

CENTER FOR LAND USE EFFICIENCY



2021

Annual Report

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

UF|IFAS
UNIVERSITY of FLORIDA



CLUE | CENTER FOR LAND
USE EFFICIENCY



Mission

Promote the adoption of science-based policies and practices that measurably create an environmentally, economically, and socially vibrant life for Florida's citizens.

Our work is *focused* on three areas:

- Agriculture,
- Urban and suburban landscapes,
- Large-scale development,

And is largely related to water *quality* and *quantity* and various best management practices (BMPs).

2021 By the Numbers

\$2,925,248

Total active extramural funding in 2021 resulting from CLUE seed funding

\$209,837

Internal funding

\$18,444,387

Active external funding

26

Interdisciplinary faculty

16

Affiliate faculty

21

Staff

36

Chaired MS

27

Chaired PhD

59

Refereed publications produced

21

Proceedings contributed to

40

EDIS

3

Books

78

Non-refereed publications

798

Trainings & Workshops with

43,734 participants

8,761

E-newsletter subscribers

70

Webinars with more than **23,000** live and recorded views

4.5 million

Unique website views

26,525

Facebook followers and **1.7** million impressions

185,000

Instagram accounts reached and **8,545** followers

100

new YouTube videos posted with **17,750** views

Behavior change brought about by UF/IFAS Extension programs in 2020 led to an estimated

344,958,268 gallons

of water saved annually in Florida, a direct impact through the Center's major Extension programs. This savings

is valued at **\$1,486,770** on Floridians' utility bills and is enough water to supply the annual indoor water needs of **3,920** households

Major Extension Programs

Florida Master Gardener Volunteer Program, Florida-Friendly Landscaping™ Program, Program for Resource Efficient Communities, H₂OSAV, Sustainable FloridiansSM, Florida Agricultural Best Management Practices



Message from the Director



Last year when I wrote the introduction to our annual report, I reflected on what a year 2020 had been. Well, 2021 has been very similar with respect to events in the world and the continuation of the pandemic. In the early summer

of 2021, the pandemic was waning, but it resumed late in the summer into the fall again necessitating many virtual events. This past year saw us in remote work, transition to work back in the office, and as I write this in February of 2022, a hybrid work environment. Accordingly, we have maintained a robust schedule of virtual education which is now the norm. Again, we hosted the Urban Landscape Summit and Agricultural Best Management Practices (BMP) Summit virtually. Both the Florida-Friendly Landscaping™ (FFL) and Master Gardener Volunteer (MGV) programs had extensive virtual education schedules. Surprisingly, we surpassed the previous year's education numbers with 70 webinars and virtual events and a total of 23,434 live and recorded views – an increase of 64% year over year. We don't expect this level of growth to continue but we do anticipate adapting a hybrid educational model in many cases and our first trial will be the Urban Landscape Summit in April. The event will be held in person as in the past and we will stream the talks as well.

We also initiated a diversity, equity, and inclusion (DEI) committee this year, and are currently assessing our programs in order to broaden our DEI commitment. Notably we hosted Abra Lee, an Black writer and gardener, as the keynote speaker for the MGV conference. She talked about the history of Florida's African American gardening culture and was well received by attendees.

I again want to recognize and thank CLUE faculty and staff in their diligence for serving our stakeholders through another difficult year. I am convinced that our faculty and staff are working on issues that are critical to Florida's citizens, such as ways to promote water conservation in landscapes through programs such as FFL, H₂OSAV and Sustainable Floridians, research and education on water quality associated with agriculture through the Agricultural BMP program, and horticultural education through the MGV program.

We continue to offer high quality, science-based educational content. We'll be hosting the fifth Urban Landscape Summit and will be organizing a BMP Summit in the spring as well. We believe we'll finally be able to meet many of you again in person and look forward to doing so in 2022.

A handwritten signature in blue ink, appearing to read 'Michael D. Dukes'. The signature is fluid and cursive, with a long horizontal stroke at the end.

Michael D. Dukes
Director

Message from the SVP



Our lawns and landscapes rest on a substrate of the sciences of biology, engineering and human behavior.

The Center for Land Use Efficiency brings these scientific disciplines together to confront a projected state

population increase of 12 million residents in the next half century.

CLUE's work is essential to progress in our state's struggle to reduce the amount of nutrients that enter our waterways and feed ecologically and economically harmful algal blooms. The center's prevention science is a lower-cost supplement or even alternative to building massive water purification infrastructure.

The principles of Florida-Friendly Landscaping™ continue, as they have for nearly 30 years, as the backbone of CLUE's sustainability efforts. Center faculty and Master Gardener Volunteers engage in a widespread and constant home-by-home campaign to change the way we green our yards.

CLUE also pursues systemic change by partnering with water management districts, industry groups, municipalities and homeowners' associations to help achieve the water conservation goals we need for a sustainable 2070.

Our lawns and landscapes will have to change if we're to avoid the worst outcomes of a 50 percent population increase in 50 years. That change has to happen now, because what we plant at our homes today will be with us for decades to come.

This annual report tells part of the story of how CLUE's biology, engineering, and social science is striving to point the way toward more sustainable Florida landscapes.

A handwritten signature in black ink that reads "J. Scott Angle". The signature is written in a cursive, slightly slanted style.

J. Scott Angle

Senior Vice President of Agriculture and Natural Resources

CLUE Faculty, Affiliates, and Staff: Interdisciplinary, Collaborative, and Innovative

CLUE Faculty

Michael **DUKES**

CLUE Director, Agricultural & Biological Engineering,
Water Conservation & Irrigation

