

Center for

LAND USE

EFFICIENCY

2020 Annual Report

UF IFAS
UNIVERSITY of FLORIDA



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



In 2020,

\$17+ MILLION

in active

EXTERNAL FUNDING

and

\$273,874

in

INTERNAL FUNDING

2020 By the Numbers

25

interdisciplinary faculty

16

affiliate faculty

22

Staff

21

Chaired M.S.

22

Chaired Ph.D.

74

Refereed publications produced

21

Proceedings contributed to

29

non-refereed publications produced

33

EDIS publications produced

1

Book authored

467.1 MILLION

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

5,308

households and saved more than

\$1.54 MILLION

on utility bills

288

faculty in-service trainings conducted that reached

25,993

participants

138

GI-BMP in-service trainings conducted that reached

2,429

participants

42

Master Gardener Volunteer in-service trainings conducted that reached

3,416

participants

8,000+

e-newsletter subscribers with a 44% open rate

64

webinars webinars hosted with more than

14,311

live participants and recorded views

2.2 MILLION

unique website visitors

36,412

Facebook followers

6,629

Instagram followers

39

new YouTube videos

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 Program

Director's Message



One word for 2020, “Whew!” In fact as I write this in mid February 2021, I’m not sure 2020 is over! What a year it was. The year started “normal” in Jan and Feb even though news of a virus was beginning to surface. In March we all began remote work as our administration grappled with how to handle the pandemic. We never stopped working on the issues critical to our stakeholders from agricultural Best Management Practices (BMPs) to training and education for green industry professionals, Master Gardeners and other stakeholders.

This is our first annual report for the Center for Land Use Efficiency since the combination of the Center for Landscape Conservation and Ecology (CLCE), Program for Resource Efficient Communities (PREC), and the IFAS Agricultural BMP program.

As you will see in this annual report, as a group we were extremely productive in serving our stakeholders and working on issues important for Florida into the future. We shifted from in-person meetings planned for the year to virtual education through our many programs. We had 14,311 attendees this year which was a three-fold increase over the previous year and more than we would have had with in person events. While we all miss the social aspect of face-to-face meetings and education, it is clear that virtual education is here to stay. In addition, it provides access for people that otherwise could not afford the cost or time to attend a face-to-face event.

I want to congratulate CLUE faculty and staff for persevering this year through many difficulties to maintain productivity and high-quality work that serves the needs of our stakeholders. While all of our efforts are important, it is efforts such as the Future Urban Landscapes of Florida and agricultural BMP summit that will lay the groundwork for the science and education needed to maintain our natural resources while serving stakeholder needs.

We look forward to continuing to serve and push the boundaries on the latest science and education in various land uses from urban to agricultural to promote the adoption of policies and practices that measurably create an environmentally, economically, and socially vibrant life for Florida’s citizens.

A blue ink signature of Michael D. Dukes, written in a cursive style.

Michael D. Dukes
Director



Message from the VP



The Center for Land Use Efficiency couldn't have come into being at a more opportune time. We are at a moment of reckoning to protect our water resources as we add millions of more people and as their activities contribute to harmful algal blooms and other high-profile effects of demands on those resources.

Yet our water quality science has been siloed. The launch of the Center for Land Use Efficiency changes that. Under the CLUE umbrella we bring together UF/IFAS work on:

- Agricultural best management practices (BMPs);
- Urban water uses that were previously the focus of the Center for Landscape Conservation and Ecology; and
- Practices that reduce water consumption and its environmental impacts in new residential community construction through our Program for Resource Efficient Communities.

CLUE's very existence recognizes that water quality is everyone's responsibility—urban and rural, agricultural and residential, public and private sector.

At the opening of CLUE's Urban Landscape Summit this year, I said that our state is better off because of CLUE. Congratulations, Michael and CLUE faculty and staff for a successful launch and on the many contributions you'll make in coming years.

Sincerely,

A handwritten signature in black ink that reads "J. Scott Angle".

J. Scott Angle

UF Vice President

Agriculture and Natural Resources

CLUE 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.

