Myakka

A UF/IFAS SOIL AND WATER SCIENCES DEPARTMENT PUBLICATION

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Our Programs Across Ecosystems

A Message from the Interim Chair

My 6 months as Interim Department Chair have gone by in a flash. On January 7, 2019 we welcome Dr. Matt Whiles as our new Chair. A short biography of Dr. Whiles follows this message. I was a member of the Search & Screen committee for the Chair, so I had an inside view of the competition. We had three very good candidates, and I think Senior Vice President Jack Payne made an excellent choice. Dr. Whiles brings new energy and vision to our department and a sincere desire to facilitate success in our faculty and staff. It is fitting that this newsletter issue is dedicated to ecosystems because Dr. Whiles is an ecologist!

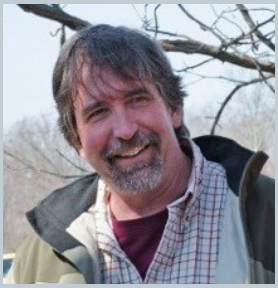
I have learned a lot about the department and its people during the last 6 months. I also learned that being a good department chair is harder than it looks. The operational side of teaching, research, and extension is really complex these days. Trying to understand how the three land-grant missions work within IFAS and within the greater UF is a challenge. The assistance of departmental staff is invaluable for an interim, and our unit has a fabulous group. Soil and Water Sciences staff are the best.

Our Gainesville and Research and Education Center (REC) faculty continue to do amazing things. The description in these pages of the ecosystems spanned by our programs provides a great overview of the diversity and quality of our programs across the state and beyond. From the saltwater coast to freshwater wetlands to production agriculture to urban landscapes… we cover it all. Our stakeholders depend on us to lead the way towards sustainable use of soil and water resources.

Reflections as I depart the Interim Chair's job: I bid farewell to Drs. Willie Harris, Peter Nkedi-Kizza, and George O'Connor, who will be retiring between now and June 2019. Those faculty will be hard to replace for sure. But on the hiring side, I am pleased we were able to initiate searches for three new faculty: an Asst. Professor of Soil Fertility, an Asst. Professor of Soil Health, and a Lecturer in Water Science. The latter two positions are part of UF's "Faculty 500" initiative to hire 500 new faculty to enhance teaching and research. Finally, this job has really made me aware of the outstanding group of teachers, researchers, extension specialists and students we have on campus and at RECs. The department is strong and we have new leadership coming on… the future is bright! I look forward to continuing my relationship with SWSD in the extension realm as I return to the Dean's office. Best wishes to all.

Thomas Obreza*, *Sr. Associate Dean for Extension and Interim Chair, SWSD

Welcome Matt Whiles, Incoming Soil and Water Sciences Chair



Before moving to Florida, Dr. Matt Whiles was a Professor at Southern Illinois University (SIU), where he directed the Center for Ecology and the Cooperative Wildlife Research Laboratory. He grew up in eastern Kansas and began his career as an undergraduate at Kansas State University, working with stream ecologists at the Konza Prairie Biological Station. He received his MS in Entomology and PhD in Ecosystem Ecology from the University of Georgia, working on headwater streams at the Coweeta Hydrologic Laboratory in the southern Appalachian Mountains.

At SIU, Dr. Whiles built a freshwater ecosystem research program that has produced 33 graduate students and over 130 scientific papers. He is co-author of one of the leading textbooks on the topic, *Freshwater Ecology: Concepts and Environmental Applications of Limnology*. He has led numerous large-scale, collaborative projects, including international efforts examining the consequences of amphibian declines in tropical streams, and a synthesis of continental-scale patterns of nutrient uptake in headwater streams. He has worked closely with government agencies and private organizations on stream and wetland management and restoration, and served on numerous panels guiding management of freshwater resources. Dr. Whiles is past-President of the Society for Freshwater Science (SFS), and the 2019 recipient of the SFS Environmental Stewardship Award.