Andrea **ALBERTIN**

Water Resources Regional Specialized Agent

Eban **BEAN**

Agricultural & Biological Engineering, Urban Water
Resources Engineer

Catherine **CAMPBELL**

Family, Youth & Community Sciences, Community
Food Systems

Gail **HANSEN**

Environmental Horticulture, Sustainable Landscape Design

Basil **IANNONE**

Forest, Fisheries, & Geomatics Sciences, Geospatial Analytics

Pierce **JONES**

Director, Program for Resource Efficient Communities

Hayk **KHACHATRYAN**

Food & Resource Economics, Horticulture Economics

Ryan **KLEIN**

Environmental Horticulture, Arboriculture

Andrew **KOESER**

Environmental Horticulture, Landscape Management

Lisa **KRIMSKY**

Water Resources Regional Specialized Agent

AJ **LINDSEY**

Environmental Horticulture, Urban Turfgrass Management

Mary **LUSK**

Soil & Water Sciences, Urban Water Quality

Chris **MARBLE**

Environmental Horticulture, Invasive Weed Management

Chris **MARTINEZ**

Agricultural & Biological Engineering, Water
Resource Management

Craig **MILLER**

Program for Resource Efficient Communities, Energy
& Water Efficiency

Esen **MOMOL**

Director, Florida-Friendly Landscaping™ Program

Paul **MONAGHAN**

Agricultural Education & Communication, Community
Based Social Marketing

Don **RAINEY**

Water Resources Regional Specialized Agent

AJ **REISINGER**

Soil & Water Sciences, Urban Soil & Water Quality

M. **JENNISON KIPP**

Sustainable Floridians(SM) Program, Ecological Economist

Lakesh **SHARMA**

Soil & Water Sciences, Director, Agricultural BMP Program

Nick **TAYLOR**

Program for Resource Efficient Communities, H₂O SAV State
Specialized Agent

Laura **WARNER**

Agricultural Education & Communication, Social Marketing
& Program Evaluation

Wendy **WILBER**

Florida Master Gardener Volunteer Program State
Specialized Agent

Yilin **ZHUANG**

Water Resources Regional Specialized Agent

Affiliated Faculty

Michelle **ATKINSON**

Manatee County, Urban Horticulture

Lynn **BARBER**

Hillsborough County, Urban Horticulture

Haimanote **BAYABIL**

Agricultural & Biological Engineering, Hydrology

Tatiana **BORISOVA**

Food & Resource Economics, Horticulture Economics

Taylor **CLEM**

Nassau County, Landscape Design

Adam **DALE**

Entomology & Nematology, Landscape Entomology

Zhanao **DENG**

Environmental Horticulture, Plant Breeding

Erin **HARLOW**

Columbia County, Environmental Horticulture

Mark **HOSTETLER**

Wildlife Ecology & Conservation, Biodiversity

Kevin **KENWORTHY**

Agronomy, Turfgrass Breeding

Jason **KRUSE**

Environmental Horticulture, Sports Turf Management

Tina **MCINTYRE**

Seminole County, Florida-Friendly Landscaping™

Matthew **ORWAT**

Washington County, Urban Horticulture

Brian **PEARSON**

Environmental Horticulture, Landscape Management

Bryan **UNRUH**

Environmental Horticulture, Urban Turfgrass Management

Sandy **WILSON**

Environmental Horticulture, Ornamental & Invasive Plants

CLUE Staff

Emma **BARRETT**

Communications Intern

Emily **EUBANKS**

Assistant Director of Communications

Melissa **FRIEDMAN**

Research Coordinator

Madeline **IYER**

Science Communicator

Jennifer **SYKES**

Communications Manager

Florida-Friendly Landscaping™ Staff

CJ **BAIN**

FFL Website & Information Tech Coordinator

John **BOSSART**

FFL Education & Extension Manager

Marc **CELESTIN**

GI-BMP Regional Coordinator

Claire **LEWIS**

Florida-Friendly Communities Statewide Coordinator

Jen **MARVIN**

FFL/FYN Statewide Coordinator

Cesar **PERALTA**

GI-BMP Regional Coordinator

Barry **SAWICKI**

FFL/GI-BMP Program Assistant

Lyn **WARD**

FFL/GI-BMP Program Assistant

Tom **WICHMAN**

FFL Assistant Director and GI-BMP Statewide Coordinator

Program for Resource Efficient Communities Staff

Barbara **HALDEMAN**

Academic Assistant

Heather **HUBBARD**

Sustainable Floridians Communications Program Assistant

Lynn **JARRETT**

Water Resources Engineer

Lesly **JEROME**

Research Assistant

Parker **JOHNSON**

H₂OSAV Data Analyst

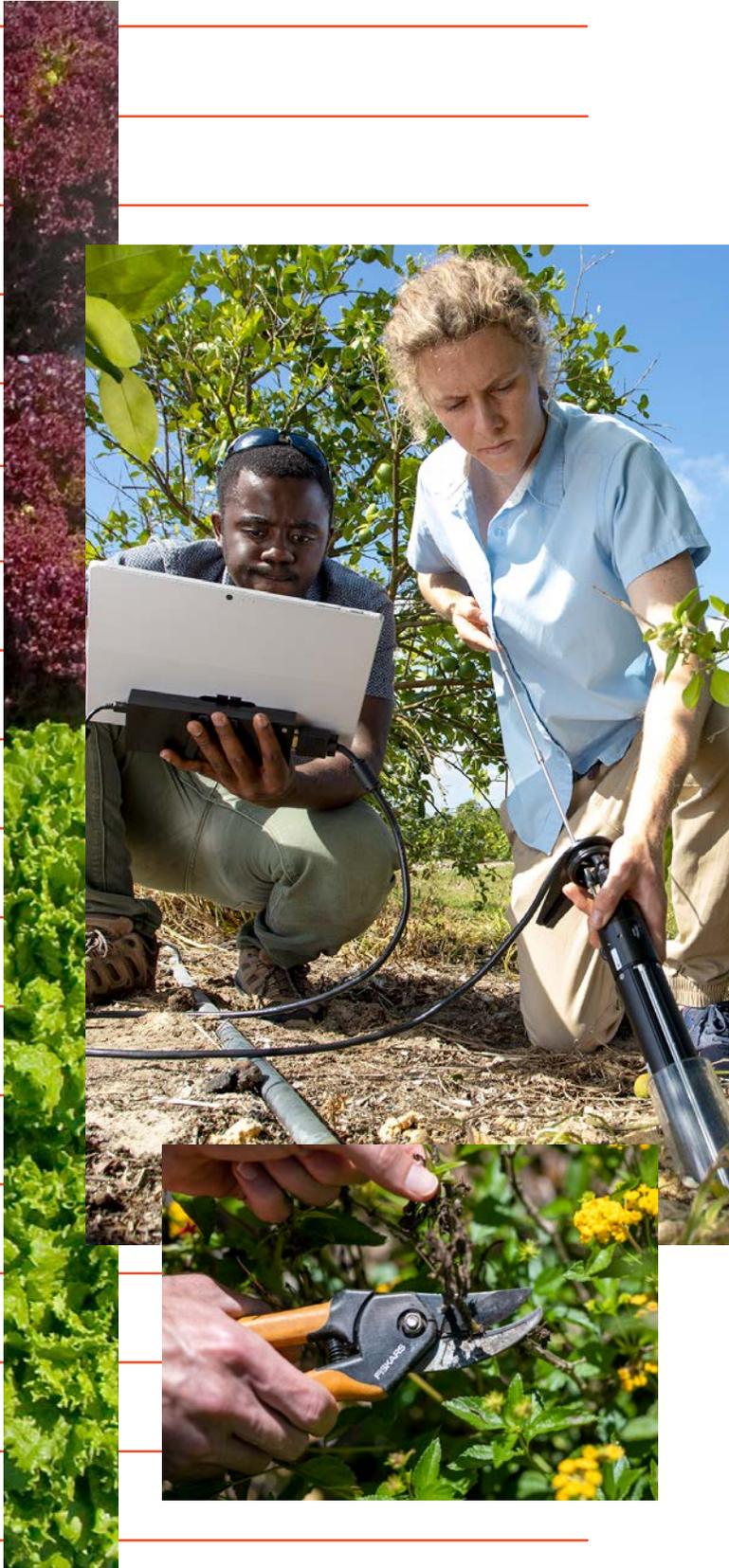
Kaitlin **ROBB PRICE**

H₂OSAV Communications Specialist

Bradley **SPATZ**

H₂OSAV Data Science & Engineering

Graduate Students



18 MS **10** PhD
Soil and Water Sciences

+

1 MS **4** PhD
School of Forest, Fisheries,
and Geomatics Sciences

+

1 MS
Food Science and
Human Nutrition

+

1 PhD
Food and Resource
Economics

+

2 MS **7** PhD
Agricultural and
Biological Engineering

+

5 MS **7** PhD
Environmental Horticulture

+

1 MS
Agronomy

+

4 MS **8** PhD
Agricultural Education
and Communication

+

7 PhD
School of Natural
Resources and Environment

+

1 PhD
Design, Construction,
and Planning

+

1 PhD
Biological and Agricultural
Engineering, North Carolina
State University

+

1 MS
Environmental Studies,
Florida International University



33 MS **46** PhD
TOTAL Graduate Students

Future Urban Landscapes of Florida – A Synthesis of Research, Extension, and Adoption