CLUE FACULTY

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

Andrea Albertin, Water Resources Regional Specialized Agent

Charles Barrett, 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 Resources & Conservation, Geospatial Analytics

Pierce Jones, Program for Resource Efficient Communities Director

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

Mary Lusk, Soil & Water Sciences, Urban Water Quality

Chris Marble, Environmental Horticulture, Weed Management

Chris Martinez, Agricultural & Biological Engineering, Water Resource Management

Esen Momol, Florida-Friendly Landscaping™ Program Director

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

Jennison Searcy Kipp, Sustainable Floridians Program, Ecological Economist

Lakesh Sharma, Soil & Water Sciences, Agricultural BMP Program Director

Nick Taylor, Program for Resource Efficient Communities, H2OSAV 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

Tatiana Borisova, Food & Resource Economics,
Horticulture Economics

Taylor Clem, Alachua County, Landscape Design

Adam Dale, Entomology & Nematology,
Landscape Entomology

Zhanao Deng, Environmental Horticulture,
Plant Breeding

Erin Harlow, Pesticide Information Office

Mark Hostetler, Wildlife Ecology & Conservation,
Biodiversity

Kevin Kenworthy, Agronomy, Turfgrass Breeding

Jason Kruse, Environmental Horticulture, Sports
Turf Management

Michael Mulvaney, Agronomy, Cropping Systems

Matthew Orwat, Washington County, Urban
Horticulture

Brian Pearson, Environmental Horticulture,
Landscape Management

Laurie Trenholm, Environmental Horticulture,
Urban Turfgrass Management

Bryan Unruh, Environmental Horticulture, Urban
Turfgrass Management

Sandy Wilson, Environmental Horticulture,
Ornamental & Invasive Plants

CLUE STAFF

Emily Eubanks, Assistant Director of
Communications

Jennifer Sykes, Communications Manager

Madeline Iyer, Science Communicator

Natasha Roberts, Communications Intern

Melissa Friedman, Research Coordinator

FLORIDA-FRIENDLY LANDSCAPING™ STAFF

CJ Bain, FFL Website & Information Tech
Coordinator

John Bossart, FFL Education & Extension Manager

Claire Lewis, Florida-Friendly Communities
Statewide Coordinator

Jen Marvin, FFL/FYN Statewide Coordinator

Tom Wichman, GI-BMP Statewide Coordinator

Elisha Cash, GI-BMP Regional Coordinator

Marc Celestin, GI-BMP Regional Coordinator

Cesar Peralta, GI-BMP Regional Coordinator

Barry Sawicki, FFL/GI-BMP Program Assistant

Lyn Ward, FFL/GI-BMP Program Assistant

PROGRAM FOR RESOURCE EFFICIENT COMMUNITIES STAFF

Lynn Jarrett, Water Resources Engineer

Lesly Jerome, Research Assistant

Parker Johnson, H2OSAV Data Analyst

Craig Miller, Energy & Water Efficiency Associate

Kaitlin Robb Price, H2OSAV Communications
Specialist

Bradley Spatz, H2OSAV Data Science &
Engineering

Barbara Haldeman, Academic Assistant

CLUE Graduate Students

CHARLES BARRETT

M.S. Students

- Benjamin Tubbs, Soil & Water Sciences

Ph.D. Students

- Ronald Jason Merrick, Agricultural & Biological Engineering

EBAN BEAN

M.S. Students

- Lindsay Albright, Soil & Water Sciences
- Timothy Beach, Soil & Water Sciences
- Ronald Fox, Agricultural & Biological Engineering
- Kayla Hess, School of Forest Resources & Conservation
- Steven Hohman, Soil & Water Sciences
- Lysbeth Perez, Agricultural & Biological Engineering
- Jovana Radovanovic, Agricultural & Biological Engineering

Ph.D. Students

- Piyush Agade, Agricultural & Biological Engineering
- Trista Brophy-Duron, Interdisciplinary Ecology
- Joseph Barrett Carter, Agricultural & Biological Engineering
- Sujit Ekka, Biological & Agricultural Engineering, North Carolina State University
- Tricia Kyzar, Design, Construction, & Planning
- Julio Pachon, Soil & Water Sciences
- Widyastri Rahmy, Design, Construction, & Planning
- Krista Stump, Agricultural & Biological Engineering

