

# 2018 UF/IFAS RESEARCH OVERVIEW

UF/IFAS FLORIDA AGRICULTURAL EXPERIMENT STATION









### **MISSION**

The research mission of the University of Florida Institute of Food and Agricultural Sciences (UF/IFAS), conducted under the auspices of the Florida Agricultural Experiment Station (FAES), is to discover new scientific knowledge, encourage innovative study, and create applications based on sound science that address challenges facing agriculture, natural resources, and interrelated human systems in Florida, our country, and the world.

### HISTORY

FAES was founded in 1887 at Florida Agricultural College in Lake City, the state's original land-grant institution. When UF officially began operations in 1906, FAES was relocated to Gainesville. For much of the 20th century, FAES was headquartered on the UF main campus in Newell Hall, named for former FAES director Wilmon Newell, who served from 1921-1943.

The first off-campus FAES facility was the Citrus Research and Education Center (REC) in Lake Alfred, established in 1917 to aid the state's citrus growers. It was followed by the Everglades REC in Belle Glade, North Florida REC in Quincy, and the Tropical REC in Homestead, all of which were established in the 1920s. Additional facilities opened in the decades that followed, increasing the statewide presence of FAES.

### FUNDING

According to the most recent National Science Foundation figures, since fiscal year 2001, UF has ranked first or second among U.S. universities in total research expenditures in agricultural sciences and natural resources and conservation.<sup>1</sup>

Financial support for UF/IFAS research activities comes from a variety of sources, including federal contracts and grants; state programs and appropriations; checkoff programs sponsored by producers; contracts and grants from non-profit organizations and private companies; donations; and revenues from the licensing of crop cultivars, products, and technologies developed by UF/IFAS personnel.

### FACULTY

UF/IFAS employs 563 faculty members with research appointments, many of whom are award-winning, internationally recognized experts who publish papers in leading peer-reviewed journals and are inducted into prestigious organizations such as the National Academy of Sciences and as fellows in the American Association for the Advancement of Science.

The University of Florida is a land-grant university and an Association of American Universities member. Our faculty are committed to the UF/IFAS research mission while also assuming Extension and teaching responsibilities. Findings from their research are used as the basis for Extension programs taught statewide via publications, distance education, and field day events, and are the foundation of many of the classes taught by our faculty.

### RESEARCH

At UF/IFAS, research scientists work diligently to discover solutions to some of the most vexing problems in Florida and the world. Our research spans three comprehensive areas: agriculture, natural resources, and human-systems research.

Our researchers play leading roles in cross-disciplinary, campus-wide research initiatives such as:

- Biodiversity Institute
- Emerging Pathogens Institute
- Florida Climate Institute
- One Health
- UF Genetics Institute
- UF Informatics Institute
- UF Water Institute

Our researchers are actively involved in UF/IFAS-based centers of excellence such as:

- Center for Aquatic and Invasive Plants
- Center for Landscape Conservation and Ecology
- Center for Nutritional Sciences
- Center for Remote Sensing
- Institute for Sustainable Food Systems
- Plant Innovation Center

### HIGHLIGHTS

FAES is committed to continually providing strategic research funding to improve its research programs to meet stakeholder needs.

The following inserts highlight a few of the research programs funded by the UF/IFAS Dean for Research Office:

- Early Career Scientists Seed Fund
- Equipment & Infrastructure Awards
- Mid-Career International Travel Awards
- OSBS Jumpstart Awards
- Undergraduate Research Internships



\*\*Currently active faculty funded by the state

### ADMINISTRATIVE GOALS\*\*\*

### RESEARCH PROGRAMS

+

**Expand our global leadership in transformational basic and applied research** by developing "seed" programs to support strategic research initiatives, increasing awareness of funding opportunities, and funding targeted investments in equipment and infrastructure.

### RESEARCH CULTURE

**Enrich our research culture to strengthen innovation and discovery** by encouraging the recruitment and retention of diverse, top-performing faculty and staff, developing and improving student research experiences, and promoting synergies between the land-grant missions.

