UF IFAS
UNIVERSITY of FLORIDA

Center for LANDSCAPE Conservation & Ecology

CENTER FOR LANDSCAPE CONSERVATION AND ECOLOGY

ANNUAL REPORT 2015-2016

Focusing on the social, environmental, and economic issues affecting urban Florida landscapes

OVER $19 MILLION IN TOTAL FUNDING

$4.13 Million
Active external funding

$328,836
Internal funding

2015-2016 AT A GLANCE

- **13** Interdisciplinary Faculty and **14** Affiliate Faculty
- Chaired **28** M.S. candidates
- Chaired **14** Ph.D. candidates
- Produced **57** refereed publications
- Produced **46** non-refereed publications
- Produced **40** EDIS publications
- Contributed to **3** books
- Granted **$328,836** in internal funding
- Received **$4.13** million in external funding
- Launched a mobile tool
- Hosted Inaugural Urban Landscape Summit
- Hosted 6 webinars with **291** participants
- **4,500** Florida Master Gardener volunteers gave **420,00** hours for a value of **$9.3** million
- Visited by **403,544** unique website visitors
- **6,878** e-newsletter subscribers
- Followed by **9,327** Facebook fans
- Followed by **971** Twitter accounts
- Viewed by **51,604** monthly Pinterest viewers
- Followed by **465** Instagram users

DIRECTOR'S MESSAGE

I'm happy to present our 2015–2016 annual report. This was a productive year with a number of firsts for us.

IN MARCH 2016, we held our inaugural Urban Landscape Summit. The summit brought together state specialists, county faculty, IFAS administration, and local government. By all measures, the summit was a resounding success. We had more than 100 attendees during the action-packed daylong event. We plan to repeat in 2017 with a revised format to include more networking time and more of the very popular lightning talks. Look for announcements about the summit in the near future.

Another first for us was the creation of the Environmentally Resilient, Resource-Efficient Land Use faculty cohort. The cohort was a collaboration between the Program for Resource Efficient Communities and CLCE, and was approved by IFAS administration in late 2015. These positions in Geospatial Analytics, Utility Analytics, Urban Water Resource Engineering, and Urban Soil and Water Quality will bring new talent to IFAS to focus on critical issues in land development and will help us develop and implement landscapes in the future that will further our mission "to protect and conserve Florida's natural resources through research-based sustainable urban landscape practices."

We've also continued our internal grants programs, both of which provide financial support to faculty research, extension programs and graduate students. This past year funding was awarded to nine projects and four graduate student programs with some of the results presented in this report.

MISSION

To protect and conserve Florida's natural resources through research-based sustainable urban landscape practices.

VISION

To be the leading source of science-based information on horticulture and the urban environment in Florida.

GOAL

To promote research-based best management practices among landscape professionals and other members of the agricultural industry, and to educate homeowners on sustainable landscape practices through its research, education, and outreach. CLCE also seeks to train students who will enter careers that allow them to engage in and promote sustainable landscape practices.

HISTORY

The center was established in 2006 by an act of the Florida Legislature in response to concerns about the sustainability of current landscape management practices and interests in water availability and quality. With Florida's ever-growing population, it was recognized that a large focus needed to be placed on landscapes, urban water and fertilizer use, plant choice, and maintenance practices. The center serves multiple stakeholders including landscape professionals, trade organizations, commercial developers, urban planners, policy makers, Extension agents, and Florida residents, providing research findings, recommendations, and education.

CLCE FACULTY AND AFFILIATES

INTERDISCIPLINARY, COLLABORATIVE, AND INNOVATIVE. The Center for Landscape Conservation and Ecology brings together an interdisciplinary team of faculty and affiliate faculty to conduct crosscutting research and deliver innovative, issues-based Extension outreach. The CLCE communications office coordinates faculty outreach efforts and ensures the center's goal and mission are at the forefront of all activities.

