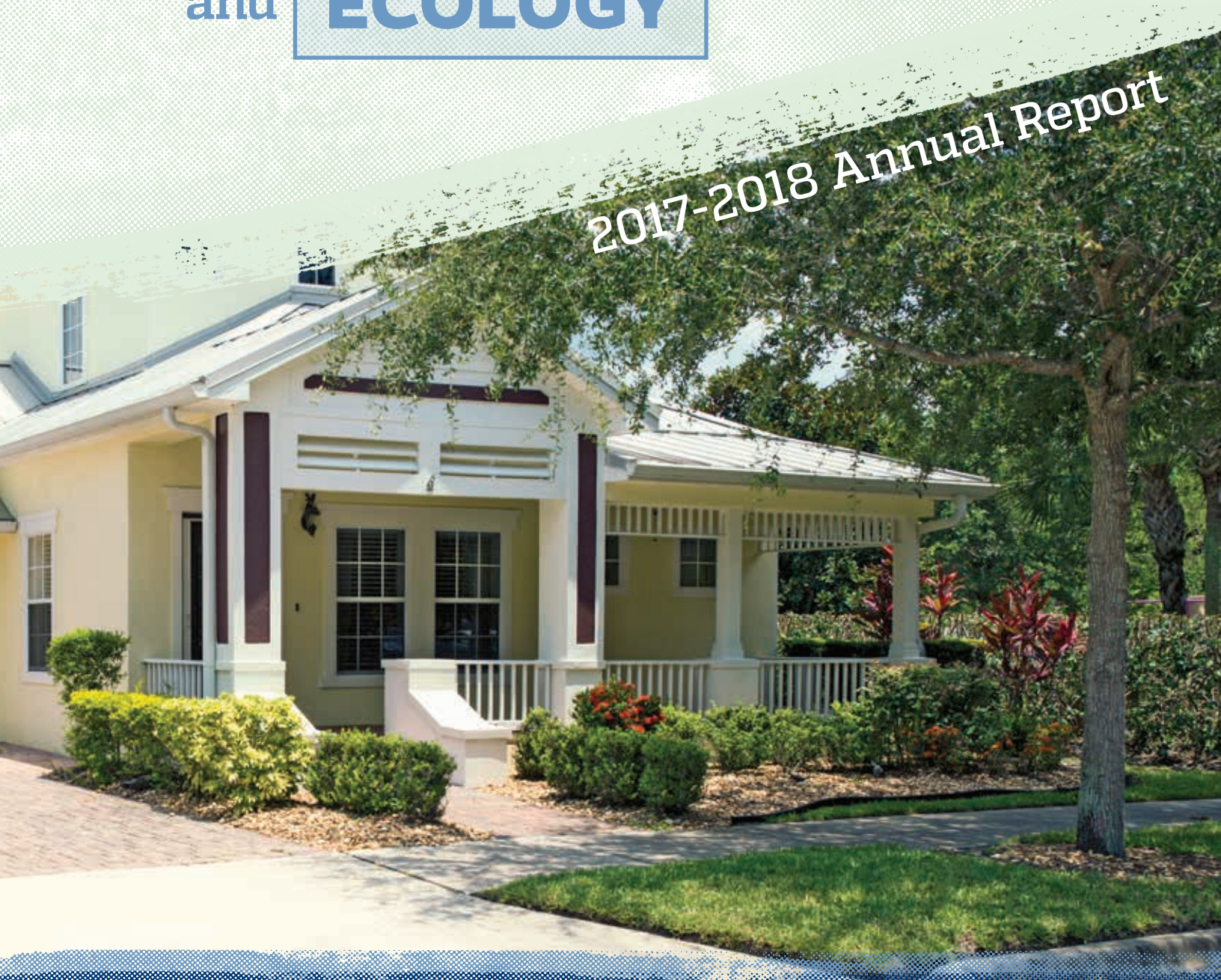
UF IFAS UNIVERSITY of FLORIDA

Center for LANDSCAPE Conservation & Ecology

Center for LANDSCAPE CONSERVATION and ECOLOGY

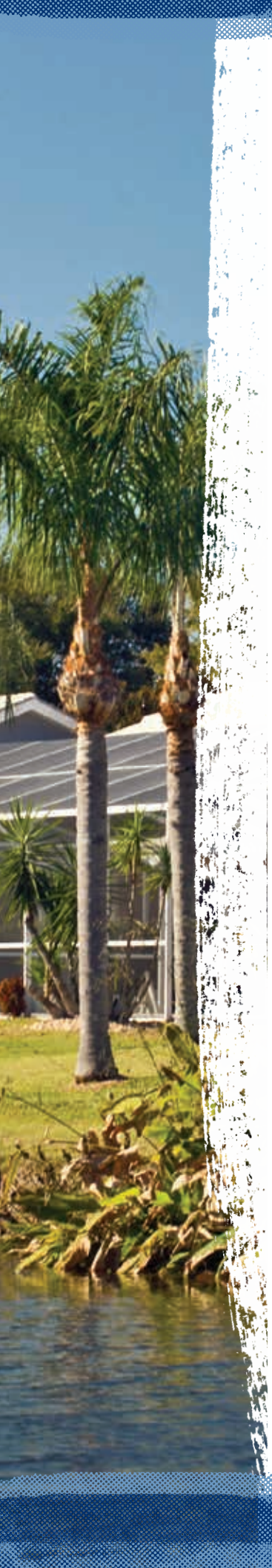
2017-2018 Annual Report



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

Over **$13.16 MILLION** in **TOTAL FUNDING** since 2012

In 2017-2018, **$5.21 MILLION** in active **EXTERNAL FUNDING** and **$321,391** in **INTERNAL FUNDING**



2017-2018 at a GLANCE

14
interdisciplinary faculty

18
affiliate faculty

12
M.S. students

14
Ph.D. students

58
refereed publications produced

16
proceedings contributed to

38
non-refereed publications produced

12
EDIS publications produced

5
books contributed

1
book authored

3rd
Urban Landscape Summit hosted

176.4 MILLION
gallons of water saved based on educational programs delivered – enough water to supply the annual indoor water needs of nearly

2,005
households and save

$583,903
on utility bills

14
webinars hosted with

3,000
views

281
in-service trainings and workshops conducted with

12,230
people served

4,669
Florida Master Gardener volunteers gave

387,000
hours for a value of

$9.03 MILLION

737,459
unique website visitors

8,000
e-newsletter subscribers

12,311
Facebook followers

Top 5 Facebook posts reached over

114,000
and engaged over

17,000
fans

1,683
Twitter followers

129,000
views monthly Pinterest

1,053
Instagram followers

Director's Message

I am happy to present our 2017-18 annual report. This year was a productive year despite some budget setbacks. Even though we had excellent support from our friends in the industry and legislature, we and IFAS as a whole were not successful in regaining the budget cuts that occurred last session. Despite this setback we will carry on this year, producing high-quality research and extending that research to stakeholders. In the meantime, we will be seeking new funding in the legislature this year.