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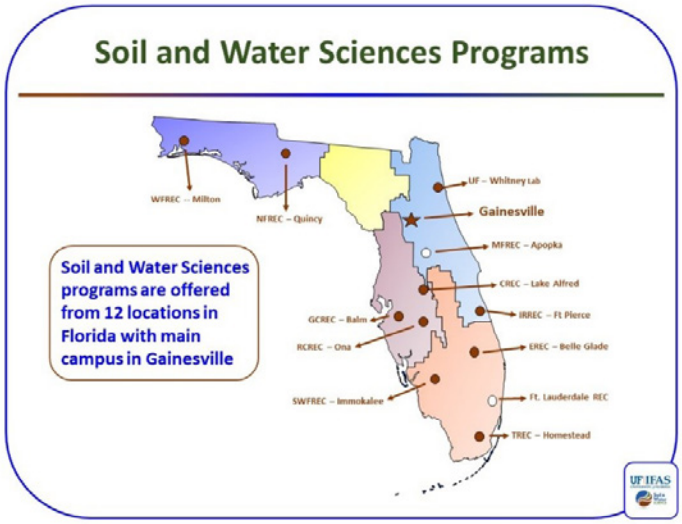
Soil and Water Resources and Environmental Sustainability - Interdisciplinary Programs

Florida's enormous economic and social development has been fueled by its favorable climate and abundant water resources. The increased population and rapid urban development, combined with demands for sustainable agriculture and protection of natural resources, have placed tremendous demands on Florida's fragile soil and water resources. Soil and water resource problems have grown in magnitude and scope across the state. Florida citizens demand protection of their soil and water resources, placing a greater demand on producers to deliver environmentally sound goods.

The major challenges for Florida's landscapes are: (1) meeting critical environmental regulations while maintaining economic plant productivity, (2) decreasing the rate of soil degradation and ameliorating degraded soils, and (3) protecting the quality of natural resources. Maintaining soil and water quality is essential to sustainable agricultural productivity, and protection and conservation of land and water resources is fundamental to meeting these challenges.

The interdisciplinary nature of SWSD programs provides students and faculty an opportunity to conduct basic and applied research at multiple (molecular to landscape) scales to solve environmental problems and protect and manage land and water resources. Our programs are focused to address soil and water quality issues in a wide range of ecosystems, including: agricultural lands,



forested lands, rangelands, urban lands, wetlands, and shallow lakes and estuaries. A common feature of all these ecosystems is soil (or sediment) and water. Global significance of our education, research and outreach/ extension includes: water quality, ecosystem productivity, carbon sequestration, greenhouse gases, and climate change. Select examples of research conducted by SWS faculty on soil (or sediment) and water issues in a range of ecosystems are presented in this newsletter.

For more information, contact K. Ramesh Reddy at: krr@ufl.edu.

Agroecosystems: Overview

Florida's agroecosystems are extremely diverse, encompassing perennial fruit trees (e.g., citrus), annual fruit crops (e.g., strawberries), vegetables (e.g., tomato), row crops (e.g., peanut), grasslands, and livestock operations. These are established in challenging climatic and edaphic conditions that make it difficult to optimize the use of external inputs such as fertilizers and pesticides.

Managing nutrient inputs, especially nitrogen and phosphorus, is critical to ensure the sustainability of the agricultural sector in the state and minimize environmental impacts. This is addressed through different approaches, including implementing management consistent with the 4Rs, increasing the use of cover crops and grasslands in rotation, and adequately using organic amendments.

Gabriel Maltais-Landry's work focuses on how these practices can be implemented to maximize crop benefits while improving soil fertility and health. For more information, contact Gabriel Maltais-Landry at: maltaislandryg@ufl.edu.

Crop Ecosystems: Citrus

Good nutrient management is critical for sustaining high levels of citrus production in Florida. With citrus greening disease (also known as Huanglongbing, HLB) reaching a chronic stage characterized by root loss, twig dieback and severe defoliation, extreme cases of nutrient leaching are inevitable if nutrients and water are not judiciously managed.