CLCE FACULTY

MICHAEL DUKES
CLCE Director
Agricultural & Biological Engineering, Water Conservation & Irrigation

EBAN BEAN
Agricultural & Biological Engineering, Urban Water Resources Engineer

GAIL HANSEN
Environmental Horticulture, Sustainable Landscape Design

BASIL IANNONE
Forest Resources and Conservation, Geospatial Analytics

HAYK KHACHATRYAN
Food & Resource Economics, Horticultural Economics

ANDREW KOESER
Environmental Horticulture, Landscape Maintenance

CHRIS MARBLE
Environmental Horticulture, Urban Weed Management

CHRIS MARTINEZ
Agricultural & Biological Engineering, Water Resource Management

ESEN MOMOL
Florida-Friendly Landscaping™ Program

PAUL MONAGHAN
Agricultural Education & Communication, Community-Based Social Marketing

GURPAL TOOR
Oil & Water Science, Urban Water Quality

LAURA WARNER
Agricultural Education & Communication, Social Marketing and Program Evaluation

WENDY WILBER
Florida Master Gardener Program

AFFILIATES

LYNN BARBER
Hillsborough County, Urban Horticulture

TATIANA BORISOVA
Food & Resource Economics, Horticulture Economics

ADAM DALE
Entomology & Nematology, Landscape Entomology

ZHANAO DENG
Environmental Horticulture, Plant Breeding

MORGAN HOPKINS
Miami-Dade County, Florida Yards & Neighborhoods

KEVIN KENWORTHY
Agronomy, Turfgrass Breeding

JASON KRUSE
Environmental Horticulture, Sports Turf Management

RAMON LEON
Agronomy, Turfgrass Weed Science

MATT ORWAT
Washington County, Urban Horticulture

SYDNEY PARK BROWN
Environmental Horticulture, Consumer Horticulture

BRIAN PEARSON
Environmental Horticulture, Landscape Management

JOE SEWARDS
Volusia County, Urban Horticulture

LAURIE TRENHOLM
Environmental Horticulture, Urban Turfgrass Management

BRYAN UNRUH
Environmental Horticulture, Urban Turfgrass Management

CLCE STAFF

EMILY EUBANKS
Educational Media & Communications Coordinator

MELISSA FRIEDMAN
Research Coordinator

CARALINE STEPHENS
Horticulture Writer

JENNIFER SYKES
Web Coordinator

FLORIDA-FRIENDLY LANDSCAPING™ STAFF

CJ BAIN
FFL Website and Information Tech Coordinator

JOHN BOSSART
FFL Education and Extension Manager

JEN MARVIN
FFL/GI-BMP Education Coordinator/Data Manager

CLAIRE LEWIS
FFL/FYN Statewide Coordinator

DON RAINEY
FFL/GI-BMP Statewide Coordinator

CLCE GRADUATE STUDENTS

M.S. STUDENTS

LUIS ARISTIZÁBAL
Entomology and Nematology
CLCE Faculty: Steven Arthurs

SINAN ASAL
Soil and Water Science
CLCE Faculty: Gurpal Toor

LYNN BARBER
Horticultural Sciences
CLCE Faculty: Andrew Koeser

ELIZA BREDER
Agricultural and Biological Engineering
CLCE Faculty: Michael Dukes

MATTHEW BURROWS
Auburn University, Horticulture
CLCE Faculty: Chris Marble

CONRADO DE LEON
Agricultural and Biological Engineering
CLCE Faculty: Michael Dukes

LISA HICKEY
Horticultural Sciences
CLCE Faculty: Gail Hansen

MATTHEW JABLONSKI
Soil and Water Science
CLCE Faculty: Gurpal Toor

STEFAN KALEV
Soil and Water Science
CLCE Faculty: Gurpal Toor

RYAN KLEIN
Environmental Horticulture
CLCE Faculty: Gail Hansen, Andrew Koeser

SARA KOVACHICH
Landscape Architecture
CLCE Faculty: Gail Hansen

SHANNON MCGEE
Agricultural Education and Communication
CLCE Faculty: Paul Monaghan

PH.D. STUDENTS

AMANDA ALI
Agricultural Education and Communication
CLCE Faculty: Laura Warner

MACKENZIE BOYER
Agricultural and Biological Engineering
CLCE Faculty: Michael Dukes

ANIL KUMAR CHAUDHARY
Agricultural Education and Communication
CLCE Faculty: Laura Warner

MUN WYE CHNG
Environmental Horticulture
CLCE Faculty: Gail Hansen

TAYLOR CLEM
Environmental Horticulture
CLCE Faculty: Gail Hansen, Esen Momol, Paul Monaghan

ISAAC DUERR
Statistics
CLCE Faculty: Michael Dukes

FLAVIO HAZEN
School of Natural Resources and Environment
CLCE Faculty: Chris Martinez

SITI JARIANI MOHD JANI
Soil and Water Science
CLCE Faculty: Andrew Koeser, Gurpal Toor