We again hosted the Landscape Summit for a third year. As in the past, it was very popular, attracting 80 county and state faculty as well as 15 other attendees. We had an incredibly interactive graduate student poster competition with 13 students competing. In the face of reduced funding available for Extension In-Service Trainings, we partnered with our faculty to host two IST's in addition to as a part of the summit itself. This collaboration altered the format of the summit somewhat but was popular with many of our county faculty who were able to get three IST's—a total of two days of education—with one trip.

For the past year, a group of CLCE faculty have been discussing the formation of an "Urban Landscape Topics" class. This class will be team taught, with 1-2 faculty each week, across a wide range of topics for a semester. The class will broaden CLCE's primarily Research and Extension research and Extension focus to formal teaching as well. In addition, it will help familiarize and potentially recruit students into the green industries. Read more about the upcoming class in this report.

It occurs to me frequently that while we enjoy a high standard of living, I am still reminded that the winds of change are always blowing. We currently have nearly 21 million residents in Florida and there are estimates that 1,000 people per day continue to move to the state. Meanwhile as I write this, algae chokes the canals in South Florida and red tide washes up on the southwest coast. It reminds me that we likely will not be doing things in 10 years and beyond the same way we are now. You will read about cutting-edge ideas and projects in this report: investigating soil compaction and amendments to mitigate stormwater quality, as well as enhancing landscape plant health, plant diversity on golf courses to enhance improve biological insect control, the investigation of mulch to control weeds, and more. These are just highlights of the many ways that CLCE is working to address issues in urban landscapes and conserve Florida's natural resources. I invite and encourage you to attend the fourth Landscape Summit already being planned for March 20-21, 2019 to hear the latest cutting-edge in science and education.

Michael D. Dukes
Director

Message from the SVP

Dear Friends,

The UF/IFAS Center for Landscape Conservation and Ecology is a great example of how UF/IFAS responds to relevant issues impacting Florida's consumers and businesses and delivers solutions that make a difference. With the ongoing support and input of the state's landscape professionals, our best home gardeners, and world-class scientists, the Center educates thousands about the latest science and best practices in balancing aesthetically beautiful urban landscapes with the need to conserve and protect our water resources.

The pressures are real. With a growing population, expanding urban and suburban communities, and the need to feed more and more people on less land, Florida is the epicenter of advancing the science of plant innovation, resource conservation, and pest management. While we deal with today's problems, we also have an eye on the future. Educating the next generation of scientists, landscape developers and urban ecologists is our way of ensuring that Florida's beautiful natural environment is not only protected but respected and valued.

The Center was created by a partnership of the University of Florida, the industry, and the legislature. Recent budget cuts at the state level, while disappointing and potentially devastating to the program, have not deterred our commitment to the science. But we cannot continue at the level that our state deserves without state support. We will return to request support of the state legislature in 2019 so we can continue to serve Florida residents with the science that they deserve.

We hope that you share this commitment and will continue to support this great program.

Sincerely,

Jack M. Payne
Senior Vice President
Agriculture and Natural Resources

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 and Irrigation

Eban Bean, Agricultural and Biological Engineering, Urban Water Resources Engineer

Gail Hansen, Environmental Horticulture, Sustainable Landscape Design

Basil Iannone, Forest Resources and Conservation, Geospatial Analytics

Hayk Khachatryan, Food and Resource Economics, Horticultural Economics

Andrew Koeser, Environmental Horticulture, Landscape Maintenance

Mary Lusk, Soil and Water Science, Urban Water Quality

Chris Marble, Environmental Horticulture, Urban Weed Management

Chris Martinez, Agricultural and Biological Engineering, Water Resource Management

Esen Momol, Florida-Friendly Landscaping™

Paul Monaghan, Agricultural Education and Communication, Community-Based Social Marketing

AJ Reisinger, Soil and Water Science, Urban Soil and 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 and Resource Economics, Horticulture Economics

Adam Dale, Entomology and Nematology, Landscape Entomology

Zhanao Deng, Environmental Horticulture, Plant Breeding

James Fletcher, Water Resources

Erin Harlow, Duval County, Commercial Horticulture

Kevin Kenworthy, Agronomy, Turfgrass Breeding

Lisa Krimsky, Water Resources

Jason Kruse, Environmental Horticulture, Sports Turf Management

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

Lloyd Singleton, Sumter County, Florida-Friendly Landscaping™

Laurie Trenholm, Environmental Horticulture, Urban Turfgrass Management

Bryan Unruh, Environmental Horticulture, Urban Turfgrass Management

Sandy Wilson, Environmental Horticulture, Ornamental and Invasive Plants

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

Claire Lewis, FFL/FYN Statewide Coordinator

Elisha Cash, GI-BMP Regional Coordinator

Marilyn Liebsch, GI-BMP Reginal Coordinator

Barry Sawicki, FFL/GI-BMP Program Assistant

Lyn Ward, FFL /GI-BMP Program Assistant

CLCE Graduate Students

M.S. STUDENTS

Seth Blair, Environmental Horticulture
CLCE Faculty: Andrew Koeser

Eliza Breder, Agricultural and Biological Engineering
CLCE Faculty: Michael Dukes

Traci Goodhart, Soil and Water Science
CLCE Faculty: Eban Bean

Keir Hamilton, Environmental Horticulture
CLCE Faculty: Andrew Koeser

Tricia Kyzar, Urban and Regional Planning
CLCE Faculty: Eban Bean

Gisele Nighswander, Forest Resources and Conservation
CLCE Faculty: Basil Iannone

James Owers, Geological Sciences East Carolina University
CLCE Faculty: Eban Bean

Karissa Raymond, Agricultural Education and Communication
CLCE Faculty: Paul Monaghan

Jeremy Robbins, Geological Sciences, East Carolina University
CLCE Faculty: Eban Bean

PH.D. STUDENTS

Andrew Benson, School of Forestry, University of Canterbury
CLCE Faculty: Andrew Koeser

Mackenzie Boyer, Agricultural and Biological Engineering
CLCE Faculty: Michael Dukes, Chris Martinez