MICHAEL DUKES

M.S. Students

- Benjamin Tubbs, Soil & Water Sciences

Ph.D. Students

- Sara Komenda, School of Forest Resources & Conservation
- Ronald Jason Merrick, Agricultural & Biological Engineering
- Sagarika Rath, Agricultural & Biological Engineering
- Krista Stump, Agricultural & Biological Engineering

GAIL HANSEN

Ph.D. Students

- Lorna Bravo, Environmental Horticulture
- Rashelle Deak, School of Forest Resources & Conservation
- Deborah Hilbert, Environmental Horticulture
- Ryan Klein, Environmental Horticulture
- Ming Wy, Horticultural Sciences

BASIL IANNONE

M.S. Students

- Brandon Bourassa, School of Forest Resources & Conservation
- Julia Rycyna, Environmental Horticulture

Ph.D. Students

- Pablo Agustin Boeri, Environmental Horticulture
- Rashelle Deak, School of Forest Resources & Conservation
- Emily Taylor, Soil & Water Sciences

ANDREW KOESER

Ph.D. Students

- **Andrew Benson**, School of Forestry, University of Canterbury
- **Deborah Hilbert**, Environmental Horticulture
- **Ryan Klein**, Environmental Horticulture
- **Claudia Paez**, School of Forest Resources & Conservation

MARY LUSK

M.S. Students

- **Lindsay Albright**, Soil & Water Sciences
- **Juma Bukomba**, Soil & Water Sciences
- **Kevin Easton**, Soil & Water Sciences
- **Audrey Goeckner**, Soil & Water Sciences
- **Zijing Liao**, Soil & Water Sciences
- **Alexandra Mauer**, Soil & Water Sciences
- **Joseph Molenda**, Soil & Water Sciences
- **Qian Yao Si**, Soil & Water Sciences
- **Hugh Webb**, Soil & Water Sciences

Ph.D. Students

- **Emily Taylor**, Soil & Water Sciences

CHRIS MARBLE

M.S. Students

- **Thomas Smith**, Environmental Horticulture

Ph.D. Students

- **Sean Campbell**, Environmental Horticulture
- **Yuvraj Khamare**, Environmental Horticulture

AJ REISINGER

M.S. Students

- **Auddie Aufforth**, Soil & Water Sciences
- **Daniela Daniele**, Environmental Studies, Florida International University
- **Daniel Fahr**, Soil & Water Sciences
- **Audrey Goeckner**, Soil & Water Sciences
- **Steven Hohman**, Soil & Water Sciences
- **Kelsey Krueger**, Soil & Water Sciences
- **Zijing Liao**, Soil & Water Sciences
- **Joseph Molenda**, Soil & Water Sciences

Ph.D. Students

- **Joseph Barrett Carter**, Agricultural & Biological Engineering
- **Audrey Goeckner**, Soil & Water Sciences
- **Gabriela Reyes**, Soil & Water Sciences
- **Emily Taylor**, Soil & Water Sciences

LAKESH SHARMA

M.S. Students

- **Hima Varsha Madala**, Agronomy
- **Benjamin Tubbs**, Soil & Water Sciences

Ph.D. Students

- **Jay Capasso**, Soil & Water Sciences
- **Ahmed Jasim**, Soil Sciences, University of Maine
- **Ahmed Zaeen**, Soil Sciences, University of Maine

LAURA WARNER

Ph.D. Students

- **Jamielyn Daugherty**, Environmental Horticulture
- **Cody Gusto**, Agricultural Education & Communication
- **Wayne Hobbs**, Agricultural Education & Communication
- **Ryan Klein**, Environmental Horticulture
- **Savanna Turner**, Agricultural Education & Communication
- **Wei Yan**, Agricultural Education & Communication

Future Urban Landscapes of Florida

In 2018, University of Florida IFAS faculty formed a multi-disciplinary group focused on future urban landscapes in Florida. The impetus for the formation of this group came from a meeting on turfgrass alternatives that shed light on the larger issue of conflicting information coming from IFAS faculty on best practices in urban lawns and landscapes. This was eroding trust in UF/IFAS recommendations, causing contention among faculty, and confusing stakeholders.