SCOTT KNIGHT
Environmental Engineering Sciences
CLCE Faculty: Michael Dukes

CHARLIE NEALIS
Soil and Water Science
CLCE Faculty: Paul Monaghan

AARON PETRI
University of Illinois at Urbana-Champaign, Urban and Regional Planning
CLCE Faculty: Andrew Koeser

JOHN ROBERTS
Environmental Horticulture
CLCE Faculty: Gail Hansen, Andrew Koeser

DEBALINA SAHA
Environmental Horticulture
CLCE Faculty: Chris Marble

JEFF VAN TREESE
Interdisciplinary Ecology
CLCE Faculty: Andrew Koeser

CHUAN WANG
Statistics
CLCE Faculty: Michael Dukes

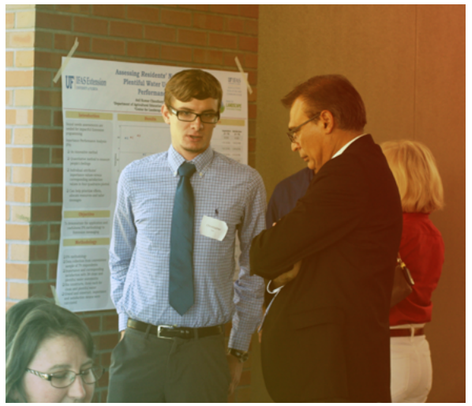
ONDINE WELLS
School of Natural Resources and Environment
CLCE Faculty: Paul Monaghan

WAN XU
Food and Resource Economics
CLCE Faculty: Michael Dukes, Hayk Khachatryan

ERIN YAFUSO
Environmental Horticulture
CLCE Faculty: Andrew Koeser, Laura Warner

QUIYAN YU
University of South Florida, School of Geosciences
CLCE Faculty: Andrew Koeser

XUMIN ZHANG
Food and Resource Economics
CLCE Faculty: Hayk Khachatryan



CLCE HOSTS INAUGURAL URBAN LANDSCAPE SUMMIT

On March 23, CLCE hosted its first Urban Landscape Summit. More than 100 faculty, staff, and stakeholders participated in research and Extension presentations throughout the day.

COUNTY FACULTY, STATE SPECIALISTS, and graduate students presented on topics related to irrigation, turfgrass, urban trees, stormwater ponds, landscape plant disease resistance, poster session, and networking.

CLCE presented two graduate student awards. Mackenzie Boyer, Agricultural and Biological Engineering PhD student, and Ryan Klein, Environmental Horticulture MS student, both received $1,000 towards their research programs. Boyer presented "A Tale of Two Regions: How Residential Irrigation Differs Between Tampa Bay and Orange County and What Does That Mean for Water Conservation." Klein presented "Relationship between Perceived and Actual Occupancy Rates in Urban Settings."

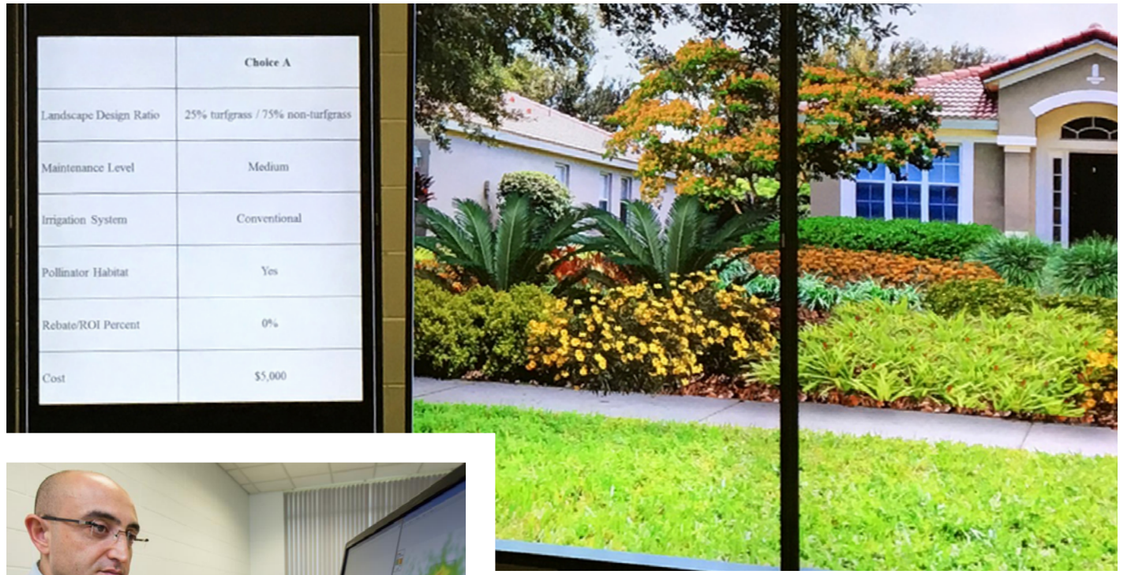
Planning is already under way for the 2017 Urban Landscape Summit. Based on evaluation feedback, the summit is moving to a two-day format with more networking opportunities.