Lorna Bravo, Environmental Horticulture
CLCE Faculty: Gail Hansen

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

Deborah Hilbert, Environmental Horticulture
CLCE Faculty: Andrew Koeser, Gail Hansen

Dongso Lee, Food and Resource Economics
CLCE Faculty: Hayk Khachatryan

Siti Jariani Mohd Jani, Soil and Water Science
CLCE Faculty: Andrew Koeser

Ryan Klein, Environmental Horticulture
CLCE Faculty: Gail Hansen, Andrew Koeser

Jennifer Marvin, Environmental Horticulture
CLCE Faculty: Gail Hansen

Hunter Merrill, Statistics
CLCE Faculty: Michael Dukes

Julio Pachon, Soil and Water Sciences
CLCE Faculty: Eban Bean

Aaron Petri, Department of Urban Regional Planning, University of Illinois at Urbana-Champaign
CLCE Faculty: Andrew Koeser

John Roberts, Environmental Horticulture
CLCE Faculty: Gail Hansen, Andrew Koeser

Debalina Saha, Environmental Horticulture
CLCE Faculty: Chris Marble

Charlie Stillwell, Biological and Agricultural Engineering, North Carolina State University
CLCE Faculty: Eban Bean

Mary Szoka, Agricultural and Biological Engineering
CLCE Faculty: Eban Bean

Jeff Van Treese, Interdisciplinary Ecology
CLCE Faculty: Andrew Koeser

Ondine Wells, School of Natural Resources and Environment
CLCE Faculty: Paul Monaghan

Erin Yafuso, Environmental Horticulture
CLCE Faculty: Andrew Koeser, Laura Warner

Quiyan Yu, Environmental Horticulture
CLCE Faculty: Andrew Koeser

Xumin Zhang, Food and Resource Economics
CLCE Faculty: Hayk Khachatryan, Gail Hansen

Research and Extension Highlighted at the Third CLCE Urban Landscape Summit

CLCE hosted its third Urban Landscape Summit in March 2018. More than 80 faculty, staff, and stakeholders participated in research and Extension presentations throughout the two-day event.

The event kicked off with keynote speaker Timothee Sallin, CherryLake president, and his talk about landscape industry trends and the path towards sustainable landscape solutions.

County faculty and state specialists presented in either a lightning round or extended format on topics relating to homeowner insights, landscapes and plants, invasives and pests, and water supply and conservation.

The second day included advanced trainings on nitrogen and water in the landscape and urban trees and water quality.

Graduate students also competed in a 2-minute lightning round presentation and poster session. Award winners received $500 towards their research programs. Carlee Steppe, environmental horticulture master's student, won for her presentation on "Propagation and evaluation of *Balduina angustifolia*, a native wildflower with ornamental and ecosystem value." Mary Szoka, agricultural and biological engineering PhD student, won for her presentation, "Talkin' bout regeneration: an initial assessment of a new regenerative stormwater conveyance system."

CLCE Expanding into Teaching Undergraduate Seminar Course

In spring 2019, Gail Hansen will be coordinating a seminar course entitled Urban Ecology in the Built Environment. While teaching is part of most CLCE faculty members' appointments, the courses are typically coordinated through their departments. This will be the first time that a course will be coordinated through the center.

Each week, the course will feature different guest faculty from within CLCE. The course has five major themes. Most CLCE faculty and affiliates will be featured at least once throughout the semester.

ECOLOGY

- Urban Soils- Chris Martinez (metals and management)
- Urban Hydrology- Basil Inononne (stormwater ponds), Eban Bean (stormwater systems), AJReisinger, Michael Dukes (irrigation)
- Urban Wildlife- Adam Dale (pest management)
- Green Infrastructure/Urban Green Space- Gail Hansen (walkable urban streets)

ENVIRONMENT

- Biophilia- Gail Hansen (ethnobotanical gardens for children)
- Ecosystem Services- Gail Hansen (why landscapes fail)
- Biodiversity- Sandy Wilson (natives and/or invasives)
- Risk Mitigation- Andrew Koeser (risk trees)

SOCIAL

- Landscape Aesthetics- Hayk Khachatryan (eye-tracking study)
- Environmental Justice- Gail Hansen (or guest speaker)
- Values, Beliefs, Norms, Ethics- Taylor Clem (VBN and landscape behavior)
- Social & Cultural Influences- Gail Hansen (landscape preferences and perceptions)
- Residential Landscapes- Jason Kruse (turf management)
- Novel Landscapes- Gail Hansen (Costa Agrihood)

SOCIAL & CULTURAL

- History and Philosophy of Man and Nature- Gail Hansen (history of landscape architecture)
- Impact of Human Activities- Chris Marble (weed management)
- Landscape Behaviors- Laura Warner (irrigation), Erin Harlow (landscape maintenance)
- Healthy Neighborhoods- Gail Hansen (walkable urban streets)
- Sustainable Neighborhoods- Gail Hansen (Fremantle, Australia)
- Performance Data- Gail Hansen (EPA stormwater case studies or FFL case studies)

CULTURAL

- Landscape Meaning & Identity- Gail Hansen (landscape design principles and elements)
- Legal Landscape- Gail Hansen (strategies for working with HOAs for FFL landscapes)
- Landscape Knowledge- Lynn Barber (extension education), Joe Sewards (consumer horticulture)
- Landscape Certification Programs- Esen Momol (Florida-Friendly Landscaping™ Program), Wendy Wilber (Master Gardener Program)
- Landscape & Planning Professions- Gail Hansen (jobs in design, planning, horticulture, etc.)
- Funding & Grants- Joe Sewards (Volusia County Extension ECHO Grant and Florida Hospital Community Garden Grant)

Mitigating Compaction in New Residential Developments

UF/IFAS researchers partnered with On Top of the World (OTOW) in Ocala, to investigate the role of compaction mitigation on reducing irrigation demand.

Soil compaction can be mitigated via tillage, which has been shown to reduce bulk density and runoff, while increasing soil porosity and infiltration. Soil amendments, such as compost, have been commonly used in agricultural settings to enhance soil quality and to a lesser extent in urban settings. Compost has been shown to increase the soil water holding capacity and provide a source of macro- and micro-nutrients in soil.