A series of five in-person facilitated meetings took place in 2018 and 2019. An additional four meetings were facilitated through an online platform in 2020 due to COVID-19. Forty research specialists and Extension agents from eleven departments, six programs, four research and education centers, and nine county Extension offices across the state participated.

The overarching goals of these meetings were to:

1. Build community and trust between faculty in different disciplines.

2. Develop a shared understanding of future urban landscape goals for UF/IFAS.
3. Develop a suite of objectives and tasks to attain the future urban landscape goals.

CREATION OF A SHARED VISION FOR FUTURE URBAN LANDSCAPES IN FLORIDA

Through facilitated discussions, brainstorming activities, and small group work, participants envisioned desired conditions for future urban landscapes in Florida. Common themes include:

- Adaptive, resilient, multifunctional
- Rehabilitation and maintenance of soil health
- Science-based/evidence-based
- Support biodiverse plant, animal, and microbe communities
- Sustainable
- Reduced inputs
- Valued



GOALS AND TASKS

Participants also identified several goals that will help them achieve their vision, which are currently in the process of being finalized. Overall, these goals include:

- Conducting research on best practices associated with designing, developing, and managing urban landscapes that meet our shared vision
- Improving communication and education to end users on best practices through condensed science-based recommendations

DEVELOPMENT OF INTERDISCIPLINARY RESEARCH PROJECTS

Several projects have emerged from this initiative and are currently in progress. One such project is looking at a multispecies lawn cover consisting of a mixture of low-growing grasses, legumes, and native forbs (page reference). Other projects include:

- A multidisciplinary effort to summarize the current science of landscapes and sustainability, and make recommendations for stakeholders
- How plant diversity and structure in yards relate to management inputs, costs, and ecosystem services
- Nutrient runoff, temperature abatement, carbon dynamics, arthropod populations, and maintenance on turf dominated and alternative landscapes

Over the course of more than two years, faculty have built trust and community, are having more open and civic discussions, have developed a shared vision for future landscapes, identified goals and tasks to get there, and are developing new interdisciplinary collaborations and research projects that span disciplines, departments, and schools of thought. At the final meeting of 2020, one participant who has been working with UF/IFAS's turfgrass science program for the last 25 years said, "My program has drastically shifted over the last 12 months to addressing a number of the topics [this] group has been discussing."

NEXT STEPS

In the coming months faculty will have an opportunity to select goals and tasks with which they would like to be involved. The group will meet once a year to share what they've been working on, continue building community, and advancing research and education that leads to better outcomes in future Florida urban landscapes.

Future of Urban Landscapes Facilitators

- **Melissa Friedman**, CLUE Research Coordinator
- **Joy Hazell**, State Specialized Agent in Facilitation and Conflict Management
- **Carol Lippincot**, Certified Professional Facilitator



Using Alternative Native Groundcover Species to Increase Native Biodiversity in Florida Landscapes

Lawns provide benefits to urban landscapes, including enhanced aesthetics, places for recreation, and carbon storage. However, they also have environmental impacts. For instance, Florida lawns are typically installed as monoculture which results in declines, in both native plants and genetic diversity. In addition, poor turfgrass species selection and over-irrigating and fertilizing can degrade and/or deplete water resources. Incorporating native flowering plants into lawns may mitigate these impacts, as these species require fewer inputs than Florida turfgrass species most heavily relied upon. Native flowering plants may also provide ecological benefits, including enhancing native biodiversity and pollinator resources. Regardless of these potential benefits, native flowering groundcovers will not be adopted if they are not aesthetically appealing.

CLUE faculty and partners conducted an experiment at Discovery Gardens at the UF/IFAS Extension Lake County Office to determine the costs and benefits associated with incorporating native flowering plants into Florida lawns.