SUMMIT REACTIONS

"Interaction between county and state faculty and graduate students was needed."

"Learning about current research and projects was really beneficial."

TRACKING CONSUMERS' BEHAVIOR WITH NEW TECHNOLOGY



Dr. Hayk Khachatryan developed the Consumer Behavior Lab (CBL) to assess consumers' preferences and behaviors when buying horticulture industry related products. At the CBL, experimental and behavioral economics methods are combined with innovative visual technology to investigate mechanisms behind human decision-making.

LOCATED AT THE Mid-Florida Research and Education Center in Apopka, the CBL currently has two means of capturing consumers' visual attention: eye tracking glasses and stationary eye tracking cameras. The eye tracking glasses facilitate in-store/on-site data collection while the stationary system is used to collect data in the lab. Both technologies record consumers' natural eye movements with a high degree of precision and accuracy.

Tracking eye movements helps us get past what consumers say they want and closer to what they actually do. In his experimental economics lab, Dr. Khachatryan teases out what information is most compelling to the consumer.

In the nursery business, for example, Khachatryan can tie visual attention measures to whether consumers will pay more for certain designations on a label, such as locally grown, certified organic, or pollinator-friendly.

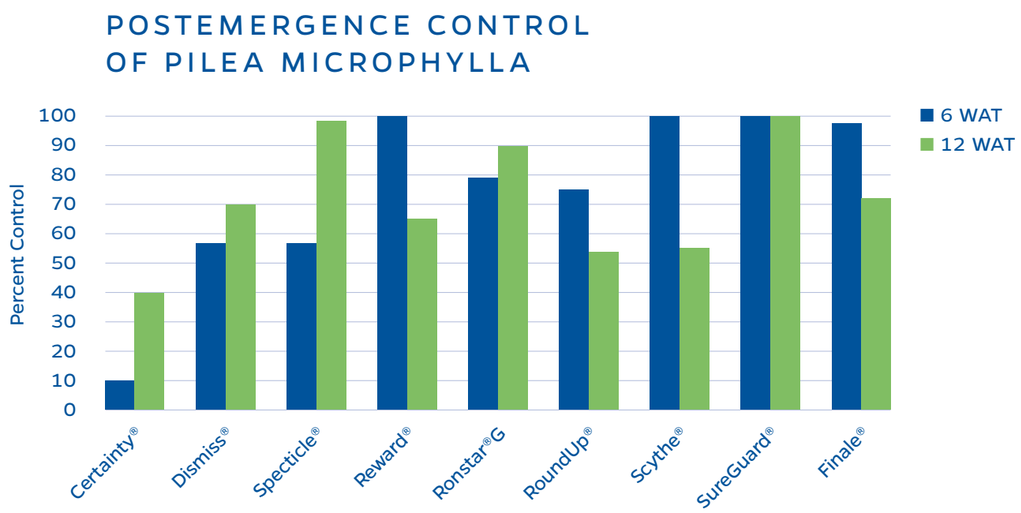
And with a wall of large digital screens, he can put a subject wearing the eye tracking glasses at the curb in front of a virtual yard. Then, by changing the composition of the landscaping – playing with the traditional turfgrass lawn versus native plants mix – he can detect at what point a consumer decides a landscape looks like too much work, a critical consideration in homeowners' decisions.

Dr. Khachatryan is one of the few scientists in the United States with these kinds of tools and the know-how to use them. His cutting-edge investigation exemplifies how UF/IFAS research increasingly focuses on figuring out what consumers really want and sharing that information with the producers who can deliver it.