MODEL HOME STUDY

Nine model homes at OTOW are part of a pilot study that began in January 2017 and will last until January 2019. The soil within the yards of three of the homes were either left compacted (controls), tilled to a depth of 6", or tilled with 1" of compost into the top 6". Treatments were applied immediately prior to turfgrass installation. Each lot received the same irrigation and maintenance. Early results from the first year show that tillage generally had little to no effect on soil physical characteristics compared with the compacted soil. However, incorporating compost decreased the bulk density, and more than doubled the PAW content within the soil, results which persisted through the fall of 2017. Increasing the PAW has the potential to reduce the supplemental irrigation necessary for turfgrass on sandy soils. Further, turf quality was noticeably better for the compost-amended soils than the control and tilled lawns. One limitation of this phase though is that model homes are not a suitable setting to evaluate stress tolerance of turfgrass.

REAL WORLD STUDY

With support from the Southwest Florida Water Management District (SWFWMD), Phase III began in January 2018 with 28 homes in OTOW. The primary objective is to evaluate whether compaction mitigation treatments can translate to actual water savings by home owners. Irrigation run times will be reduced initially for homes which received soil amendment treatments and they will be allowed to adjust their irrigation run times. Runoff and leachate volumes and concentrations will be measured to evaluate the relative benefits and impacts to downstream surface and ground waters.

Additionally, the FNGLA Endowment Fund supported a study to evaluate the long-term persistence or diminishment of compaction effects in residential lawns. In this study, we sampled 10 lawns that were 3, 10, 20, and 30 years in age. Phase I was included prior to treatments being applied as age 0. The uniform source of fill material, climate, construction methods, and management within OTOW offers a unique opportunity to evaluate the temporal changes in lawns. Results from this study show that compaction decrease with time. This data allowed us to put into context the effect of compost amending soils, which, based on these measurements, seems to accelerate compaction mitigation process by 3-5 years.

Eban Bean, CLCE Faculty

WHAT CAUSES SOIL COMPACTION?

Vehicles and heavy machinery used during construction of homes leaves the upper layer of soil on many lots compacted, increasing bulk density and reducing infiltration rates. Soil compaction from traffic results from vehicle weight, wheel slippage, and engine vibrations, with maximum compaction occurring in the top 30 cm of soil.

Soil compaction can increase runoff volumes and loadings to surface. Nutrient inputs from residential developments contribute to impairment of surface waters and springs via urban stormwater runoff and leachate of fertilizers and atmospheric deposition.

DEFINITIONS

Field Capacity (FC)

Soil is much like a sponge when it comes to water and plants. Consider taking a hard, dry sponge and running it under the water. Eventually it will fill with water and taken out from under the flow, a portion of the water will drain away. This portion can be called the free water. In soil, this is the water that flows through large pores and does not remain in the root zone long enough for root uptake. **The water content at which water stops draining away is called Field Capacity (FC).**

Permanent Wilting Point (PWP)

Squeezing the soaked sponge will release additional water. But no matter how hard it's squeezed, there will be a fraction of water that remains in the sponge. Similarly, there is a fraction of water held by the smallest pores which plants cannot extract. **This fraction of water is known as the residual water, and since plants begin to wilt, this is known as the Permanent Wilting Point (PWP).**

Plant Available Water (PAW)

The soil water content between the FC and PWP is known as the Plant Available Water (PAW). This fraction of water is held by pores that are not too large or too small. The distribution of pore sizes within a soil determines how water flows through soil and is held by the soil. Altering the porosity or structure can affect the distribution of pore sizes and how water is held in the soil. One setting where this can have significant impacts is the residential landscape.

Conservation Habitats on Florida Golf Courses

Florida has over 1,300 golf courses, more than any other state in the United States. These spaces, averaging over 100 acres each, are among the largest and most common managed green spaces in urban or residential areas. The healthy turfgrasses, trees, and shrubs on these courses provide several benefits, like reducing urban temperatures, filtering air and water, supporting wildlife, and providing recreational space. However, to maximize these services plants must be healthy, which means they are often highly maintained to protect them from pests and promote growth. Due to the constraints on Florida's natural resources, and the golf industry's interest in developing more sustainable maintenance practices, UF/IFAS entomologist and CLCE Affiliate Faculty member, Dr. Adam Dale, has teamed up with the Seven River's Chapter of the Florida Golf Course Superintendent's Association to develop new approaches.

Florida's climate facilitates frequent pressure from insect pests that attack turfgrasses and ornamental plants. However, with the appropriate conditions, it also provides great potential for biological control and pollinator conservation. This is important because biological control can reduce reliance on pesticides, and concern is mounting as native bee populations are declining around the globe. One approach to addressing these challenges is converting areas of managed turfgrass to less maintenance-intensive and more ecologically functional habitats.

Recent research in Dr. Dale's lab has found that creating native wildflower habitats in out-of-play areas on Florida golf courses increases pollinator and natural enemy abundance and diversity compared to out-of-play areas with only turfgrass. Importantly, this increase translates to over a 50% increase in biological control rates of caterpillar pests in adjacent areas like fairways and tee boxes. Also, the number of wildflower species in a mixture matters. Specifically, a seed mix of eight species conserved significantly more native bees and predatory insects than a seed mix of four species.

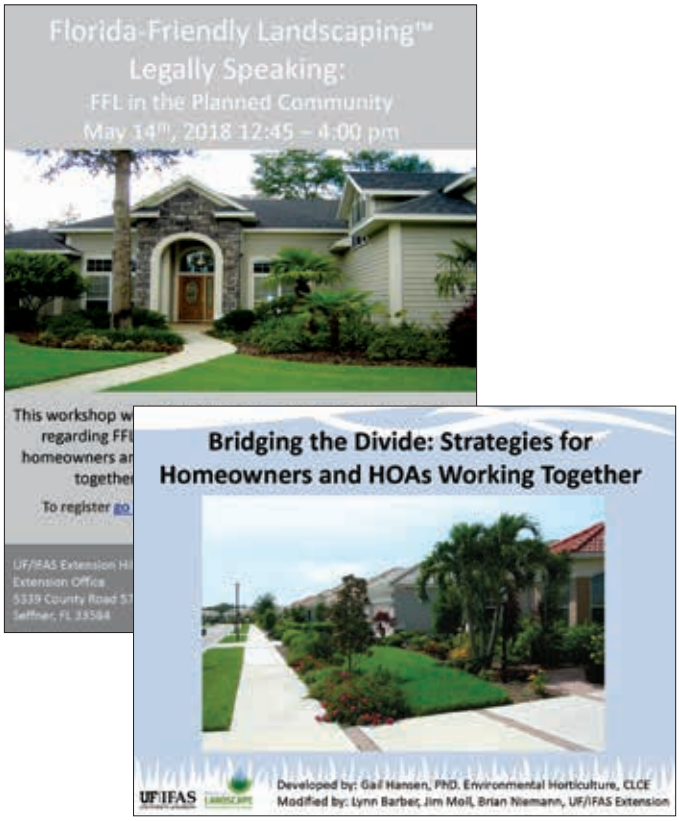
The goal of this work is to develop best management practices that golf course superintendents can use to reduce maintenance inputs, conserve beneficial wildlife, and provide agronomic and economic benefits for their course. Thus far, we have a good start at identifying new approaches that may reduce pesticide and natural resource inputs while promoting beneficial insect communities.

