwannee Valley Experiment Station near Live Oak, Florida.

International Association for Ecology (INTECOL)-Wetlands Working Group (WWG) -2012 Conference

The University of Florida and Society of Wetland Scientists (SWS) in collaboration with several state and federal agencies and professional societies are hosting the 9th INTECOL International Wetlands Conference, which will be held June 3—8, 2012 in Orlando, Florida. The conference offers a platform to review research on complex challenges and integrated solutions for sustainable management of wetland resources in a changing world. Special emphasis will be placed on the influence of climate change on wetland biota, biogeochemical cycling, hydrology, carbon sequestration, greenhouse gases, salinity, water quality, and long-term storage of nutrients and contaminants. Conference co-chairs are: K. Ramesh Reddy, G. Ronnie Best (USGS), and Glenn R. Guntenspergen (SWS). For conference questions, contact: Ramesh Reddy at: krr@ufl.edu **or** *Mandy Stage, Conference Coordinator at:* mstage@ufl.edu or visit the conference web site: http://conference.ifas.ufl.edu/intecol/