### • RESEARCH PEOPLE

**Build satisfaction and quality of life on the job for faculty and staff** by facilitating professional development, fostering an inclusive and collegial environment, and recognizing distinction in disciplinary and interdisciplinary research.

\*\*\*Developed in collaboration with faculty and unit leaders in 2016



### **EARLY CAREER SCIENTIST SEED GRANT**

To promote and facilitate the long-term success of early-career faculty and UF/IFAS research programs, the UF/IFAS Dean for Research Office supports Early Career Scientist Seed Grants in partnership with the UF Senior Vice President for Agriculture and Natural Resources and the UF Vice President for Research. Each award is a maximum of \$50,000.

The program is competitive, and proposals are reviewed by senior faculty with the formality of a federal funding agency. All applicants, regardless of whether funded, receive feedback intended to help with the preparation of subsequent grant applications. The funding rate has averaged 56 percent since the inception of the award in 2013. Recently, a survey was administered to determine whether the program helped faculty obtain external funding. The results indicated that the program is valued by early-career faculty and has been effective in improving their grantsmanship skills, with a return on investment of \$4.50 for every dollar invested.



IFAS Research

### EXTERNAL FUNDING SUCCESS





Return on Investment
So

For every \$1 invested,
\$2

faculty secured \$4.50 in external awards.
\$2

So
So

### **Sources of External Funding**



UF IFAS Research



#### **DECREASING NATURAL METHANE**

Ruminant animals such as cows ferment plant-based food in specialized stomachs, which produces methane, a greenhouse gas with the potential to warm the atmosphere up to 25 times more than carbon dioxide. Methane emissions from the U.S. livestock sector alone are equivalent to emissions from 22 billion gallons of gasoline consumption. Because this source of methane is a natural consequence of beef production, associate professor Nicolas DiLorenzo in Animal Sciences is investigating ways to increase the digestibility of common forages by ruminants that would decrease methane emissions while maintaining animal growth rates. With preliminary data collected from his Early Career Scientist Seed Grant, DiLorenzo procured external funding from the Florida Cattlemen's Association to continue the research. He is developing and testing ways to treat forages that could improve digestibility by at least 5 percent, which, once implemented, would constitute approximately \$22 million in annual savings by Florida cattlemen and a reduction of the industry's carbon footprint.



#### NOVEL PATHOGEN TREATMENTS

The growing resistance of pathogens to antibiotics in treating common infections is a global concern. Methicillin-resistant *Staphylococcus aureus* (MRSA) strains are resistant to multiple antibiotics. MRSA causes approximately 80,000 severe infections and kills 11,000 Americans each year – alarming statistics that make Kelly Rice's research particularly critical and urgent. Rice, an associate professor in the Microbiology and Cell Science Department, is working to identify how this highly transmissible pathogen evades antibiotic treatment and host immune defenses so new treatments can be developed. Rice and her team found that MRSA's nitric oxide production influences its physiology and helps the pathogen tolerate oxidative stress, clues that may lead to more effective control strategies. Rice's Early Career Scientist Seed Grant award allowed her research team to generate baseline data that helped procure a \$1.6 million grant funded by the National Institutes of Health. This funding allows her lab to perform detailed studies on this nitric oxide production and its role in regulating this pathogen's metabolic versatility that could be the key to improving the effectiveness of antibiotic treatments.



#### WATER CONSERVATION STRATEGIES

Growing demand for water and competing land uses are threatening Florida's water security, necessitating the establishment of water protection regulations. Changing forestry practices is one option being considered by policymakers. Payment for Ecosystem Service (PES) programs motivate forest landowners to help conserve water, but the effectiveness of these programs depends in part on landowners' willingness to participate. Damian Adams, associate professor in the School of Forest Resources and Conservation, reviewed common features of PES programs, evaluated the feasibility of alternative program features, and conducted a survey of northeast Florida forest landowners to assess their willingness to accept payments in exchange for participation. The survey data were used to estimate the effectiveness of alternative program configurations that policymakers can use to develop an ideally effective forest-water PES system in Florida. Adams also used the results to show proof-of-concept that helped secure a \$5 million USDA-NIFA grant to scale up the research effort with the goal of developing a program that has broad participation by forest landowners throughout the Southeast.