Adam Dale, CLCE Affiliate Faculty

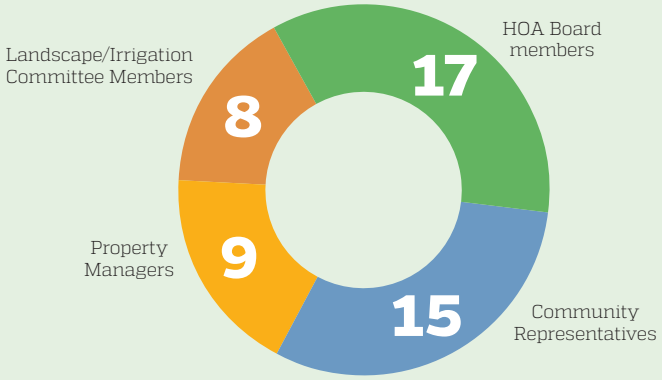
Bringing Together Homeowners and Homeowner Associations in Series of "Legally Speaking" Workshops

The nine principles of Florida-Friendly Landscaping™ (FFL) offer homeowners an incredible diversity of landscape options when designing a yard that is both environmentally sustainable and aesthetically pleasing. However, these myriad options can sometimes lead to disputes with a homeowners association (HOA) if a homeowner's vision for their yard conflicts with the neighborhood's restrictive covenants. To help bridge this gap the FFL program presented a workshop in their continuing series of workshops called "Legally Speaking: FFL in the Planned Community." These workshops use multiple case studies to illustrate and explore the causes of homeowner-HOA disputes and potential paths to resolution. The latest workshop, held May 14 in Hillsborough County, featured Barbara Stage, a community association attorney based in Orlando and FFL advisory committee member, who provided an overview of the current legal decisions and their effects on facilitating adoption of FFL principles in planned communities. In addition, Jeannette Moore, a realtor who is president of both Green Florida Properties and the Floridians for Florida-Friendly Yards, and who is also on the FFL advisory committee, offered the perspective of the real estate industry on mitigating homeowner-HOA disputes. The workshop was rounded out with a presentation by the local FFL Extension agents on strategies for working with HOAs and accessing the numerous online publications and resources developed by the FFL program. This latest "Legally Speaking" workshop had 49 attendees, all of whom indicated on a post-workshop survey that they would implement what they had learned.

Esen Momol, CLCE Faculty



LEGALLY SPEAKING PARTICIPANT CATEGORIES



Mulch's Physical Properties Influence Weed Control

Mulch has been proven to improve ornamental plant growth and is an effective non-chemical alternative for weed control. Mulch reduces light to germinating weed seedlings, reduces available moisture in the mulch layer, and acts a physical barrier, all benefits in terms of preventing weeds. Most of the studies evaluating mulch for weed control examine different mulch types or different mulch depths and resulting weed control, and put less emphasis on the physical properties of the mulch they are using, which often leads to different results among researchers. For any given type of mulch, how it is harvested and processed (bark size, shredded, chipped, milled, etc.) will dramatically influence its physical properties, like particle size, and thus will affect its ability to control weeds.

While mulch is an effective method for weed control (and can outperform herbicides in many cases), research is needed to quantify physical characteristics that are needed for optimum weed control and how to use different types of mulch materials in the most effective manner. This is the goal of Debalina Saha, PhD candidate, who is currently investigating how different mulch types, depths, and physical properties influence weed control in landscape planting beds. Developing guidelines in terms of physical properties, depths needed for different materials, and the most effective mulch types would both provide homeowners and landscapers the information they need to select the best mulch for their situation and provide mulch manufacturers how these materials should be processed for this use.

To accomplish these goals, greenhouse and outdoor experiments were conducted in 2017 to determine how mulch type, depth, and physical properties would affect weed seed emergence and growth. These studies evaluated how well different mulch types and depths blocked out sunlight to weed seeds, how fast water moves through various mulch types, weed germination within the actual mulch layer, and which mulch types and depths were most effective in preventing weed growth from seeds either already in the soil (seeded below mulch) or those that may have blown in on top of the mulch (seeds placed above the mulch). Results showed that mulch will generally be more effective on weed seeds already in the soil (placed below the mulch) compared with seeds that come in after mulch has been placed (seeds placed above the mulch). When seeds were placed above the mulch, pine bark and pine straw consistently outperformed a shredded wood-based mulch (Figure 1). It was observed that weeds could actually germinate in the shredded wood mulch because it retained more water for a longer period of time than other mulch types after an irrigation event (Figure 2). Results also showed that mulch depths of at least 1 inch reduced over 99% of light to germinating weed seeds and increasing mulch depths beyond that do not always correlate with better weed control, especially if weeds are able to germinate and grow with in the mulch layer itself, as was the case in the shredded wood mulch.

The overall conclusions of this research is that mulch will be more effective on weed seeds already in the soil, and mulch depth becomes less of a factor when the mulch physical properties allow weeds to germinate within the mulch layer itself. Larger-particle mulch materials, like pinebark nuggets or pinestraw will hold less water than finer materials like shredded wood, which may improve weed control. Homeowners and landscapers will have to vary these factors along with cost, availability, and aesthetic appeal when deciding on a mulch type for different landscape projects.

Chris Marble, CLCE Faculty

Nature Coast Master Gardeners Enhance Natives

The Nature Coast Master Gardeners from Levy, Gilchrist, and Dixie Counties developed an invasive plant control team to target control of Brazilian peppertree, air potato vine, and water lettuce. Each of these invasives requires a different approach and the Master Gardeners partner with federal, state, and local governments, civic groups, and residents of Dixie, Gilchrist, and Levy counties to bring about positive action.

WATER LETTUCE

Water lettuce covered the surface of Sue Sink, an emergency exit for cave divers. Partnering with Manatee Springs Park, Master Gardeners worked in the water from canoes and onshore using nets, paddles, and makeshift traps to corral and remove the lettuce. Sue's Sink surface has been 98% cleared of water lettuce.