Davie Kadyampakeni's program is currently investigating the roles of macro- and micronutrients such as N, Ca, Mg, Mn, Zn, Fe and B in mitigating the impact of HLB in greenhouse and field studies and determining optimal thresholds for sustaining environmental quality without compromising yields.

To improve citrus production, his program is also looking at water quality and soil health management through moderation of soil pH, utilization of soil amendments and novel irrigation scheduling practices.

For more information, contact Davie Kadyampakeni at: dkadyampakeni@ufl.edu.

Crop Ecosystems: Sugarcane

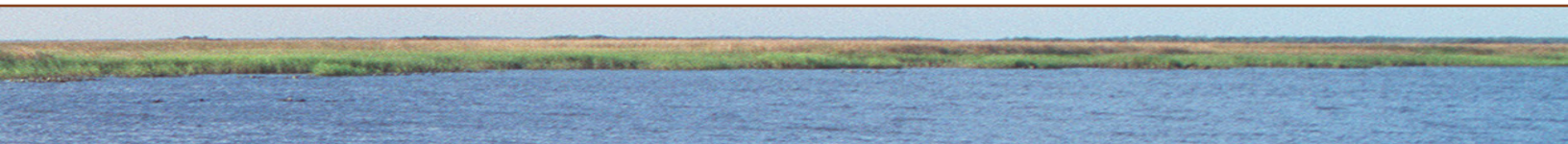
Sugarcane (*Saccharum* spp.) is Florida's most valuable row crop, produced on 1600 km^2, where approximately 80% is grown on Histosols in the Everglades Agricultural Area (EAA) in south Florida. About 50% of the cane sugar produced in the U.S. comes from Florida, with a total economic value of over $2 billion.

Due to concerns about the quality of drainage water leaving the EAA basin and entering the Everglades ecosystem, all farms in the basin implement mandatory Best Management Practices (BMPs) to reduce phosphorus (P) loads in drainage water.

Samira Daroub conducts research and extension programs in nutrient, water and sediment management. The BMP program has been extremely successful in achieving a 55% long-term average P load reduction, surpassing the goal set by the Everglades Forever Act of 25% reduction.

Achieving basin-wide compliance is the result of successful cooperation among EAA growers, UF/IFAS researchers, and the South Florida Water Management District (SFWMD).

For more information, contact Samira Daroub at: sdaroub@ufl.edu.



Crop Ecosystems: Tropical Crops

Tropical fruit acreage is estimated to be about 12,000 acres, concentrated in the southern counties in Florida with ~ $70 million in annual sales and a statewide economic impact of over $178 million. The main crops are avocado, mango, carambola, lychee, longan, mamey sapote banana/plantain, papaya, and guava. Minor crops include sapodilla, jackfruit, sugar apple, atemoya, star apple, pitaya, passion fruit, canistel, and white sapote.

The predominant soils for tropical fruits are calcareous, with various problems such as low water holding capacity (but rapid permeability), low use efficiency of fertilizers, micronutrient deficiencies and potential leaching of nutrients into groundwater.

Yuncong Li's soil and water research and extension program focuses on developing management practices involving micronutrients, soil amendments, cover crops, irrigation, soil testing calibration, controlled release fertilizers, etc. to improve soil fertility, increase crop production, and protect the environment. For additional information, contact Yuncong Li at: yunli@ufl.edu.

Crop Ecosystems: Vegetables

Florida ranks second in vegetable production, mostly for fresh markets, in the US and contributes over $1.6 billion (~16%) to the state's economy (FL Ag Overview, 2017). Vegetables, melons and berries are grown across different ecosystems in the state, employing different but intensive management strategies.