#### **Researcher Contacts**



DECREASING METHANE Nicolas DiLorenzo Associate Professor Animal Sciences, North Florida REC 850-526-1615 ndilorenzo@ufl.edu



PATHOGEN TREATMENTS Kelly Rice Associate Professor Microbiology and Cell Science 352-392-1192 kcrice@ufl.edu



WATER CONSERVATION Damian Adams Associate Professor Forest Resources and Conservation 352-846-0872 dcadams@ufl.edu

### **MID-CAREER INTERNATIONAL TRAVEL**

UF/IFAS is committed to helping mid-career faculty expand the reach of their research programs by establishing a diversified portfolio that includes programs with global impact. As international programs are becoming increasingly important to faculty development, student training, and the success of the University of Florida, the Mid-Career International Travel Awards program was developed to foster new collaborations with colleagues abroad.

Established in 2016 by the UF/IFAS Dean for Research, the College of Agricultural and Life Sciences and UF/IFAS Global, this program funds up to \$10,000 to each of at least 10 teams per year. Teams are coordinated by a tenured associate professor and consist of at least one of their graduate students and a colleague at a non-U.S. institution. Competitive applications propose the development of a new line of research or are hosted in a location new to the faculty member. To date, the program has funded at least 43 faculty and students that have traveled to visit hosts across the globe.



IFAS Research

### **INTERNATIONAL TRAVEL LOCATIONS**







#### TAIWAN: VEGETABLE GRAFTING

Vegetable grafting creates new ways to generate superior plants by combining scion (above ground) and rootstock (below ground) plant components from different genetic sources. This technique helped advance production of vegetables in Asian and European countries by better managing soil-borne diseases, increasing water and nutrient uptake efficiency, improving plant tolerance to biotic and abiotic stressors, and enhancing crop yield. To learn more about the integrated use of grafting in vegetable production, associate professor Xin Zhao of the Horticultural Sciences Department traveled with a graduate student to the World Vegetable Center in Taiwan, an international, non-profit research and development institute. There they learned innovative grafting techniques and new information for both protected culture and open-field systems that improve efficiency, cost-effectiveness and environmental impacts. Information from this trip will benefit U.S. growers and was incorporated into three courses on horticultural crop production and organic and sustainable farming.



#### AUSTRALIA: SMUTGRASS MANAGEMENT

Smutgrasses are non-native, tufted perennial grasses that negatively impact livestock grazing lands in Florida. These weed species are undesirable because they are generally not palatable to livestock, resulting in economic losses of a least \$55 per animal. The Florida Cattlemen's Association listed smutgrass control as one of their top research priorities. Brent Sellers, a professor at the UF/IFAS Range Cattle Research and Education Center, traveled with one of his graduate students to the Tropical Weeds Research Centre in Queensland and New South Wales, Australia, where four species of smutgrass are plaguing local ranchers. They found that the most effective herbicide in Australia is not available in the U.S., but other strategies such as managing the weeds with biological controls or alternative grazing rotations could be utilized by Florida ranchers. This new international collaboration is allowing faculty and students at both institutions to work together to develop long-term smutgrass management programs and potentially initiate a formal student-exchange program.



#### SOUTH AFRICA: RHINO CONSERVATION

The Kruger National Park is one of Africa's biggest game reserves and home to one of the largest remaining populations of white rhinoceros. However, these populations are declining rapidly due to poaching. James Austin, an associate professor in the Department of Wildlife Ecology and Conservation, traveled with a graduate student to collaborate with park biologists and veterinarians to initiate the development of a rhinoceros conservation genomics program. The team aims to utilize blood and tissue samples collected over the past two decades of rhino monitoring to estimate relatedness among white rhinos and eventually predict individual rhino reproductive success. This information will contribute important data on the changing distribution of lineages in different regions of the park and can be used to improve strategies to protect the existing populations in Kruger and other protected areas. These data will be combined with ecological, demographic, and habitat data to provide comprehensive information for more effective management decisions, including those related to captive breeding programs.