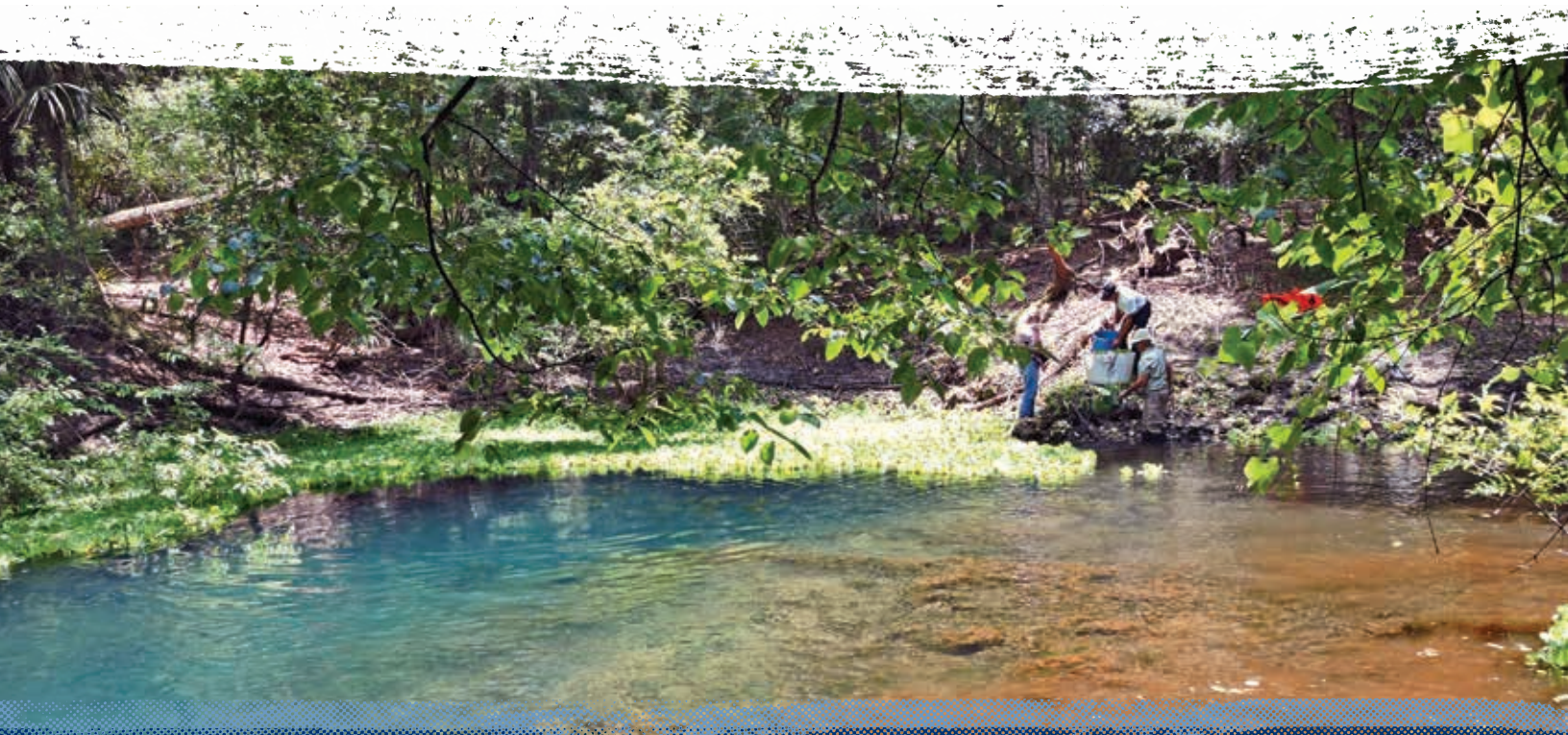
AIR POTATO VINE

Working in Yankeetown, Master Gardeners provided specialized training for plant ID and collection and released air potato beetles. This resulted in a 70% reduction of air potato at these sites.

BRAZILIAN PEPPERTREE

Master Gardeners meet weekly in Cedar Key and the Lower Suwannee National Wildlife Refuge to conduct control using basal and cut stump herbicides and uprooting. This part of the project received a grant from the Florida Fish and Wildlife Commission which paid for chemicals, equipment, and protective gear. The sites are reporting 40% containment which is less than hoped for, but the volunteers are keeping the invasives at bay.

Wendy Wilber, CLCE faculty



EPA WaterSense Program: Pressure Regulating Sprinkler Bodies

Proper operating pressure is critical to an efficient and effective landscape irrigation system. In many instances, however, systems run at excessive pressure - leading to water waste and sometimes poor landscape health. One method for addressing excessive operating pressure in irrigation is pressure-regulating sprinkler bodies (PRB). These sprinkler bodies are designed to ensure a specific pressure output despite excessive pressure in the system.

In-ground landscape irrigation sprinklers, which consist of a nozzle and a sprinkler body, are designed to operate within a range of pressures and have a recommended operating pressure under which the nozzle reaches its ideal performance. In many cases, sprinklers are installed at sites where the system pressure is higher than the recommended operating pressure.

The Dukes research group conducted trials subjecting various PRB models from an assortment of manufacturers to a variety of pressures and gather data on pressure regulating effectiveness. This testing was used by the EPA WaterSense program to develop their new spray sprinkler body specifications. There are now 85 EPA WaterSense labeled spray sprinkler bodies.

Based on the University of Florida data, WaterSense selected water efficiency and performance criteria based on both flow rate and outlet pressure. Performance related to flow rate ensures water savings are realized when installed in an irrigation system with high pressure. While WaterSense has a goal of promoting flow reduction by using these products, EPA is also setting a performance criterion to ensure the irrigation system functionality is not impacted. Low pressure can impact the uniformity of the water applied across the landscape. By including a performance criterion to ensure pressure drop through the sprinkler body is not too low, sprinkler bodies with nozzles functioning in the field should be able to perform adequately.

Michael Dukes, CLCE Faculty

Jacksonville Formosan Termite Task Force

The invasive Formosan subterranean termite, *Copotermes formosanus* is a subterranean termite that attacks both structures and living trees. Jacksonville is following in the footsteps of New Orleans, which estimates 30-50% of its trees are infested with Formosan termites and have been for decades. New Orleans, in partnership with LSU, was the first city to complete city-wide treatments of trees.