With Florida’s population growth predicted to increase 50 percent over the next 50 years, demands on our already-stressed water supply will more than double. Much of that demand is for landscape irrigation. Excessive and improper irrigation can lead to wasted water resources and movement of nutrients from landscapes to sensitive water bodies. According to a special report, *Florida 2070/Water 2070*, “The single most effective strategy to reduce water demand in Florida is for individuals to significantly reduce the amount of water used for landscape irrigation.”

In 2018, UF/IFAS faculty formed a multi-disciplinary group focused on future urban landscapes in Florida. Nine facilitated meetings took place over the next three years to discuss

challenges and potential solutions and included participation from 40 research specialists and Extension agents from around the state and with a diversity of expertise.

Currently, landscape practices in Florida are dominated by sprinkler irrigated turfgrass. While turfgrass is an important landscape plant with many benefits, it typically requires routine maintenance and lacks biodiversity. In addition, lack of homeowner education can lead to over-irrigation and excess inputs of fertilizer, pesticide, and herbicide.

The Future Urban Landscapes of Florida group understands that the resource-intensive landscapes that are the norm today are not



sustainable into the future. However, this is a broad and complex issue with no single solution, and many approaches will be needed. Several projects have come about since the group's formation, with applications both regional and statewide, including:

- A collaboration between Florida-Friendly Landscaping™ and Florida Water StarSM Programs that certifies residential properties that meet higher expectations of water conservation and water quality.
- Measuring water quality in stormwater ponds planted in different designs, and the social barriers to residents and decision makers in adopting these plantings as BMPs.
- Aesthetics, resiliency, and ecological benefits of a multispecies lawn cover consisting of a mixture of low-growing grasses, legumes, and native forbs.
- County code incorporating language that prohibits irrigated turf from being installed in backyards of new developments in Central Florida, and instead permits landscaping and ground cover that utilizes low-volume irrigation.
- Developing tools and educational resources for urban stakeholders to manage stormwater more effectively using low-impact development (LID) and green stormwater infrastructure techniques.

- A landscape design book that provides 18 different landscape styles for large and small yards following FFL's right plant, right place principle.

The nursery industry has also shown support and enthusiasm for this work. They are growing and testing multispecies lawn covers in their nurseries and demonstrating them in landscapes, and they are also amending rates of compost in poor soil of current and future developments to reduce irrigation needs, increase water conservation, establish drought-tolerant native plants, and increase arthropod abundance and biodiversity.

The Future Urban Landscapes of Florida group held their final facilitated meeting in June 2021 and plan to reconvene annually to share what they've been working on, continue to build community, and advance the thinking on the research and education that leads to better outcomes for current and future urban landscapes in Florida. Work from this effort will also be highlighted at future events, such as the upcoming Urban Landscape Summit, in April of 2022.



Researching Stormwater Ponds in Manatee County

Can plants on the banks and littoral shelves of pond perimeters act as better filters than the grass normally planted and help improve water quality in Florida ponds?

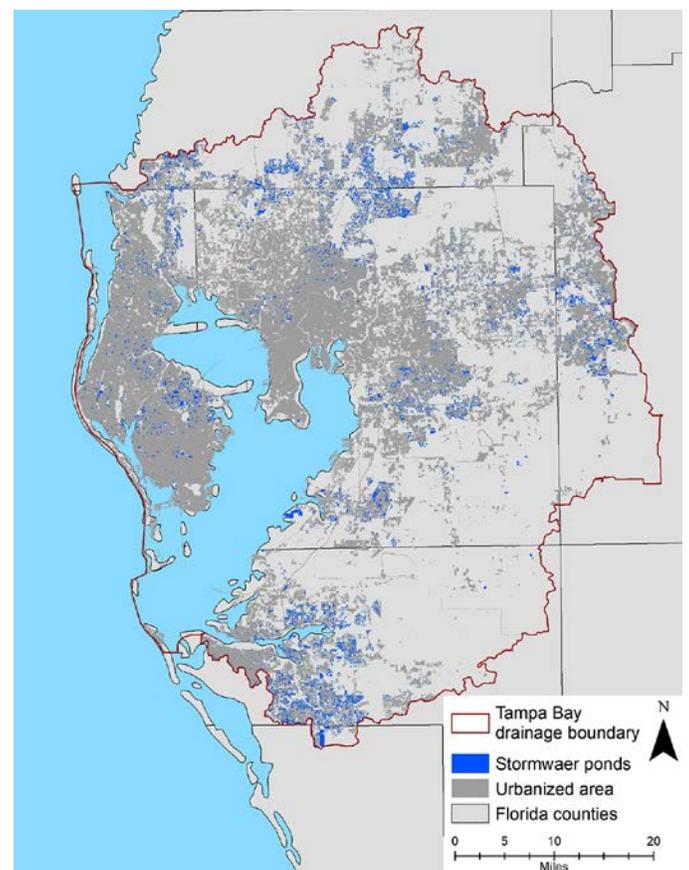
That's the research question a team of center faculty and staff are trying to answer. Led by UF/IFAS Extension Manatee County Extension Agent Michelle Atkinson, the team is focused on both the physical aspects of stormwater pond improvement as well as the social aspects of perceptions and behaviours related to them. Working within the Lakewood Ranch community and other areas of Manatee County, the team is focusing on many different aspects related to stormwater ponds. Research efforts include:

- **Developing a plant list for pond site plantings that improve water quality** – Dr. Basil Iannone, Dr. AJ Reisinger, and Dr. Mary Lusk received a \$197,000 EPA grant to monitor water quality, to try different mixes of plants, and to gauge how effective each mix is in filtering. The Manatee County government is a key partner and is also supporting the research by paying for pond plantings.
- **Understanding residents' concerns about pond site plantings** – While the biological and physical scientists seek a mix of pondside plants that filter water and attract wildlife, social scientist Dr. Paul Monaghan will gauge residents' reactions – will there be concerns about plantings obstructing “waterfront” views, or complaints that the new plantings are unattractive, looking tangled and wild? Results of this research could reach beyond Manatee County to the rest of the state.