#### **Researcher Contacts**



TAIWAN Xin Zhao Associate Professor Horticultural Sciences 352-273-4773 zxin@ufl.edu



AUSTRALIA Brent Sellers Professor Agronomy, Range Cattle REC 863-735-1314, ext. 207 sellersb@ufl.edu



SOUTH AFRICA James Austin Associate Professor Wildlife Ecology and Conservation 352-846-0646 austinj@ufl.edu

### **UNDERGRADUATE RESEARCH INTERNSHIPS**

The Undergraduate Summer Research Internship Program is implemented by the UF/IFAS Office of Research to introduce students to research at UF/IFAS, improve their research skills, and help support faculty in their research programs. Students are able to view and apply for specific projects that contribute to the research portfolio of the Florida Agricultural Experiment Station.

Since 2004, more than 600 student interns have assisted faculty and graduate students by learning new research skills such as collecting and analyzing data that contribute to specific research projects' goals and objectives. While many internship projects are located on campus in Gainesville, several students work at UF/IFAS research stations across Florida. Interns are compensated \$14 per hour for 240 hours of work during summer semester. Many go on to work in paid student positions or begin graduate programs related to their internship.



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### Intern Data



200K+ invested in fiscal year 2017



**23%** of 2017 student applicants funded **96%** of alumni would recommend internship\*

\*based on a survey with 38% response rate



### MARKETING ANALYTICS

After completing a Food and Resource Economics (FRE) data analytics course, Glen Gold knew he was passionate about solving problems using big data, so he secured a research internship with FRE professor Sherry Larkin. He learned to work with specialized software known as SAS to compile large amounts of data into decipherable analytics to track and predict trends. Throughout his internship, Gold was applying SAS to real-world retail sales data collected by The Nielsen Corporation. He focused on seafood products purchased by households in the southeastern U.S. The outcome was a multivariate pricing model that estimated price premiums and discounts associated with value-added products. Food manufacturers are able to use the model to predict retail prices and demand by segments of customers in each market area. The Home Shopping Network (HSN) in Tampa hired Gold specifically for his experience in working with retail scanner data using SAS. He was promoted to manager, where he leads a team in conducting market analytics on current and potential consumers of HSN products and providing daily "forecasts" to the management and marketing teams.





#### **GOLF COURSE SUSTAINABILITY**

There are more than 1,100 golf courses in Florida, most of which have managed turfgrass, providing very little biodiversity. In summer of 2017, Grace Cope helped Adam Dale and his research team determine whether golf courses can serve as viable conservation habitats for native pollinators. Dale, an assistant professor in Entomology and Nematology, hypothesized that cultivating wildflowers in out-of-play areas of golf courses would increase native pollinator abundance and diversity. They cooperated with three local golf courses, and Cope traveled to each regularly to set up traps, build nesting boxes, and bring specimens back to the lab for analysis. Results showed that abundance of pollinators did increase with the presence of wildflowers, and that golf course wildflower habitats provide conservation benefits that could support pollinator communities in urban ecosystems. Cope considers herself a "professional dabbler," and strives to have an interdisciplinary education. She is currently majoring in Visual Arts and minoring in Entomology and Nematology. This internship experience made Cope realize that her passion lies in science, and she plans to attend graduate school for entomology.

#### **CIVIL ENGINEERING**

Lauren Coe was pursuing a Land and Water Resources Engineering degree when her advisor recommended that she consider an undergraduate research internship to broaden her real-world experience. Coe was matched with Michael Dukes, an Agricultural and Biological Engineering professor, to help conduct off-site testing of storm water drainage on different soil types. She used soil-moisture sensor data to help determine how different soil conditions affected growth of green peppers and other vegetables. The experience made her competitive enough to receive a Science, Mathematics and Research for Transformation (SMART) Scholarship in her final semester as an undergraduate – an award typically given to graduate students with a strong research background. Besides the technical skills learned, Coe credits this internship for her ability to successfully work in team environments with a high regard for research integrity. The SMART Scholarship guaranteed her a position in a military research lab; following graduation, Coe worked in the Coastal Hydraulics Lab of the U.S. Army Corps of Engineers.