In 2016, the Jacksonville Formosan Termite Task Force was formed to create and implement a strategy to educate residents and help protect the community. The City of Jacksonville's Mayor's Office asked the Extension Office to help inspire change after the Jacksonville's Cummer Museum was forced to demolish the Women's Club in 2016 due to termite damage. The Women's Club was a historic building that had recently had $7 million in renovations.

The task force developed an integrated pest management (IPM) plan that includes monitoring, education, treatment and prevention strategies. In the summer of 2017, a city-wide monitoring project was conducted to determine the extent of the problem. In 2018, an education campaign was planned and in 2019 a treatment strategy for the city's right-of-ways and parks should be in place.

Formosan termites are a concern to property owners and communities because they infest living trees and structures. May through July, they swarm in the evenings in large numbers to find a mate and make new colonies. Formosan termites have millions of individuals in a colony and can forage from their nest as far as 300 feet. Because of these large numbers, they do a significant amount of damage in shorter periods of time compared to native subterranean and drywood

termites. It is possible for these termites to live in trees while also feeding on homes and vice versa.

Determining the extent of the Formosan termites was also part of the IPM program. To do this, 130 monitoring devices were placed throughout Duval County's 918 square miles. Funded by local businesses, the monitoring stations are glue boards attached to clip boards that hung on light poles. Each week the glue boards were removed, replaced, and the termites identified and counted. Each location where termites were found, their numbers, and species were mapped. The interactive map can be viewed at http://sfyl.ifas.ufl.edu/duval/hort-and-pest/termites/. The project helped determine the extent of the invasive Formosan termite spread throughout Jacksonville and showed that the termites are throughout the entire county, and appear to be mostly concentrated in the Historic Riverside Area. This data is being used to help focus the educational efforts and design the treatment strategy. Additional projects with Florida Agricultural and Mechanical University entomology faculty is also underway in other parts of the county.

Erin Harlow, CLCE Affiliate Faculty

Endeavour Executive Fellowship: Perth, Australia

The Endeavour Executive Fellowship is a competitive, merit-based award for professional development that is granted by the Australian Government's Department of Education and Training. Educators and students from around the globe can apply for various awards, including research fellowships that are available to faculty and Masters, PhD, and Post-Doctoral students. Applicants must first connect with a host at an Australian university or research center and then submit a project proposal and detailed application form. CLCE faculty member Gail Hansen received the fellowship award in 2018 and shares her experience.

My host faculty is Dr. Joseli Macedo, Head of the School of the Built Environment, at Curtin University in Perth, Western Australia. Perth is located in a world diversity hotspot known for its many unique and spectacular native plants. Curtin is a large university with 58,000 students, 30% of whom are international, and 3,500 faculty. Curtin is ranked in the top one percent of universities worldwide in the highly regarded Academic Ranking of World Universities, and is ranked as the 26th most international university in the world. Curtin also has 16 cooperative research centers (CRCs) located throughout Australia.

My faculty position is in the Humanities College, School of the Built Environment, Urban Planning Department. In addition to the proposed project, visiting faculty are encouraged to engage with students and other faculty by contributing to their teaching and research programs. I met with students in the Year 1: Planning Graphics and Design studio three different times for desk critiques and critiques on their project

presentations. The first year students were tasked with designing a colony on Mars or the moon suitable for a tourist destination or a work camp for miners. Curtin University is partnering with NASA on Mars research and all academic programs on campus were required to include a project/curriculum related to Mars in their courses for 2017-2018. I also gave a seminar presentation for the John Curtin Institute for Public Policy that was open to all faculty and Perth planning professionals. The topic was the design of walkable urban streets and the importance of street trees and other design elements to create pedestrian-oriented spaces in urban areas. The Urban and Regional Planning department is highly regarded at Curtin University and the seminar was well attended.

FELLOWSHIP PROJECT: URBAN ECOLOGY FOR CITIZEN SCIENTISTS

For the fellowship, we proposed to write a book about urban ecology for citizen scientists and other community members who are interested in the environmental health and civic welfare of their community. The book will have a socio-environmental focus with information on urban ecology concepts and social and cultural influences that affect the environment in urban areas. The working title is *Nature and the City: Urban Ecology for Citizen Scientists*.

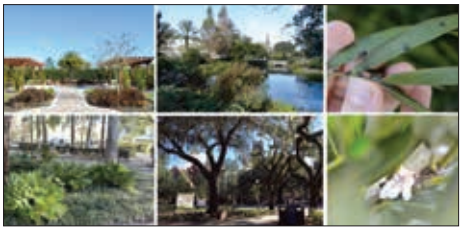
The book is organized into four units to illustrate the link between the activities of humans and natural systems that create certain environmental conditions in the urban environment. The units are ecology, environment, social, and culture. Unit 1, Ecology, focuses on urban soils, hydrology, wildlife, and vegetation and Unit 2, the Environment, focuses on biophilia, ecosystem services, biodiversity, urban structures, and disturbance and risk mitigation. These units are linked to Units 3 and 4 which focus on social and cultural issues, including topics such as landscape meaning and identity, landscape behaviors, healthy and sustainable neighborhoods, landscape values, beliefs and norms, and the legal landscape.

Gail Hansen, CLCE Faculty

Understanding Spatial Ecology In and Around Residential Landscapes

The Residential Landscape Ecology Lab (RLEL) studies the ecology of the fastest-growing land cover type in the United States—residential landscapes, with the aim of increasing their ecological functionality. Current work focuses on two widespread anthropogenic ecosystems,ornamental gardens and stormwater ponds.

STRUCTURAL COMPLEXITY AND BIODIVERSITY OF ORNAMENTAL GARDENS



Master's student Gisele Nighswander is determining how structural complexity and plant diversity in the gardens of four north-central Florida communities affect the abundance of plant-damaging arthropod pests. Early findings from gardens at UF indicate less arthropod pests in gardens having greater plant species richness and structural complexity. This study will inform how to design landscaping to promote pest resistance.

STORMWATER PONDS AS INVASIVE PLANT VECTORS

A survey of 40 randomly selected stormwater ponds receiving infrequent mowing revealed the presence of one or more of ten different invasive plant species, suggesting stormwater ponds contribute to species movement, particularly the spread of invasive plants. Dr. James Sinclair, a RLEL postdoc, is investigating this possibility using computer simulations and observational field studies.

ORNAMENTAL PLANTINGS IN STORMWATER PONDS

Households living on stormwater pond edges often perceive plants in and around these ponds as "messy." However, plants limit soil erosion and enhance water quality. Using comparisons between planted and unplanted ponds, our team will determine if ornamental plantings help to stabilize banks and improve water quality in a way that is aesthetically acceptable to nearby residents.