- **Mapping stormwater ponds** – Dr. Eban Bean and Dr. James Sinclair used mapping software to determine that there are 76,000 stormwater ponds throughout Florida. The first assessment determines the quantity and invasion of stormwater ponds throughout Florida and their potential for spreading invasive species.

Stormwater Pond Research Team

- Michelle Atkinson
- Dr. Basil Iannone
- Dr. Eban Bean
- Dr. Paul Monaghan
- Dr. AJ Reisinger
- Dr. Mary Lusk
- Dr. James Sinclair



Featured Stormwater Pond: Greenbrook Pond

Multiple stormwater pond sites have been designed and plant lists developed to support these projects. Greenbrook Pond featured a new

design (figure 1). The different color sections of the design correlate to the types of littoral plants needed for the plant list.



Greenbrook Park Plant List

Yellow Zone – littoral shelf areas along the shore

Alligator flag
Thalia geniculata

Lanceleaf arrowhead
Sagittaria lancifolia

Three-square bulrush
Schoenoplectus pungens

Giant bulrush
Schoenoplectus californicus

Pickerelweed
Pontedaria cordata

Yellow canna
Canna flaccida

Gulf Coast spikerush
Elocharis cellulosa

Swamp lily
Crinum Americanum

Leather fern
Acrostichum danaeifolium

Brown Zone – areas along edge of pond that could become wet

Dwarf fakahatchee
Tripsacum floridanum

Purple lovegrass
Eragrostis spectabilis

Dahoon holly
Ilex cassine

Elliot's lovegrass
Eragrostis spectabilis

Sand cord grass
Spartina bakeri

Marlberry
Ardisia escalanoides

Muhlygrass
Muhlenbergia capillaris

Red maple
Acer rubrum

Green Zone – areas in the water

White water lily
Nymphaea odorata

CLUE Establishes Committee to Focus on Diversity, Equity, and Inclusion

In early 2021, the center established a DEI committee. The first step was to establish an annual plan with assigned action goals. Each of the center's units is represented on the committee, which meets quarterly and reports on programmatic activities. Some of the highlights of the center's DEI initiative are included below.

2021 Florida Master Gardener Volunteer Conference Keynote Speaker Delves into Florida's Gardening History



Writer and national speaker Abra Lee was the invited keynote speaker for the Florida Master Gardener Volunteer Conference held virtually in October 2021. Presenting to almost 500 volunteers online, Lee discussed Florida's Black gardening history. Her talk took volunteers on a historic road trip throughout the southeast with an emphasis on Florida and

described an extraordinary tale of espionage in the name of flowers with familial ties to the Harlem Renaissance.

Lee is the author of "Conquer the Soil: Black America and the Untold Stories of Our Country's Gardeners, Farmers, and Growers," as well as founder of a community of the same name. Conquer the Soil is dedicated to celebrating the history, art, and culture of horticulture. She describes herself as having "spent a whole lotta time in the dirt as a municipal arborist, extension agent, airport landscape manager, and more." She is a graduate of Auburn University College of Agriculture and an alumna of the Longwood Gardens Society of Fellows, a global network of public horticulture professionals.

Encouraging Diversity Training within the Center

The center's DEI committee encouraged participation in the newly offered IFAS Championing Diversity, Equity, and Inclusion course and other diversity trainings offered through UF and professional organizations.



UF/IFAS CHAMPION

**INCLUSION, DIVERSITY
EQUITY, ACCESSIBILITY**

Completed Diversity Training in 2021

- Michael Dukes
- Wendy Wilber
- Jennison Kipp
- Emily Eubanks
- Madeline Iyer
- Jennifer Sykes
- Laura Warner
- Taylor Clem
- Eban Bean
- AJ Reisinger



Reaching Spanish Speaking Landscape Professionals

The Florida-Friendly Landscaping™ GI-BMP program offers classes in English and Spanish. Regional GI-BMP Coordinator Cesar Peralta teaches and assists county agents with teaching in both English and Spanish. Peralta also reviews written materials in Spanish. In 2021, the FFL GI-BMP program taught nine classes to 209 Spanish-speaking individuals.

Increasing Scientific Literacy through Readability Efforts

Writing with accessibility in mind has been a focus of the center’s DEI efforts this past year. An estimated 1 in 5 Americans struggle to read at the most basic level. To address this need we measure the readability of our consumer horticulture content, both on websites and social media.

To improve readability the center’s communication staff use the Flesch reading ease

scoring (FRES) method. The FRES metric gauges how accessible a document is to readers of varying proficiencies. A score between 60 and 70 (out of 100) is considered “plain English.” Content scoring above 70 is considered “easy to read” for the general public. Unfortunately, scores between 0 and 30 are common in academic and professional writing. These documents are generally considered readable only by college graduate-level readers.

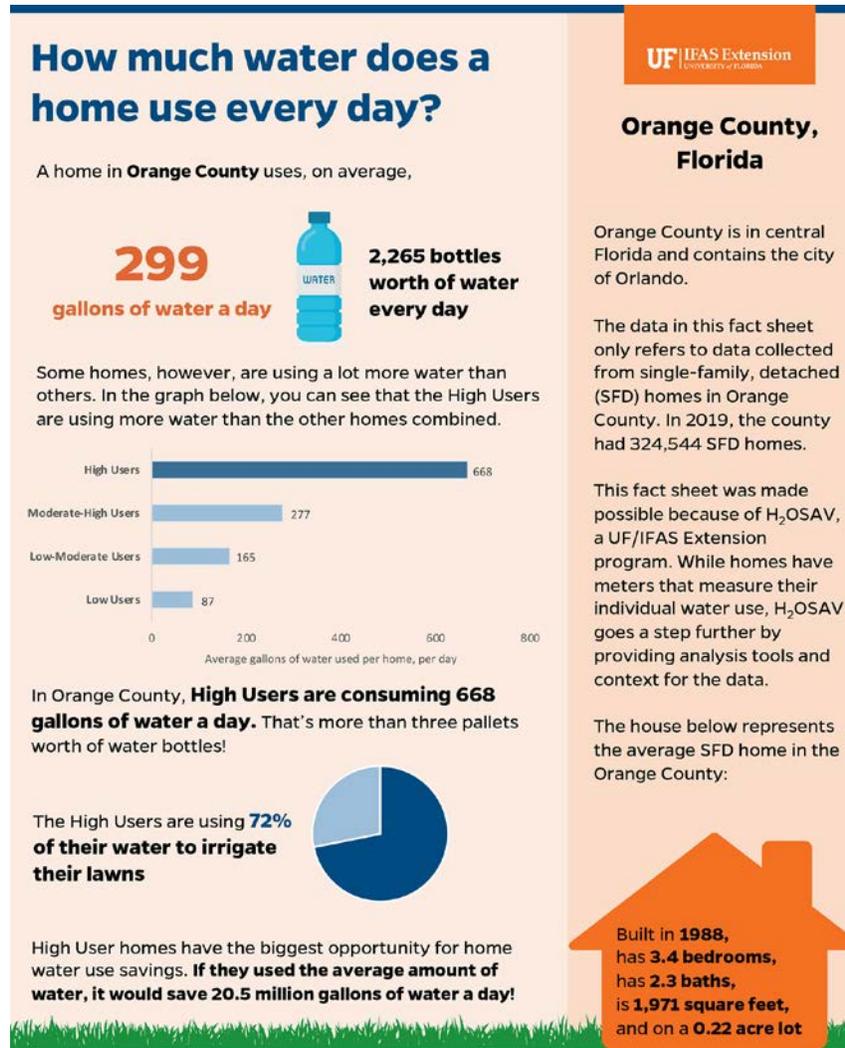
This year, the center conducted readability tests on content to be published on the Gardening Solutions website and the Master Gardener Volunteer newsletter. The goal was to bring the FRES up to at least 60 for all new material written with non-professional readers in mind. We’re proud to report that our content from 2021 was significantly more accessible to the average reader. An overwhelming majority of the articles published this past year score above the mark for plain English.