Most vegetable crops in the state such as tomatoes, watermelons and green peppers are produced on plastic mulched beds using fertigation through drip systems on acid-mineral soils. These soils are managed to a pH between 6.0-6.5, optimizing nutrient availability. Both drip and sprinkler systems are considered relatively efficient systems, where nutrient losses beyond the rootzones are minimized.

While soil and nutrient management are similar, tomatoes, potatoes and peppers are also cultivated using seepage irrigation, in regions with higher water tables resulting from a shallow impermeable layer in the soil profile. Water table levels are adjusted frequently as needed in these systems to aid capillary rise of water into the rootzones. This system of water management is highly inefficient, where nearly 87% of water is lost through subsurface runoff. Seepage irrigation is estimated to cover over 800,000 acres in the state, mostly in south Florida.

In the Everglades Agricultural Area covering Palm Beach, Martin, Hendry, and Glades Counties, high value winter vegetables such as lettuce, celery, and spinach are produced on organic soils. Continuous tillage of these artificially drained organic soils has resulted in increased soil pH to over 7.8, primarily due to exposure of subsurface limestone. Therefore, soil pH is carefully managed as close as possible to acidic ranges by adding significant amounts of elemental sulfur to optimize nutrient availability.

Further south, in Miami-Dade County, snap beans, okra, peppers and potatoes, among other vegetables, are predominantly produced. This region is characterized by calcareous rock and marl soils, with typical soil pHs ranging from 7.4 to 8.2. Such a high soil pH results in significantly reduced phosphorus and micronutrient availability to crops, along with loss of nitrogen through volatilization. Except for phosphorus, there is no interpretation available at this time for soil test results. Efforts are on-going to identify a more appropriate soil extractant and soil test interpretations. For more information, contact Rao Mylavarapu at: raom@ufl.edu.

Grassland Ecosystems

Grasslands account for nearly 5 million Florida hectares and represent both rangeland and improved pasture. They support over 1.7 million head of cattle, a lucrative equine industry, and offer wildlife habitat. Grasslands stabilize and improve soil carbon storage and recycle nutrients from water and animal wastes. Grassland soil processes are being studied and managed to lessen negative environmental impacts from the livestock industry. For example, biosolids often used as pasture fertilizer can impose environmental risk.

Our faculty measure biosolids' impact on soil properties, as well as greenhouse gas emissions to improve best management practices. Additionally, slow-release phosphorus fertilizer sources are being evaluated to optimize pasture productivity while safeguarding adequate soil phosphorus storage capacity. Soil nitrate mitigation is being pursued through pasture management, such as substituting nitrogen fertilizer with legumes.

For more information, contact Cheryl Mackowiak at: **echo13@ufl.edu**.

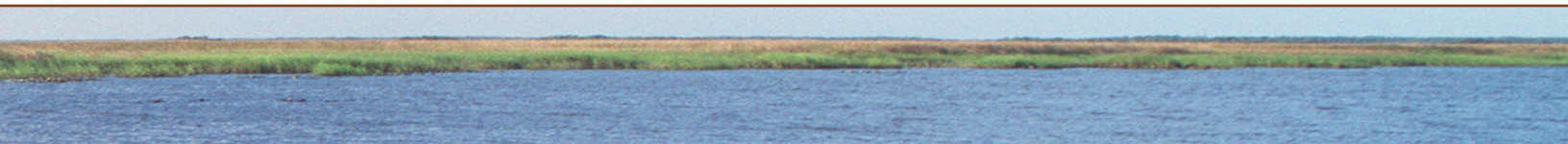
Urban Ecosystems

Over 90% of the population in Florida lives in urban environments, causing multiple environmental impacts across a variety of spatial and temporal scales. Urban ecosystems include a variety of ecosystems within urban environments, such as residential lawns, stormwater ponds, urban streams, and urban forests. Management of increased stormwater runoff caused by increased impervious surfaces and the potential impacts of this runoff on downstream water quality is a major issue associated with urbanization.