EFFECTS OF STORMWATER MANAGEMENT ON FORESTED WETLANDS

Stormwater ponds often drain into nearby wetlands, potentially affecting plant communities via altered hydrology, water chemistry, and propagule movement. Master's student Kayla Hess is quantifying these changes. Findings will be used to limit the impacts of an actual future development project on nearby wetlands.

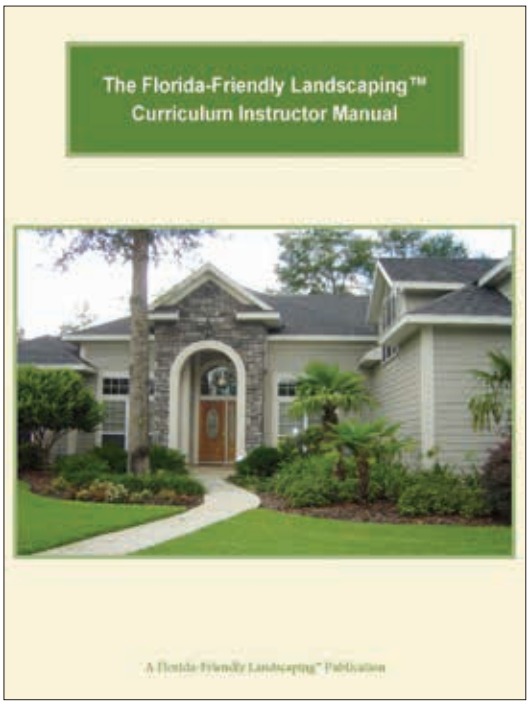
Basil Iannone, CLCE Faculty

New FFL Standard Curriculum Available

The new Florida-Friendly Landscaping™ (FFL) Curriculum Plan and Instructor Manual was developed by FFL state office staff, as well as FFL agents and coordinators from county-based FFL programs throughout the state.

The FFL curriculum provides Extension professionals and FFL educators a standard training curriculum detailing the nine Florida-Friendly principles. This standard training curriculum facilitates a consistent statewide message for presenting principles. The curriculum includes ten modules, each with a lesson plan, guided learning activities, a standard PowerPoint presentation, and both a pre- and post-test.

Educators are also encouraged to use the six-month follow up FFL Behavior Change Survey.



Master Gardener Webinar Series

Master Gardeners are connecting with state specialists and hearing about projects from around Florida while earning continuing education units. Each month, selected topics are presented by Zoom and Master Gardeners from throughout the state can join in and ask questions.

- Snakes and Reptiles in the Landscape
- Groundcovers
- Blueberries
- Customer Service
- Growing Tomatoes in the Home Garden
- Turf Questions Driving You Nuts?
- Wings Over Florida: Butterflies Program
- Plant Explorers
- Florida-Friendly Landscaping Plots vs. Conventtional Landscapes
- Twenty Questions for Diagnosing Plant Problems
- Creating a Pollinator Grden with Youth Leaders
- Landscape Insects Update

Center Faculty and Staff Recognized for Outstanding Efforts

GRADUATE EDUCATOR OF THE YEAR BY ASHS

Sandra Wilson, environmental horticulture professor and CLCE affiliate faculty member, has been named Graduate Educator of the Year by the American Society of Horticultural Sciences. She was recognized during a July ceremony in Washington, D.C. Wilson, who teaches graduate courses in Florida native landscaping, plant propagation, and annual and perennial gardening, has developed a number of innovative online teaching tools to help students learn about plants. Wilson has chaired or co-chaired committees for five doctoral students and 14 master's students. As a Roche professor, Wilson provided distance learning education leadership to faculty and staff in the UF/IFAS College of Agricultural and Life Sciences.

AWARDED SEED FUNDING

The IFAS Early Career Scientist Seed Funding program has recognized **Dr. Andrew Koeser,** CLCE faculty and an assistant professor in environmental horticulture. Dr. Koeser was awarded $48,488 in research funding for his project, "Trees and Natural Disasters: Improving Estimates of Likelihood of Impact, Likelihood of Failure, and Consequences of Failure in Professional Risk Assessments." The IFAS Dean for Research office, in partnership with the Senior Vice President for Agriculture and Natural Resources and the Vice President for Research, has once again implemented the funding program to facilitate development of new faculty research, jump-start their research programs, and to provide a platform for their future success. Out of 24 proposals, 15 were awarded.

IRRIGATION ASSOCIATION BOARD OF DIRECTORS

Michael Dukes, CLCE Director, has been elected to the Irrigation Association Board of Directors, which establishes the association's strategic direction, policies, and programs. The board monitors current and evolving industry trends, determines strategic priorities, defines public policy positions and acts as steward of IA's financial resources. Directors are elected each fall by regular members of the association and represent the diversity of member types and market segments. The Irrigation Association is a leading membership organization for irrigation companies and professionals. According to a news release from the Irrigation Association, Dr. Dukes' first exposure to the irrigation industry was in his uncle's irrigated cornfield. He has almost exclusively worked in irrigation research and education and has been active with the Irrigation Association since 2001. He served in the Smart Water Application Technologies group of the IA, where he developed the rain sensor test protocol used to test a variety of commercially available products. In addition, Dr. Dukes has been a member of the Irrigation Show Technical Program Committee since 2006 and has served as vice chair and chair of that committee. He has won many awards and honors for his work, including the American Society of Agricultural and Biological Engineers Fellow in 2017 and the Irrigation Foundation Excellence in Education Award in 2014.

MISSION

To conduct interdisciplinary research and provide science-based education on urban landscape practices to protect and conserve Florida's natural resources

VISION

To be the leading source of science-based information and innovations for landscape practices in the urban environment in Florida

GOAL

Seeks 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.

Advisory Board

Chair – Ben Bolusky, 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

Wendy Graham, UF Water Institute

Dean Kopsell, UF/IFAS Environmental Horticulture Department

Betsy McGill, Florida Turf Producers

Saqib Mukhtar, UF/IFAS Extension Administration

Lois Sorensen, Southwest Florida Water Management District

CONTACT INFORMATION

Center for Landscape Conservation and Ecology
200 Mehrhof Hall
Gainesville, FL 32611
(352) 392-1864
mddukes@ufl.edu

UF IFAS UNIVERSITY of FLORIDA

Center for LANDSCAPE Conservation & Ecology