#### **Researcher Contacts**



MARKETING ANALYTICS Sherry Larkin Professor Food and Resource Economics 352-392-1784 slarkin@ufl.edu



GOLF COURSE SUSTAINABILITY Adam Dale Assistant Professor Entomology and Nematology 352-273-3976 agdale@ufl.edu



CIVIL ENGINEEERING Michael Dukes Professor Agricultural and Biological Engineering 352-392-1864, ext. 205 mddukes@ufl.edu

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### **OSBS JUMPSTART AWARDS**

The Ordway-Swisher Biological Station (OSBS) was established for the long-term study and conservation of natural ecosystems. The UF/IFAS Dean for Research Office leverages the unique characteristics of the OSBS through a competitive funding program, the OSBS Jumpstart Awards, which began in 2016. Awarded projects vary in size and scope, but all have a focused plan for acquisition of external support for longer-range objectives.

One of many resources available at the OSBS is the National Ecological Observatory Network (NEON), a large-scale ecological observing system created to collect data for multi-disciplinary experiments on behalf of the scientific community. In 2011, with funding from the National Science Foundation, the University of Florida signed a 30-year land-use agreement with NEON to utilize OSBS as the southeastern domain core site. The researchers who receive the Jumpstart Awards leverage NEON baseline data to generate complementary information that aids in the investigation of plant and animal distributions, land management, climate, and ecosystem services.



OSBS is a UF research support facility that currently comprises more than 9,500+ acres with building facilities to support research, education, and conservation efforts. The station is located approximately 20 miles east of Gainesville in Melrose (Putnam County, Florida).

### **15 DISTINCT VEGETATION COMMUNITIES**

A scaled map of the OSBS showing vegetation communities by color



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### METHANE EMISSIONS IN WETLANDS

Wetlands are the largest source of methane, a greenhouse gas. Methane emissions from wetlands are difficult to measure due to variations in size and hydrology, which in turn limits the accuracy of predicting impacts of a changing climate. Stefan Gerber, an associate professor in Soil and Water Sciences, developed a process-based emission model using NEON's remote-sensing data to quantify methane emissions generated at the OSBS. His team calibrated the model for the three most prevalent wetland types on the OSBS in order to understand the dynamics of emissions at each site. He determined the feasibility of new remote-sensing observations for providing high-resolution soil-moisture and wetland boundaries and investigated the ability of NEON instruments to accurately capture landscape-level methane emissions. According to Gerber, the OSBS provides an ideal test environment for the development of an operational model that would estimate emissions from wetlands in the entire southeastern U.S., a crucial piece of information in predicting greenhouse gas emission levels, the effects of a changing climate, and the scale of mitigation projects that are needed to prevent adverse impacts.





### FOOD WEBS IN LONGLEAF PINE ECOSYSTEMS

Longleaf pine ecosystems are one of the most threatened ecosystem types in North America due to land-use changes, with forests now totaling less than 4 percent of their historic range. Traditionally, conservation efforts have focused on tree regeneration through prescribed fires. However, Wildlife Ecology and Conservation assistant professor Benjamin Baiser and his interdisciplinary research team believe this problem requires a more modern, whole-ecosystem approach that considers the relationships between tree regeneration, understory plants, endangered species, and invasive species. So far, his team has sampled 354 individuals across 19 grasshopper species and are extracting and sequencing gut-content DNA. In combination with plant abundance data sampled at NEON, Baiser's team is beginning to piece together these food webs to examine the structure, dynamics, and function of each species within the longleaf pine community. Ultimately, Baiser hopes to discover how prescribed fire affects plant-herbivore interactions and how fire management strategies can advance to account for all of the species within an ecosystem.