Understanding Residential Water Use in Florida

In 2021, H₂OSAV added St. Cloud Utilities as a partner. We now work with 15 utilities representing 4.5 million people. Our data covers 21% of Florida's population and 28% of issued consumptive use permits.

H₂OSAV also continued its series of publications sharing the basics of water use in specific Florida counties. The approach capitalizes on what we know of human learning. People learn best by building on basic knowledge, like learning calculus builds on an understanding of arithmetic.

By starting with just the basics of water use, we hope to provide



Floridians a strong foundation for understanding how we use our water. As we build on this foundation, we will add publications that dive deeper into water use and provide more insights for water conservation.

Even our most basic publications, however, highlight opportunities for water conservation. In addition to sharing average home characteristics and average water use, the publications explain the main drivers of water use. By dividing single-family, detached homes into four quartiles, we can

show that some homes are using significantly more water than others. Further, these “high users” are using more than half their water for irrigation. This leads to the conclusion that focusing conservation efforts on the irrigation of high users provides the greatest opportunity for water savings. This targeted conservation approach can have a significant impact. If just these “high users” in Orange County reduced



their water use from 668 gallons per day (gpd) to the 2020 average of 299 gpd, it would save 20.5 million gallons of water every day.

Our first publication in this series covered the Gainesville Regional Utilities territory ([#AE544](#)). We used a county-based approach for counties served by more than one utility. We began with a publication on Orange County, Florida, published in August 2021 ([#AE561](#)). The publication was timely, coinciding with a liquid oxygen shortage that Orange County faced in August. A surge in COVID-19 cases led to the shortage, relevant because some utilities use to treat their water.

Incidents like this show the fragility of our water supply, and highlight the importance of providing basic information on water use. Homeowners can use the facts in our publication and infographic to evaluate whether they are high users. If so, they would learn that adjusting irrigation provides the best opportunity for reducing overall water use.

From a utility perspective, focusing these conservation efforts is critical. We work with utility partners to evaluate the best options for water conservation. As a result of these partnerships, the Orlando Utility Commission

(OUC) reached out to H₂OSAV during the shortage. They requested a list of over-irrigating commercial properties. We were able to provide the information in only two hours, helping OUC quickly reach out to the customers with the highest potential water savings.

Further, these publications can have lasting impacts on development as well. Average water use can be used to quickly estimate the impact of a new development. For example, imagine a planned development in Orange County with 100 new homes. If these homes used the average amount of water, we would expect an increase in water use of 29.9 kgal daily. If these homes irrigated heavily and fell into the “high user” category, we might see an increase in water use of 66.8 kgal daily. Understanding the impact of new developments allows for better planning around water conservation. For developers, it also provides a benchmark for success in these new communities.

We look forward to continuing this publication series across the state of Florida. Be on the lookout for a publication focused on Osceola County, expected to be published on the Ask IFAS website in late 2021/early 2022.



Welcoming New Center Faculty

Dr. Ryan Klein Improves Urban Tree Risk



Dr. Ryan Klein joined CLUE as an assistant professor of arboriculture in the department of environmental horticulture. Dr. Klein's research focuses on the risk associated with urban trees and their survival following hurricanes

and other intense storms. His interests center around exploring the impacts that urban forests have on the health and safety of urban populations.

Most of the world's population live in urban areas and urban sprawl continues to consume our

remaining natural spaces. As the trends in urban growth continue, he views the relationship between people and their natural surroundings as especially significant. Human interactions, such as planning and management become ever more important to the sustainability of our urban forests. Thus, it is vital for research to address these issues and bridge the gap between human culture and the natural world.



Dr. Catherine Campbell Connects Producers, Consumers, and Local Governments with Urban Food Systems



Dr. Catherine Campbell joined CLUE as an assistant professor in the UF Department of Family, Youth and Community Sciences. Her appointment will

focus on social science research in community food systems.

Dr. Campbell conducts social science research on food systems to support community health, sustainability, equity, and resilience. Her research focuses on understanding the behavior, motivation, and decision making of food systems stakeholders—including producers, consumers, and local governments—with a special focus on urban food systems. Her research uses social-ecological models to examine the values, decision making, and behavior of food producers, consumers, and decision makers.

In particular, Dr. Campbell's research targets small family farms; urban food production, distribution, and sales; and community-based programs. She also focuses on policies to increase access to healthy food and reduce negative health outcomes. Another research focus is the social and environmental factors that contribute to inequality in the food system, including inequalities in access to healthful food, in the distribution of benefits and burdens, and in diet-related illness.



Dr. A. J. Lindsey Enhances Turfgrass Quality while Minimizing Environmental Impacts



Dr. A. J. Lindsey is the most recent addition to the CLUE faculty. Joining the center in late 2021, Dr. Lindsey is an assistant professor in urban turfgrass management with the environmental horticulture

department at the University of Florida. His research program involves developing sustainable turfgrass management practices, optimizing turfgrass nutrient and water use, improving turfgrass performance through

the addition of foliar and soil amendments, enhancing turfgrass soil health, and/or investigating alternative and sustainable fertilizer sources.

Dr. Lindsey's extension program will focus on developing educational programs and products on turfgrass management systems. He hopes to help enhance turfgrass quality and ecosystem services while minimizing negative environmental impacts.



Partnering for Advanced Master Gardener Volunteer Education

The UF/IFAS Extension Florida Master Gardener Volunteer Program



embraced virtual learning throughout 2021. Volunteer demographics for the MGV program show significant participation by the vulnerable population of over 65. Volunteers were excited to participate in virtual learning activities from the safety of their own homes. They were especially happy to continue being trained in advanced subjects and maintain their social connections in the program.