Active research projects being led by AJ Reisinger, Mary Lusk, and Ashley Smyth of the Soil and Water Sciences Department (along with colleagues from other UF/IFAS departments) are attempting to identify how stormwater ponds retain and remove nutrients from stormwater and identify strategies to enhance nutrient removal. Nutrient export from residential landscapes is another concern related to urban ecosystems in Florida.

Research projects being led by AJ Reisinger, Allan Bacon, and Mark Clark (along with colleagues from other UF/IFAS departments) are attempting to identify how soils in residential landscapes develop over time, to identify how different management practices (i.e., compost amendments) may enhance soil health, and to quantify nutrient export (both runoff and leaching) from typical residential landscapes.

For more information, contact AJ Reisinger at: **reisingera@ufl.edu**.



Coastal Ecosystems

Along the 1200 miles of Florida's coast you can find salt marshes, oyster reefs, seagrasses, mangroves, white-sand beaches and urban centers. The coastal zone contributes to about 79% of Florida's economy. Valued for tourism and fisheries, coastal ecosystems also provide benefits such as erosion prevention, carbon sequestration, nutrient removal and protection from storm events. Given their location, where land meets sea, coastal ecosystems face a unique set of issues.

Researchers in the Soil and Water Sciences Department are working throughout the state to help Florida's coasts. We are investigating how sea level rise affects soil and water quality, the benefits of living shorelines and ways to combat red tide. Collectively, these projects will help build strong and resilient coastal communities. For more information, contact Ashley Smyth at: ashley.smyth@ufl.edu.

Estuarine Ecosystems

Coastal aquatic ecosystems in Florida include coral reefs, salt marshes, mangrove forests, seagrass beds and oyster bars. All of these unique and highly productive ecosystems have a decidedly marine influence in common, and all provide significant ecosystem services, such as shoreline protection, storm surge buffering or fisheries habitat. As humans, we benefit substantially from these ecosystem services, some of which have been valued between $15,000 - >$100,000 per acre per year. Unfortunately, all of these coastal aquatic ecosystems are experiencing significant anthropogenic pressures such as unprecedented development pressure along our coastlines and by degradation of water quality upstream of discharge into these estuaries.

Florida is currently experiencing significant environmental and economic impact from red tide (bloom of the dinoflagellate *Karenia brevis*) on both coasts of south Florida and other harmful algal blooms (HABs) associated with the St. Lucie and Calossahatchee estuaries due to nutrient laden freshwater inputs originating from Lake Okeechobee. The Indian River Lagoon (IRL), a significant inland marine lagoon on the east coast of Florida, is in crisis as a three year long HAB has decimated seagrasses and shellfish beds with catastrophic ecosystem effects. Perhaps the most widespread issue in Florida waters, and one that receives little attention, is that of shoreline erosion from boat wakes and mismanagement of shoreline habitats. All of these impacts are occurring concomitantly with sea level rise and local climate change.

Several faculty in the SWSD are working in these and other areas of impact across the state. Chris Wilson is highly engaged in estuarine water quality issues statewide, particularly with organic pollutants and agricultural runoff. Mark Clark and Todd Osborne are both engaged in shoreline restoration and protection using natural vegetation and constructed oyster habitat, a creative mix of ecosystem engineering technology termed "living shorelines". Laura Reynolds is working on seagrasses around the state. Patrick Inglett and Todd Osborne are both engaged in sediment and water quality research addressing the IRL.

Todd Osborne is also working with hard clam aquaculture industry and molecular biologists at the Whitney Laboratory for Marine Biosciences to breed specialized varieties of *Mercinaria* clams that can help improve water quality but are also adapted to the adverse environmental condition of the IRL. Todd Osborne's lab is also working in the St. Augustine and Cedar Key areas to better understand the role of sea level rise and hurricane effects on water quality and pollution processes. He is also researching the transition of salt marsh to mangrove, a process of vegetation community shifts induced by climate change, along the east and west coasts of Florida to better understand the ecological and environmental implications of this dramatic landscape scale change. For more information, contact Todd Osborne at: osbornet@ufl.edu.