#### UNDERSTORY SPECIES IN SANDHILL ECOSYSTEMS

The restoration and conservation of longleaf pine forests in upland sandhill ecosystems are critical for maintaining regional biodiversity and climate-resistant landscapes in the southeastern U.S. Many understory species in these ecosystems, such as wiregrass, are heavily impacted by current land-management regimes – namely rotational burning – and a better understanding of those impacts will help improve management plans. Stephanie Bohlman, an assistant professor in the School of Forest Resources and Conservation, is investigating the relationships between the soil type, the seasonal timing and frequency of prescribed burns, and historical land-use to determine how these factors influence understory species. Bohlman and her team used the data collected from, and the maps generated by, NEON instruments to train and test computer algorithms to identify understory species that were developed for other applications, such as land-mine detection. The results will have broad applicability to vegetation analysis at NEON sites in other ecosystems and will allow better monitoring of understory species distributions and compositions throughout the lifetime of NEON at the OSBS.

#### **Researcher Contacts**



METHANE EMMISSIONS Stefan Gerber Associate Professor Soil and Water Sciences 352-294-3174 sgerber@ufl.edu



FOOD WEBS Benjamin Baiser Assistant Professor Wildlife Ecology and Conservation 352-392-1947 bbaiser@ufl.edu



UNDERSTORY SPECIES Stephanie Bohlman Assistant Professor Forest Resources and Conservation 352-846-3503 sbohlman@ufl.edu

### **EQUIPMENT & INFRASTRUCTURE AWARDS**

The UF/IFAS Dean for Research Office, in partnership with the UF Senior Vice President for Agriculture and Natural Resources and the UF Vice President for Research, fund the Equipment & Infrastructure Awards to enhance the capacity for research within UF/IFAS. Awards are used to fund new equipment that expands research capabilities and provides improvements to specialized instruments and facilities that support research endeavors. All awards increase the scope and depth of the UF/IFAS research enterprise, both on campus and around the state.

Funds are awarded annually to faculty teams that cost share their proposals. On average, faculty match 50 percent of the cost of the project or equipment, for a total annual investment of up to \$1.5 million. Proposals that benefit multiple faculty or programs, and that are likely to increase the competitiveness of UF/IFAS faculty for extramural funding, are also prioritized. Since 2014, more than \$3.6 million has been awarded to fund 105 proposals for a total investment of more than \$7 million in additional UF/IFAS equipment and infrastructure.



IFAS Research

### Funding By Location

**Funding Sources** 









### FLUORESCENCE STEREO MICROSCOPE

Disease-resistant and non-invasive plant varieties are highly sought after by landscapers and homeowners in Florida. Zhanao Deng, an environmental horticulture professor at the Gulf Coast Research and Education Center (GCREC) develops plants with these desirable characteristics by combining the DNA from two or more plants into a single organism. Deng was awarded funds to purchase a fluorescence stereo microscope equipped with a UV light and camera that can quickly identify the number and types of proteins that determine whether a gene is expressed or not. If the desired gene is expressed, the UV light shows a green fluorescence, but if it is not expressed, it shows a red fluorescence. Before the GCREC had this equipment, researchers collected tissue samples in petri dishes and traveled to other sites for analysis, which not only delayed discoveries but also increased the probability of contamination. Deng said the technology is indispensable for his and his colleagues' research programs.



#### GAS CHROMATOGRAPH

Finding replacement parts and computer support for a 30-year-old gas chromatograph – a device that analyzes semi-volatile and volatile compounds – was a challenge for Soil and Water Sciences professor Christopher Wilson, hindering his research progress. An Equipment & Infrastructure Award allowed Wilson to purchase a new gas chromatograph, a critical piece of equipment for measuring trace levels of pesticides. Wilson is using this instrument to investigate factors influencing pesticide runoff in ornamental nurseries, a problem that has adverse effects on the environment and aquatic animals. Working with several other universities, his lab is testing samples from more than a dozen nurseries to develop application and irrigation solutions that minimize these adverse effects. This gas chromatograph also has extremely high sensitivity with the ability to detect parts-pertrillion concentrations, and it is not available in any other labs at UF/IFAS. Scientists from four other departments and two outside organizations are utilizing this equipment in their research programs, demonstrating its value to UF/IFAS research programs.