PRE- AND POSTEMERGENCE CONTROL OF *PILEA MICROPHYLLA* (ARTILLERY WEED)

AN INCREASINGLY PROBLEMATIC WEED IN FLORIDA LANDSCAPES

In 2014, Dr. Chris Marble began researching the efficacy of common pre- and postemergence herbicides on Pilea microphylla. Also known as artillery weed, artillery fern, gunpowder plant, and other names, P. microphylla is becoming more and more common as a weed species in Florida landscapes. →



→ **LITTLE IS CURRENTLY KNOWN** about artillery weed, and herbicide efficacy has not been previously reported. As it's only considered a weed in Florida and Hawaii, it is not listed on any herbicide labels. It is notoriously difficult to control, and glyphosate, the most commonly used herbicide, offers little to no control in most cases.

Results showed that while several herbicides including diquat (Reward) and pelargonic acid (Scythe) provided excellent control at 6 weeks, artillery weed was able to re-grow following these treatments. The best control was achieved by making applications of either flumioxazin (SureGuard), oxadiazon (Ronstar, indaziflam (Specticle), or glufosinate (Finale). Interestingly, all of these other than glufosinate are used primarily as preemergence herbicides, but provided good to excellent control of artillery weed postemergence.

This research shows that for postemergence control, several herbicides are available which will provide better results than glyphosate including glufosinate, indaziflam, and flumioxazin; if the weeds are small, diquat and pelargonic acid may also provide control. If the area is heavily infested with mature artillery weed, a preemergence herbicide will likely be needed to prevent reoccurrence. In this case, all of the herbicides evaluated provided at least some suppression, but across trials the most consistent results were observed when oxadiazon or any product containing prodiamine was applied.

PREEMERGENCE HERBICIDE USE IN MULCHED LANDSCAPE BEDS

There are currently no label recommendations for preemergence herbicide use in mulched landscape beds. One of the most important aspects of preemergence herbicides is that they must be incorporated into the soil with rainfall or irrigation soon after application to be "activated." It is unknown if more or less moisture is needed if an area is mulched, nor is there information available on how different mulch materials and herbicides interact.

CLCE Ph.D. student Debalina Saha is currently investigating how mulch type, depth, and activation moisture impact the performance of four different herbicides. In this current research trial, three types of mulch (pinestraw, pinebark, and hardwood chips) were applied at two different depths. Herbicides including prodiamine, indaziflam, and a combination of pendimethalin + dimethenamid-P were applied using two different formulations (granular or spray-applied). After treatment, three different irrigation amounts were applied to determine if more or less irrigation is needed to activate the herbicide, and also to determine how various mulch types, particle sizes, and depths interact with herbicides and what impact these factors may have on control of the most common landscape weed species. This greenhouse trial was initiated in 2016 and will be repeated in both greenhouse and field environments in 2017.

FLORIDA-FRIENDLY LANDSCAPING™
GREEN INDUSTRIES BEST MANAGEMENT PRACTICES

IMPROVING FLORIDA'S WATER AND NATURAL RESOURCES

46,192

green industry professionals have received GI-BMP training since 2006, valued at **$6.9 million**.

93–99%

of GI-BMP training participants are using best practices for irrigation, maintenance, fertilization, and pesticide application on a regular basis.

72%

use soil tests to determine fertilization needs.

85%

use soil moisture or other sensing devices to ensure effective water use.

To date, the GI-BMP program has trained more than 41,000 individuals using in-person and online classes given in English, Spanish, and Haitian Creole.

THE GREEN INDUSTRIES Best Management Practices (GI-BMPs) program is a science-based educational training program for lawn-care and landscape maintenance professionals. The GI-BMPs teach environmentally safe landscaping practices that help conserve and protect Florida's ground and surface waters. They can also save Florida homeowners money, time, and effort; increase the beauty of the home landscape; and protect the health of family, pets, and the environment. The GI-BMP program trains landscaping professionals in proper fertilization and irrigation practices that protect Florida's water resources. To date, the program has trained more than 41,000 individuals using in-person and online classes given in English, Spanish, and Haitian Creole.

"The success we have achieved for the GI-BMP program can only be attributed to teamwork," said Esen Momol, state director for the Florida-Friendly Landscaping™ program, which oversees the GI-BMP program. "All the Extension agents, FDEP coordinators, and our industry partners statewide who have put in countless hours for curriculum development and instructing hundreds of training classes can feel a great deal of satisfaction in the recognition provided by these awards. Florida is truly better off for their efforts."

Developed by UF/IFAS and the Florida Department of Environmental Protection (FDEP) and endorsed by the pest control industry, this training is partially funded by FDEP through a Nonpoint Source Management (Section 319h) grant from USEPA.