Wetland Ecosystems

Wetlands remain one of our most important and sensitive aquatic ecosystems. Florida maintains an abundance of wetlands from inland, isolated depressional systems, lacustrine fringes, riverine and bottomland hardwoods, to coastal marshes and seagrass systems.

The Soil and Water Sciences Department is a world leader in wetlands research, with decades of studies on a range of wetland issues including ecosystem restoration and indicators, carbon sequestration, methane and other greenhouse gas emissions, microbial and biogeochemical functions, and water quality improvement in watersheds and urban landscapes.

Constructed wetland technologies are also a significant area of research, and the Department is actively involved in long-term studies to understand and model nutrient removal in the Stormwater Treatment Areas of the Everglades. For more information, contact Patrick Inglett at: pinglett@ufl.edu.

Congratulations Graduates - Fall 2018

PhD

Setyono Hari Adi (Grunwald)
Amanda Desormeaux (SNRE) (Jawitz)
Siti Jariani Mohd Jani (Toor & Koeser)
Andres Rodriguez (Daroub & Gerber)

MS

Kaylee August (Osborne)
Jonathan Diller (Daroub)
Excy Herrera (Reisinger)
Sara Liu (P. Inglett)
Alexandra Waldon (K.S. Inglett)

BS - IS-EMANR (Advisors - Curry and Enloe)

Angela Echeverry
Crystal Flores
Alexandra Frezer
Natasha Hart
Samantha Kasten
Ryan Pugh
Adam Yingling

SLS Minors (Advisor - Bonczek)

Angela Echeverry
Evan Francisco
Alexandra Frezer
Niamh Hays
Kelsea Heider
Rhys Joaquin
Adam Yingling

Welcome New Students - Spring 2019

PhD

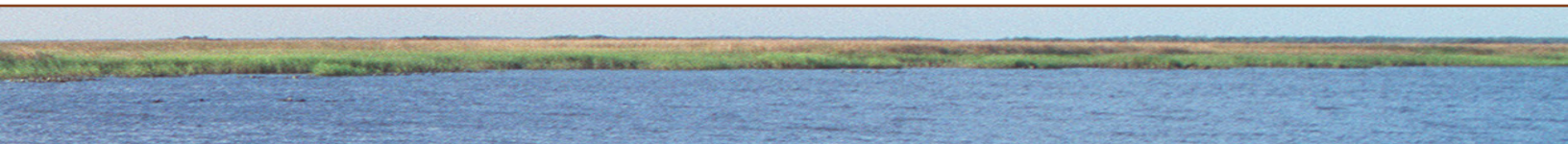
Trista Brophy (SNRE, Smidt)
Adam Siders (Whiles and Reisinger)

MS

Tanyaradzwa Chinyukwi (Kadyampakeni)
Perseveranca da Delfina Khossa (Schumann)
Catherine Karlovich (Smidt)
Zijing Liao (Lusk & Rechcigl)
Christine Miller (Judy)

BS - IS-EMANR (Advisors - Curry and Enloe)

Preston Barney
Anthony Bolesta
Kathryn Fulford
Lori Jazarevic
Benjamin Luchka
Mariya Petrova
Ashley Pogue
Juan Salva
Ryan Warner
Katie Yanuzzeli



Faculty, Staff and Student Accomplishments

21st World Congress of Soil Science (WCSS) 2018 attendees

Faculty: **Samira Daroub**, **Sabine Grunwald**, **Rao Mylavarapu**, **Vimala Nair**, **Pedro Sanchez**

Students: **Claire Friedrichsen** (Daroub), **Andressa Freitas** (Nair), **Saroop Sandhu** (Gerber and K.S.Inglett), **Renita Kay Wilcox** (Grunwald)