The Florida MGV Program collaborated with multiple partners to bring advanced, specialized topics to the volunteers. These included trainings on firescaping with the Florida Master Naturalist Program, citrus with the Citrus Research and Education Center, and school gardens with UF/IFAS Family Nutrition Program and Texas A&M University.

Preparing Communities for Wildfires through Firescaping

Every year hundreds to thousands of wildfires occur across Florida and the southeastern US.

The fast-moving blazes threaten both residents and their homes. Partnering with University of Georgia and the Florida Master Naturalist Program, a firescaping training was offered to Florida Master Gardener Volunteers and Florida Master Naturalists to make an impact and help protect Florida homes from wildfire.

The 8-hour virtual training was conducted over four weeks. Classes included a blend of presentations, “hands-on” activities, and discussions. The training introduced participants to Florida fire history and behavior, plant flammability, firescaping design, home wildfire risk assessment, and tips for combining firescaping with other landscape objectives. Volunteers who completed the training can educate their communities on firescaping and other wildfire risk reduction measures.

Bringing Citrus Back to Homeowners

The UF/IFAS Citrus Research and Education Center brought an outstanding program to the Master Gardener Volunteers that focused on new citrus varieties being developed at





CREC. Additionally, the volunteers were given an update on citrus greening and homeowner recommendations regarding growing citrus. Finally, the Citrus REC announced that they would be collaborating with the Extension offices and the Master Gardener Volunteer program by providing participating extension offices with a set of the newly developed citrus varieties to trial in their demonstration gardens.

Exploring New School Gardening Curriculum

The Florida Master Gardener Volunteer Program, and UF/IFAS Family Nutrition Program offered a Junior Master Gardener in-service training to Florida MGV Coordinators, 4-H agents, and FNP educators. Hosted with Texas A&M University, participants were able to delve into the new curriculum, Learn Grow Eat Go, which focuses on gardening as well as nutrition and physical activity.



Taught virtually, participants were mailed classroom activities to try as a group on camera. They then discussed educational connections and theory on how to adapt lessons to their own programs.

In 2021

4,101
Master Gardener Volunteers

611
New Volunteers Trained

194,666
Volunteer Hours Contributed
at a Value of
\$5.5 million

New for Readers: *Urban Ecology for Citizens and Planners*

Dr. Gail Hansen, along with Dr. Joseli Macedo from the University of Calgary, have written *Urban Ecology for Citizens and Planners*.

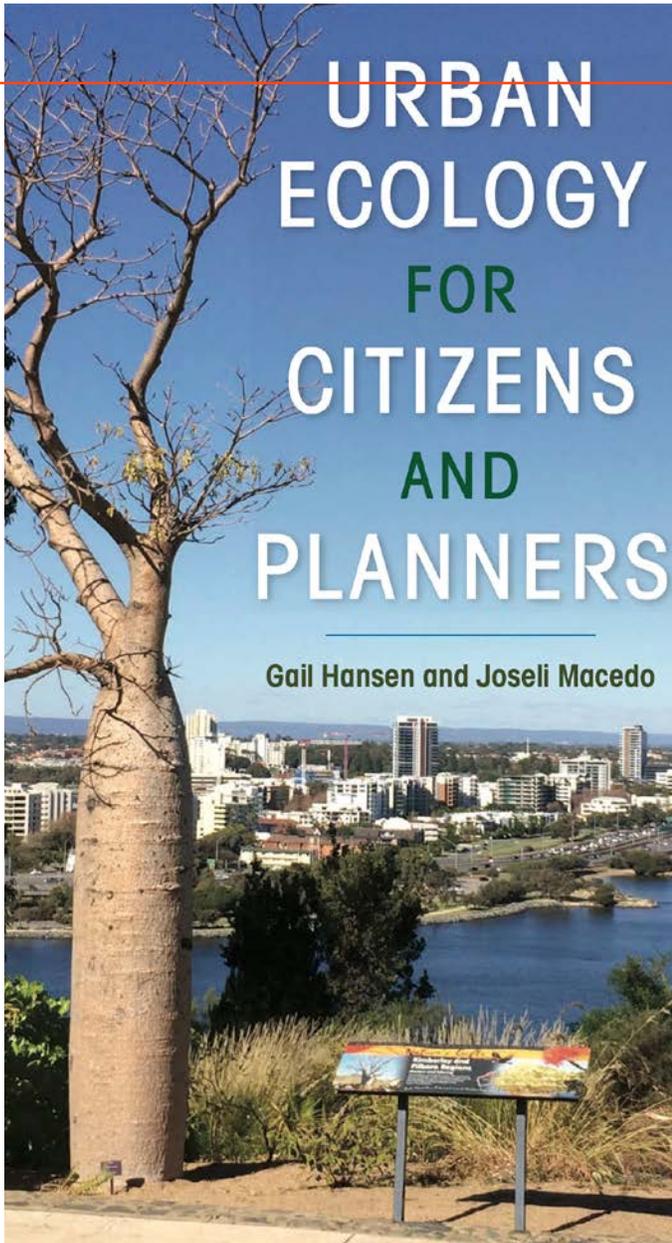
This book encourages citizens, planners, and scientists to actively engage in improving the environment and quality of life in their community through citizen science and planning policy that considers the value and impact of nature in urban contexts. The book was funded through the Endeavour Executive Fellowship from Australia Awards and allowed the authors to gather and write at Curtin University in Perth, Australia.

In *Urban Ecology for Citizens and Planners* authors discuss urban ecology with an emphasis on the social and cultural influences that shape urban landscapes. Part I focuses on natural components in and around city structures, such as urban hydrology and urban vegetation that create biodiversity in cities. Part II describes the bionetworks of the city, including the

significance of green spaces and environmental design to the overall health of cities and people. Finally, part III explores our historical relationship with nature, the human affinity for nature, and technology, practices, beliefs, and values that shape the function and look of nature in cities.

Each chapter is organized in three sections: *what, so what, and now what*. *What* describes environmental conditions and current practices. *So What* explains the significance of these conditions and practices, and *Now What* looks to the future with strategies for improving nature and natural functions in cities, including new approaches and technologies. In addition to these three sections, each chapter highlights a project, case study, or expert insight that illustrates the chapter's topic. These vignettes explore citizen science programs and the contribution of citizens toward integrating natural and urban environments.





Author Profiles

Gail Hansen is associate professor in the Environmental Horticulture Department of the University of Florida, Institute of Food and Agricultural Sciences. Prior to joining the university, Gail worked for a landscape architecture/land planning firm for eight years on various planning and urban design projects. Her areas of expertise in teaching and extension include design of future urban landscapes, urban ecology, and the social and cultural dimensions of urban landscapes. In her extension program she regularly consults with developers, city agencies, and community organizations on best design practices for sustainable urban landscapes. Dr. Hansen has an MLA and a PhD in landscape architecture from the University of Florida.