#### INFRARED IMAGING SYSTEM

Western Blotting is a method used in molecular biology to identify and quantify specific proteins extracted from cells. Traditionally, this technique used chemiluminescence, which is the emission of light during a chemical reaction, but it is time-consuming and difficult to get reproducible and accurate results. Tracy Scheffler, an assistant professor in Animal Sciences, purchased an infrared imaging system called the Odyssey CLx (LICOR Biosciences, Inc.), which was not available in any UF/IFAS units. The Odyssey generates more precise, reliable and higher-quality data while reducing processing time. Scheffler is using this technology to determine proteins related to heat tolerance, muscle growth, and meat tenderness of beef cattle and pigs. Ultimately, this may help cattlemen to breed for higher meat yield and quality, thereby maximizing value. Data generated using this system was vital for a proposal that received a multi-year USDA grant that is evidence, in part, of the return on investment of the Equipment & Infrastructure Awards.

#### **Researcher Contacts**



FLUORESCENCE MICROSCOPE Zhanao Deng Professor Environmental Horticulture, Gulf Coast REC 813-633-4134 zdeng@ufl.edu



GAS CHROMATOGRAPH P. Christopher Wilson Professor Soil and Water Sciences 352-294-3166 pcwilson@ufl.edu



INFRARED IMAGING Tracy Scheffler Assistant Professor Animal Sciences 352-392-7529 tscheffler@ufl.edu



### **UF/IFAS Units**

8

14

15 13

7

(10)

المرافعة مدينه

2

4

16

17

#### ★ Gainesville Campus Departments

- Agricultural and Biological Engineering
- Agricultural Education and Communication

8

8

Agronomy

12

12

- Animal Sciences
- Entomology and Nematology
- Environmental Horticulture
- · Family, Youth and Community Sciences
- Food and Resource Economics
- Food Science and Human Nutrition
- Horticultural Sciences
- Microbiology and Cell Science
- Plant Pathology
- School of Forest Resources and Conservation
- Soil and Water Sciences
- Wildlife Ecology and Conservation

#### **Off-Campus Research and Education Centers (REC)**

- 1 Citrus REC | LAKE ALFRED
- 2 Everglades REC | BELLE GLADE
- 3 Florida Medical Entomology Laboratory | VERO BEACH
- 4 Fort Lauderdale REC | FORT LAUDERDALE
- 5 Gulf Coast REC | BALM, PLANT CITY
- 6 Indian River REC | FORT PIERCE
- 7 Mid-Florida REC | APOPKA
- 8 North Florida REC | MARIANNA, QUINCY, SUWANNEE VALLEY
- 9 Range Cattle REC | ONA
- 10 Southwest Florida REC | IMMOKALEE
- 11 Tropical REC | HOMESTEAD
- 12 West Florida REC | JAY, MILTON

#### **Research and Demonstration Sites**

- 13 Hastings Agricultural Extension Center | HASTINGS
- 14 Nature Coast Biological Station (NCBS) | CEDAR KEY
- 15 Ordway-Swisher Biological Station (OSBS) | MELROSE
- 16 Plant Science Research and Education Unit (PSREU) | CITRA
- 17 Tropical Aquaculture Laboratory (TAL) | RUSKIN, APOLLO BEACH

An Equal Opportunity Institution. Florida Agricultural Experiment Station, Institute of Food and Agricultural Sciences, University of Florida, UF/IFAS Dean for Research, Jackie Burns, publishes this information to advance research programs and related activities. For more information contact the UF/IFAS Office of the Dean for Research, P.O. Box 110200, Gainesville, Florida 32611-0200, 352-392-1784.