In March 2019, Master Gardener Volunteers assisted in installing 18 2x2m plots. The plots have one of three lawn treatments: bahiagrass (*Paspalum notatum*) monoculture, bahiagrass-forb mixture, and forbs alone. Master Gardener Volunteers also assisted with study maintenance and data collection. For the treatments with forbs, low-growing species were selected that have attractive flowers and the potential to tolerate mowing. Bahiagrass was selected for its drought tolerance and ability to grow without fertilizers. Plots were irrigated through establishment, after which irrigation only occurred three times during dry winter months. No fertilizer was used.

SELECTED FORBS SPECIES



Phyla nodiflora
(frog fruit)



Salvia lyrata
(lyreleaf sage)



Mimosa strigillosa
(sunshine mimosa)



Coreopsis leavenworthii
(leavenworth's tickseed)



Image was taken prior to national guidelines of face coverings and social distancing.

ECOLOGICAL BENEFITS

Flowers in plots with forbs were visited by honeybees, bumble bees, butterflies and moths, flies, and other types of bees.

Bahiagrass was only visited by flies.

Forb-only plots also had nearly **4X MORE POLLINATOR VISITS** than either bahiagrass or bahiagrass-forb plots. The abundance and taxonomic richness of herbivorous arthropods were up to 2X higher in plots having forbs.

PLANT COVERAGE

Forbs plots had **7-19% MORE GREEN PLANT COVERAGE** in spring and summer, but **9 TO 21% LESS GREEN COVERAGE** during dry winter months. This reveals the potential need for supplemental irrigation during dry periods.

AESTHETICS

Surveys taken by garden visitors during periods of low plant coverage revealed that only 33% of visitors would use mixed forbs in their yards. Nevertheless, about **60%** of these respondents, once educated on project goals, expressed an **INCREASED INTEREST** in enhancing lawn plant diversity. Surveys in summer during maximum plant coverage are still needed.

OTHER CHALLENGES

Weed pressure in all plots was at levels greater than what homeowners could easily control. Thus, weed suppression strategies (e.g., high-density plantings, pre-emergent treatments) or acceptance of recruiting species will be required. Finally, *Coreopsis leavenworthii* and *Salvia lyrata* did not tolerate mowing as we thought, revealing the need to accept height unevenness and/or the need to identify other better-suited, lower-growing species.

PROJECT IMPACTS

Despite these challenges, our project has inspired two major Florida plant producers to explore production and installation strategies for mixed-species lawns, confirming the commercial potential for this lawn style. Overall, this study has revealed important insights into the potential environmental benefits and practical challenges faced in increasing plant diversity in Florida lawns.

Basil Iannone, Wendy Wilber, Brooke Moffis, Sandy Wilson, Adam Dale, Bryan Unruh, and Julia Rycyna, CLUE faculty, affiliates, and students

Enhancing Stormwater Quality through a Statewide Hybrid Extension Program for Pond Managers

Stormwater is the biggest contributor to water pollution in Florida and wet detention ponds are the most common method for stormwater management. Improving stormwater detention ponds and lakes is a major focus of UF/IFAS. Extension agents are often faced with the need to communicate stormwater pond best management practices (with few UF resources) to community board members who do not understand the functions of these systems. This gap makes recommendations based on science difficult to achieve. Most community members and many pond professionals do not connect stormwater ponds to downstream water quality. However, stormwater is the leading contributor to water pollution, and ponds are the primary stormwater best management practice for the developed landscape.

To help close this knowledge gap, a team of Center for Land Use Efficiency faculty, affiliate faculty, and county Extension agents worked to create a hybrid training program that focuses on providing pond managers with evidence-based tools for a holistic approach to pond management. This training focuses on enhancing water quality, wildlife habitat, and pond longevity. The program targets technicians of commercial pond management companies, homeowner association leaders (HOAs), community association managers (CAMs), local government pond managers, and private pond owners.

The Healthy Ponds Certification program is a self-paced, eight-week online course that was first offered in the fall of 2020. Course participants can earn up to 25 Pesticide Applicator's License CEU credits and the course will cost \$250.