ASA, CSSA, SSSA

2019 ASA, CSSA, SSSA Future Leaders in Science Award: **Andressa Freitas** (Nair)

2nd Place award at the graduate student poster competition Biochar: Agronomic and Environmental Uses organized by the Biochar Community, Environmental Quality Section, ASA, CSSA, SSSA 2018 International Annual Meeting: **Andressa Freitas** (Nair)

UF One Health

2nd Place Winner for UF One Health Capture The Movement Contest: **Lukas Pidgeon** (SWS-Bonczek)

CALS Scholarships

Doris Lowe and Earl and Verna Lowe Graduate Scholarship: **Claire Friedrichsen** (Daroub), **Suman Raja Jumani** (Deitch and Jawitz), **Clayton Nevins** (P. Inglett and Strauss) and **Xiaoping Xin** (He).

Doris Lowe and Earl and Verna Lowe Undergraduate Scholarship: **Meylin Muniz**, **Stephen Singleton** and **Ethan Weinrich** (EMANR-Curry and Enloe).

Florida Rural Rehabilitation Corporation Off-Campus Scholarship: **Emily Gaskin** and **Carmen Hernandez** (EMANR-Curry and Enloe)

CALS Scholarship: **Vitaliya Repina** (EMANR-Curry and Enloe)

Branan Scholarship: **Lindsay Furr** (SWS-Bonczek)

Suwannee County Conservation District & W.B. Copeland Scholarship: **Lukas Pidgeon** (SWS-Bonczek)

2018 SWSD Research Forum Student Competition Winners

Best Oral Presentation: **Yan Liao** (Gerber)

Best Graduate Student Poster Presentations: **Yanyan Lu** (Silveira), **Katie McCurley** (Jawitz), **Julio Pachon** (Bacon) and **Saroop Sandhu** (Gerber and K.S.Inglett)

Best Undergraduate Student Poster Presentations: **Haley Cox** (Clark and Kelly) and **Niamh Hays** (Clark and Kelly)

SWSD Scholarships and Awards

SWSD UNDERGRADUATE AWARD RECIPIENTS

Donald A. Graetz Education Award: **Katharine Frey** and **Meylin Muniz** (EMANR-Curry and Enloe)

Fredrick Smith Award: **Lukas Pidgeon** and **Wenny Cruz-Lopez** (SWS-Bonczek)

George J. Hochmuth Education Award: **Vitaliya Repina** (EMANR-Curry and Enloe)

Outstanding Undergraduate Award: **Caroline Buchanan** (SWS-Bonczek)

SWSD GRADUATE AWARD RECIPIENTS

Ben Skulnick Fellowship: **Traci Goodhart** (Deitch) and **Cayla Sullivan** (Reynolds)

George J. Hochmuth Education Award: **Xiaoping Xin** (He)

Sam Polston Fellowship: **Nan Xu** (Bhadha and Mylavarapu) and **Katie McCurley** (Jawitz)

V.W. Carlisle Fellowship: **Andressa Freitas** (Nair) and **Claire Friedrichsen** (Daroub)

William K. Robertson Graduate Fellowship: **Conor MacDonnell** (P. Inglett), **Katsutoshi Mizuta** (Grunwald), **Clayton Nevins** (P. Inglett and Strauss), **Qudus Uthman** (Kadyampakeni and Nkedi-Kizza)

2018 Quantitative Environmental Soil Science Pedometrics Award: **Setyono Hari Adi** (Grunwald)

2019 Wetland Biogeochemistry Laboratory Graduate Fellows Award: **Conor MacDonnell** (P. Inglett) and **Tracey Schafer** (Reddy and Osborne)

Myakka (pronounced 'my-yak-ah' – Seminole word for "big waters") gives a special identity to our department, as it is also the name of Florida's State Soil, Myakka fine sand. The State of Florida has the largest total acreage of Myakka fine sand (sandy, siliceous, hyperthermic Aeric Alaquod) on flatwood landscapes.