ENVIRONMENTALLY RESILIENT, RESOURCE-EFFICIENT LAND USE COHORT

A new partnership between CLCE and the Program for Resource Efficient Communities has resulted in a new faculty cohort with four hires. Cohort faculty will work together and with their home academic department, CLCE, and PREC to develop new research and Extension programs.

Land development decisions and their impacts on water and energy resources are critical to the resiliency and sustainability of Florida's urban, agricultural, and natural systems and directly/ indirectly impact almost every UF/IFAS program. The cohort will develop and adopt a systems approach to land use decision-making and management practices.

EBAN BEAN
Urban Water Resource Engineering
60% Extension, 40% Research
Dr. Bean is an assistant professor in the agricultural and biological engineering department and specializes in stormwater management, water quantity and quality issues, low impact development (LID), and sustainable urban development to reduce nonpoint source pollution. Dr. Bean received a PhD in agricultural and biological engineering from the University of Florida and is a licensed professional engineer.

BASIL IANNONE
Geospatial Analytics
60% Research, 40% Extension
Dr. Iannone is an assistant professor in the forest resources and conservation department and specializes in geospatial analysis of sustainable and resilient land development. His research interests include ecosystem services and functioning, ecological restoration, and biological invasions. He received a PhD from the Ecology and Evolution Program, Biological Sciences at the University of Illinois.

JORGE BARRERA
Utility Analytics for Sustainable Planning
60% Research, 40% Extension
Dr. Barrera is an assistant professor in the agricultural and biological engineering department and specializes in the area of utility analytics applied to land use, water, and energy. His research addresses the design of market mechanisms for the efficient allocation of resources under conditions like congestion and spatial use. He received a PhD in systems engineering from the University of Virginia.

?

POSITION OPEN (INTERVIEWS OCCURING IN FALL 2016)
Urban Soil and Water Quality
60% Extension, 40% Research
This position will be based in the soil and water sciences department and will specialize in the fate and transport of inorganic and organic contaminants in urban watersheds and develop alternative and remediation strategies.

CENTER FACULTY AND STAFF RECOGNIZED FOR OUTSTANDING EFFORTS

AMERICAN SOCIETY OF AGRICULTURAL AND BIOLOGICAL ENGINEERS JOHN DEERE GOLD MEDAL AWARD
Dr. Michael Dukes has been honored with the 2016 John Deere Gold Medal award. The ASABE gives the award to recognize distinguished achievement in the application of science and art to the soil. "It is a great honor to be selected by my peers for this prestigious award," Dukes said. "I look forward to continuing my work in helping create sustainable landscape practices that will impact not only Florida, but the world."

INTERNATIONAL SOCIETY OF ARBORICULTURE EARLY CAREER SCIENTIST AWARD
Dr. Andrew Koeser was recently awarded the ISA Early Career Scientist Award. This Award of Distinction is given to professionals showing exceptional promise in arboriculture research. One of Koeser's current projects is a mobile app for risk assessment data collection and mapping. He is also co-writing a series of tree identification books unique to the different regions of Florida. "My research in tree risk assessment carries on the goal of enhancing current efforts being made to improve assessment processes," states Koeser. "I think the app project has the potential to gather user data needed in order to make reasonable assessments of potential tree failure."

UNIVERSITY OF FLORIDA SUPERIOR ACCOMPLISHMENT AWARD
Emily Eubanks received the Jeffrey A. Gabor Employee Recognition Award. Nearly 300 employees gathered at the J. Wayne Reitz Union's Grand Ballroom on April 14 for the 2016 Superior Accomplishment Awards ceremony. This annual program recognizes staff and faculty members who contribute outstanding and meritorious service, efficiency and/or economy, or to the quality of life for students and employees. Eubanks has been with the Center since 2006. She has her BS and MS in Agricultural Communications from UF.

ADVISORY BOARD

BEN BOLUSKY – CHAIR
Florida Nursery, Growers, and Landscape Association

TOM ALLEN
Florida Irrigation Society

JOHN DAVIS
UF/IFAS Research Administration

DALE DUBBERLY
Florida Department of Agriculture and Consumer Services

TOM FRICK
Florida Department of Environmental Protection

DEIRDRE IRWIN
St. John's River Water Management District

CAROL LIPPINCOTT
UF Water Institute

ROSEMARY LORIA
UF/IFAS Environmental Horticulture Department

BETSY MCGILL
Florida Turf Producers

SAQIB MUKHTAR
UF/IFAS Extension Administration

LOIS SORENSEN
Southwest Florida Water Management District