The program is also a clearinghouse for stormwater pond research and recommendations. Agents can facilitate and offer the program to improve the understanding of the physical, biological, chemical, and cultural best practices for stormwater pond management. These strategies increase stormwater pond function while making ponds easier to maintain, reducing chemical treatments, and increasing water quality, wildlife habitat, and biodiversity.

This online resource that details stormwater pond best management practices will enhance UF/IFAS programming to the targeted audience, and in turn will enhance water quality and diverse aquatic habitats.

A new, **EVIDENCE-BASED** course of pond owners and managers.

A **CLEARINGHOUSE FOR RESEARCH** and expert understanding of stormwater pond management.

An **AVENUE TO CONNECT, DISCUSS, AND LEARN FROM ONE ANOTHER** on issues surrounding healthy pond management.

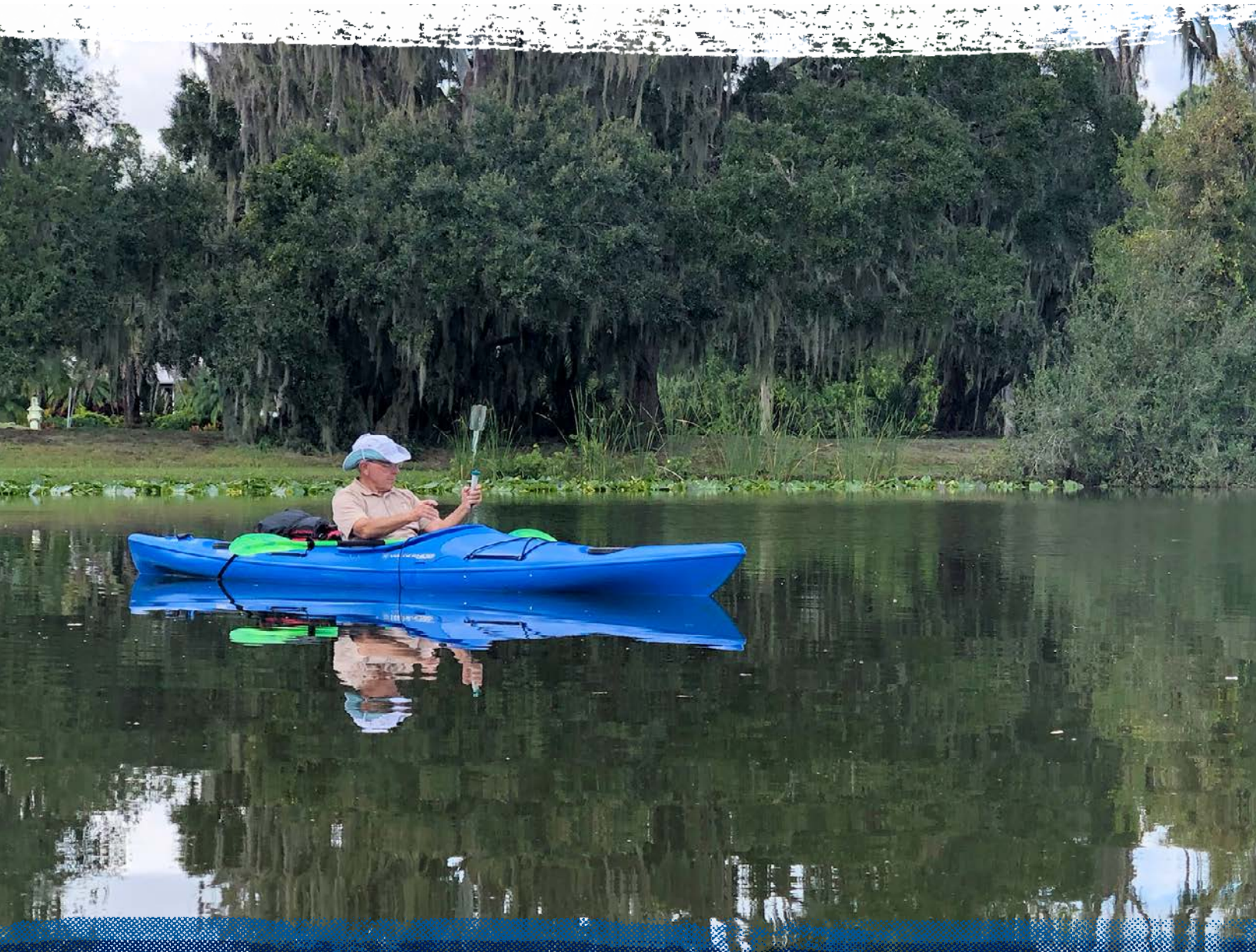
Healthy Pond Certification Program Field Day participants talk about the their biggest struggles to maintaining a healthy pond.