Joseli Macedo is professor in the School of Architecture, Planning and Landscape at the University of Calgary and former dean of the Faculty of Architecture and Planning at Dalhousie University in Canada. She started her academic career at the University of Florida where she was Chair of the Department of Urban and Regional Planning, Director of the Center for International Design and Planning, and Affiliate Faculty in the Center for Latin American Studies and the School of Natural Resources and the Environment. Joseli has taught and conducted research in the areas of sustainable cities, urban design, and international development for 30 years. She has published on city design and urban form, land policy and land tenure, housing policy, urban planning history, and pedagogy.

Florida-Friendly Landscaping™ Program Reaching Underserved Audiences through Innovative Programming

Training and Certifying Incarcerated People

The FFL/GI-BMP team has collaborated with Florida Department of Corrections to provide private in-house GI-BMP trainings for inmates interested in training in the Green Industries. GI-BMP Regional Coordinator Marc Celestin and Taylor County instructors Lisa Strange and Clay Olson were offered the challenge of certifying approximately 100 inmates at Jefferson County Correctional Facility in Monticello. Ninety-two inmates participated in the training and 87 were certified.

I really enjoyed the class.

I believe this training certificate will go well with my Wastewater Management course.

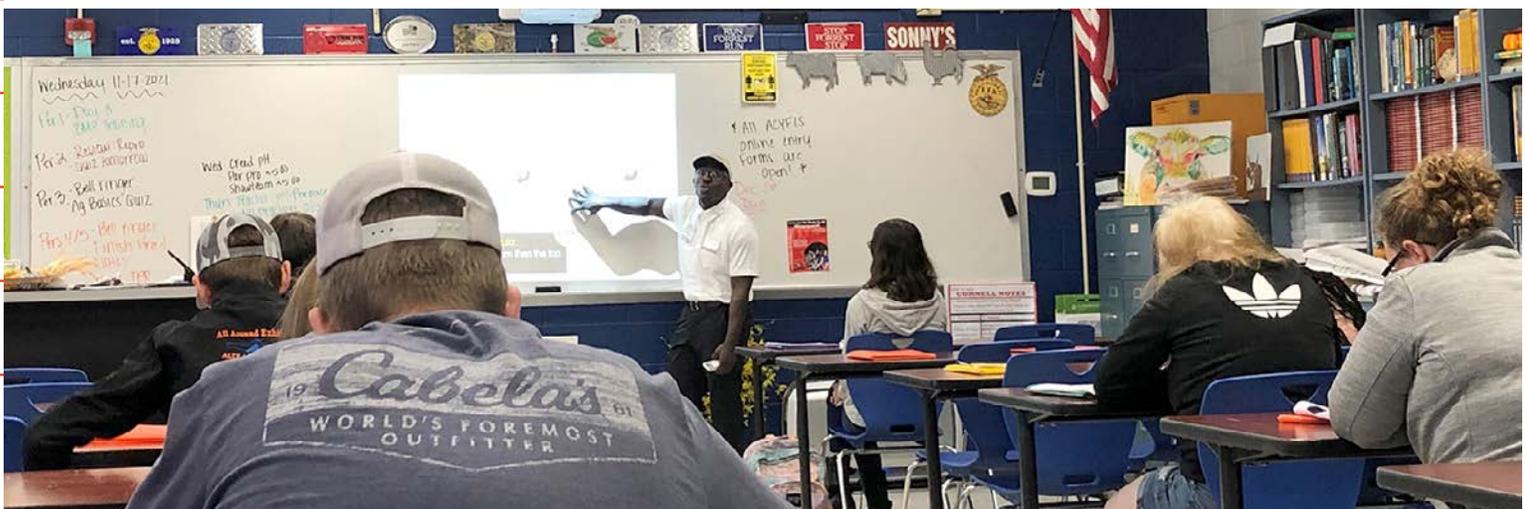
This class informed me

that I was doing a few things the wrong way and I can now correct myself.

Training and Certifying High School Students

FFL/GI-BMP initiated a pilot program at Santa Fe High School to train and certify students in the SFHS horticulture program. Twenty-four students received the first high school

FFL/GI-BMP training in Florida, and of those, 22 tested to certify on the GI-BMP post-test. Currently, 21 certified high school students are ready to apply for the Limited Urban Commercial Fertilizer Applicator Certificate (LCFAC) with FDACS.





Providing Landscape Education to Support the Fair Income Housing Tax Credit

The Florida Fair Income Housing Tax Credit subsidizes the acquisition, construction, and rehabilitation of affordable rental housing for low- and moderate-income tenants. This is a 10-year tax credit to the developer of new or renovated affordable rental multifamily housing communities. If the landscape is recognized as Florida-Friendly they earn two points towards the certification.

The Florida-Friendly Landscaping™ Program assisted the Bay Area Apartment Association (BAAA), a trade association that represents apartment



community owners and managers, as well as trade professionals that support apartment communities, in the greater Tampa Bay region with implementing FFL in their communities. This included both a site visit to one of the BAAA properties and a presentation with practical “how to” guidance on making their communities more Florida-Friendly. The team from the state office and UF/IFAS Extension Hillsborough County provided an irrigation evaluation of BAAA property the Lenox Apartments and provided guidance on landscape and irrigation improvements. After reducing irrigation from seven days a week to two, there was a savings of 360,880 gallons of water and \$938.29.

Researching Food Systems to Improve Urban Communities

Florida's population continues to grow and this growth influences agriculture and urban communities' connection to food. CLUE faculty member and assistant professor in the Department of Family, Youth, and Community Sciences, Dr. Catherine Campbell is working to understand ways in which integrating food into urban environments can improve health and wellness in Florida's urban communities.

With SEEDIT grant funding, Campbell has been interviewing Extension faculty and urban farmers to find out their needs and goals. These interviews will help develop program goals for UF/IFAS to support changes in the food system for urban agriculture (UA) operations.

Results from interviews with Extension faculty show that faculty perceive urban agriculture as growing; they want to do

more UA programming but are limited by lack of time and funding; and they believe investing in UA programming and staff could provide opportunities to reach new audiences.

Urban agriculture farmers also provided insight through interviews. In general, UA operations utilize multiple production methods, but most grow in beds, rows, or fields. They primarily sell direct-to-consumer and most revenue comes from vegetable and fruit crops. Many face barriers common to small farms and have additional urban issues related to permits, zoning, and land availability.

Campbell organized a workshop on the future of urban agriculture with a diverse group of stakeholders participating. The conclusions from the workshop were that UA operations are complex and, for Extension to be effective in reaching them, programming needs to be differentiated between the different types of operations and their goals. It's also common for UA operations to struggle with profitability. UA operators feel like research, Extension, and industry groups don't "fit" their needs. In addition, Campbell learned that many operations rely on information that is not science-based to make decisions on production and marketing.

Photo credit: Liz Felter, UF/IFAS Extension Broward County Extension Agent.



Top Opportunities for Urban Agriculture

Value-added products

Agritourism

Online sales/home delivery

New crops



Photo credit:
Liz Felter,
UF/IFAS Extension
Broward County
Extension Agent.