Week	Module	Content
1	1	Introduction, Background, Pond Geography and Geology, Regulations
2	1	Meet Your Stormwater Pond, The Ecology of Stormwater Ponds, Human Dimensions of Stormwater Ponds
3	2	Introduction to Healthy Ponds, Buffer Zones, and Littoral Zones
4	2	Algae, Aquatic Life, Semi-Aquatic Life
5	3	Introduction to Maintaining Stormwater Ponds
6	3	Plant ID, Problems and Management in the Buffer Zone, Problems and Management in the Littoral Zone
7	3	Problems and Management of Aquatic Life, Managing Perceptions, and Hillsborough Adopt-a-Pond case study
8	4	Field Day

Abbey Tyrna, Michelle Atkinson Eban Bean, Mary Lusk, CLUE faculty, affiliates, and partners

Healthy Pond Field Day participant is trying out different water chemistry probes and putting the results within the context of local pond water chemistry.



Florida Evaluating the Benefits of Florida's Urban Forests

Urban forests include street trees, park trees, residential trees, and trees along trails in a nature preserve. Urban forests provide many benefits. Many of a tree's benefits are influenced by the health and size of its canopy. Preservation and management of the urban forest is critical to ensure that citizens receive the maximum benefits that urban trees can provide.

To determine the value of urban forests, a team of CLUE researchers and partners evaluated tree canopy coverage in Florida. Tree canopy coverage is the percent of a given land area covered by leaves and branches when viewed from above. Canopy coverage assessments allow a community to estimate current coverage, understand the extent of the urban forest, set coverage goals, and track potential changes over time. It is measured in the field with specialized

equipment or by analysis of aerial and satellite imagery. The team analyzed canopy coverage in Florida's 29 metropolitan and micropolitan census-designated areas.

Urban forest ecosystems provide a variety of economic and environmental benefits, including shading homes to create energy savings, intercepting rain to reduce stormwater, improving air quality by filtering pollutants, and sequestering carbon to offset emissions associated with climate change. Many urban forest benefits are influenced by the combined surface area of all the leaves in a tree's canopy. Evaluation of these benefits allows city managers and citizens to gauge the importance of the urban forest compared to other key infrastructure elements and to budget for the appropriate management of this natural resource.



AIR POLLUTION REMOVAL

Toxic air pollutants can cause adverse effects to human health, disrupt ecosystem processes, and reduce visibility in cities. Tree leaves remove air pollutants by directly absorbing them or indirectly capturing them on their surfaces.

STORMWATER RUNOFF

Stormwater runoff is the rainwater that flows over the ground after a rain event. Impervious surfaces, such as roads, parking lots, and rooftops, do not allow water to infiltrate the soil. And as water flows over impervious surfaces, it can pick up many different pollutants (e.g., antifreeze, grease, pesticides, bacteria) that are present on these paved surfaces. Trees help combat the negative effects of stormwater runoff by capturing rainfall on their leaves and bark, thereby reducing the amount of water hitting impervious surfaces. In addition, tree roots and fallen leaves can promote soil conditions that allow more water to enter the soil during a rain event.