Urban Agriculture

The production, processing, distribution, and sale of food within urban and suburban areas for noncommercial/hobby, commercial, educational, or nonprofit purposes. Examples of these activities include:

- Food producing gardens (community, backyard, institutional, market, or rooftop)
- Edible landscaping
- Bee, poultry, and animal keeping
- Farmers markets or mobile produce trucks
- Urban or market farms
- Innovative food-production methods, such as hydroponics, aquaponics, and aquaculture



Photo credit:
Lorna Bravo,
UF/IFAS Extension
Broward County
Extension Agent.

Examples of *Urban Agriculture Operations*

Innovative high-tech operations producing premium quality/high-end products

Community farms focused on connecting farms, food, and communities

Advocates who are working for food justice, equity, and the environment

Traditional small farms on the periphery of urban areas with business models focused on urban markets

Virtual Learning and Outreach

The center has been a leader with virtual learning events in 2021 by hosting more than 70 webinars and virtual events including two summits and a large conference. More than 23,000 participants interacted with us either through live virtual events or watching recordings.

Landscape Summit

In 2021, the Urban Landscape Summit resumed in a new format after taking a year off. The new virtual format allowed for 1,446 live attendees to tune in over 11 weeks. Sixteen projects focused on extension and research projects impacting Florida's landscapes and water. UF/IFAS Vice President of Agriculture and Natural Resources, Dr. Angle, presented the keynote and discussed how IFAS is contributing and partnering with Florida's green industry.

Ag BMP Summit

The Agricultural BMP Summit was held over the course of nine sessions and featured researchers throughout the state who spoke on crop specific topics as well as broader issues. More than 660 participants attended the live sessions and 680 participants watched the recordings.

MGV Conference

Held every other year, the Florida Master Gardener Volunteer Continued Training Conference moved to a virtual platform this year. This conference was held on the Microsoft TEAMS platform over the course of three days and featured three concurrent tracks for a total of 12 sessions, two keynote speakers, and interactive IFAS bookstore shopping time. More than 400 volunteers attended the virtual conference, with full access to session recordings afterwards.





MGV Book Club

With a new book and author talk every quarter, volunteers and gardening enthusiasts throughout the state were able to interact with each other, topic experts, and even directly with the author through this unique virtual learning opportunity. Book selections included: *How Plants Work* by Dr. Linda Chalker-Scott, *Composting for a New Generation* by Michelle Balz, and *The Foodscape Revolution* by Brie Arthur, with eight books featured since the club's launch. The club's dedicated Facebook group has over 450 active members.

Webinars

The center hosted 50 webinars for the Florida Master Gardener Volunteer Program, the Florida-Friendly Landscaping™ Homeowner Program, and the Florida-Friendly Landscaping Professionals Program. These monthly webinars included advanced trainings from specialists, research updates, and timely information. More than 11,544 participants attended the webinars in a live format and more than 8,000 participants viewed them as a recording.

Funding Best Management Projects to Help Florida Farmers

Partnering with the Florida Department of Agriculture and Consumer Services, UF/IFAS provided mini-grants to faculty working on projects related to agricultural Best Management Practices (BMPs). These mini-grants support

efforts throughout the state and provide essential information to specific crop industries.



2021 FDACS Best Management Practices Mini-Grants

Grants	Authors
Maximizing Phosphorus Availability for Potato Production	Dr. Wendy Mussoline UF/IFAS Extension Putnam County Agriculture Agent
Cover Crops in Dryland West Florida Fields	Libbie Johnson UF/IFAS Extension Escambia County Agriculture Agent
An Overview of 2021 Corn and Watermelon Nutrient Management Projects Using Controlled Release Fertilizer Sources as a BMP	De Broughton UF/IFAS Extension Northeast Regional Specialized Agriculture Agent
Establishing Rhizoma Perennial Peanut into Bahiagrass on Horse Farms	Caitlin Bainum UF/IFAS Extension Marion County Livestock Agent Dr. Carissa Wickens UF/IFAS Equine Extension Specialist
Summary of Hands-On Trainings for the Utilization of Soil Mapping and Nitrogen Calibration Strips to Optimize Row Crop Nitrogen Use in Florida	Ethan Carter UF/IFAS Extension Northwest Regional Specialized Crop IPM Agent
Facilitating the Adoption of Best Management Practices Through On-Farm Trials	Jay Capasso UF/IFAS Extension Columbia County Row Crop Agent
Expanding the Statewide Soil Moisture Sensor Network: Engaging Farmers and Agents in Technology to Protect Water Resources	Yvette Goodiel UF/IFAS Extension Martin County Commercial Horticulture and Sustainable Agriculture Agent
Quantification of Leaching Potential Across Irrigation Management Levels in Drip Irrigated Tomato	Craig Frey UF/IFAS Multi-County Commercial Vegetable Extension Agent and Hendry County CED

Communicating through Digital Platforms

In 2021, the Gardening Solutions website and associated social media were again very popular.

There were **1.8 million** users of the Gardening Solutions website with **4.5 million** unique views.

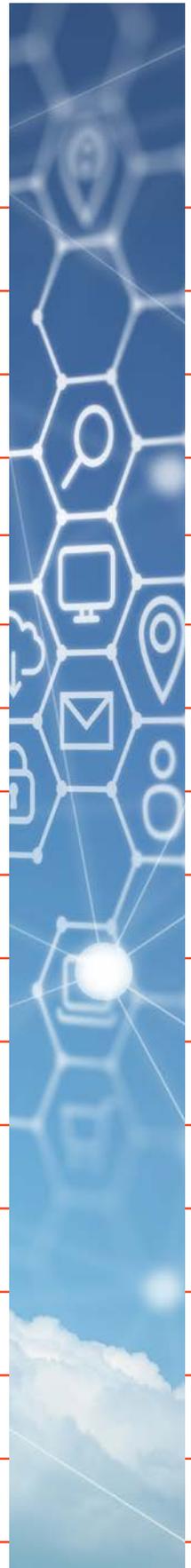
The Neighborhood Gardener newsletter has **8,761** subscribers and an open rate of **48%**. That's 22% better than the industry average according to Constant Contact. The newsletter "click" rate is **17%** which is 15% better than the email newsletter industry average.

The Master Gardener Facebook page has **26,525** followers and **1.7 million** impressions in 2021.

The Master Gardener Instagram reached **185,000** accounts and had **8,545** followers.

The **Florida-Friendly Landscaping™ Program** launched a redesign of their site with content organized by audience.

Popular articles for 2021 included **Native Plants, Vegetable Gardens by Season, Landscaping in the Shade, Heat-tolerant Vegetables, Florida Weed ID Video Series, and Gardening Myths.**



About the Center

The Center for Land Use Efficiency promotes the adoption of science-based policies and practices that measurably create an environmentally and socially vibrant life for Florida's citizens. Research and Extension programs largely relate to water quality and quantity and various best management practices (BMPs) in the following areas:

- Agriculture
- Urban and suburban landscapes
- Large-scale development

Contact information

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