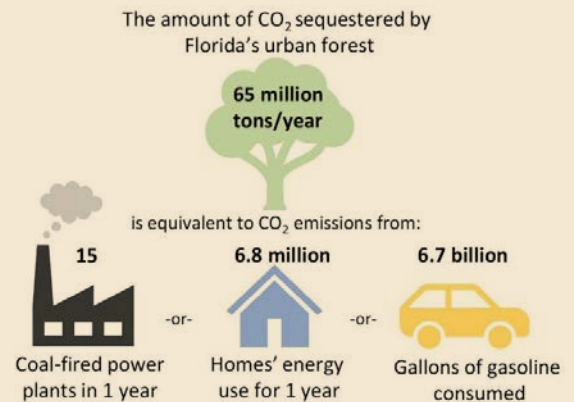
CARBON SEQUESTRATION AND STORAGE

Carbon dioxide (CO₂) is a greenhouse gas that plays a significant role in global climate change. Trees can help combat climate change by taking in carbon dioxide from the atmosphere. During photosynthesis, trees take in atmospheric carbon dioxide and store it as carbon in their trunks, branches, and roots. A tree will continue to sequester and store carbon until it dies.

Andrew Koeser, Drew McLean, Deborah Hilbert, Michael Andreu, Rob Northrop, CLUE faculty, staff, students, and partners

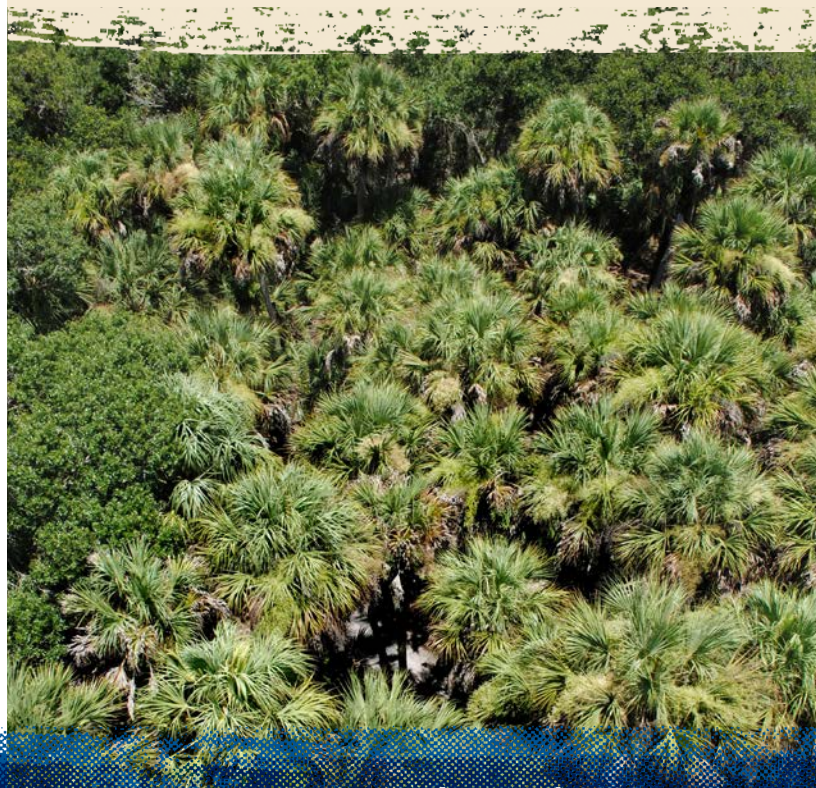
FLORIDA'S URBAN FORESTS...

- remove **600,000 TONS OF AIR POLLUTION** each year which **SAVES \$605 MILLION** in health care costs.
- intercept **50 BILLION GALLONS OF WATER** a year through stormwater treatment.
- sequester (capture through annual growth) **65 MILLION TONS** of CO₂ a year.



Credit: US EPA greenhouse gas equivalencies calculator

- store **1 BILLION TONS** of CO₂ equivalent.
- provide **\$4.1 BILLION IN ANNUAL BENEFITS** for Florida's citizens and visitors.



H₂OSAV: Using the Power of Measurement to Help Save Florida Water

Imagine a situation where you set a goal to run faster. The first thing you would do is determine how far and how fast: perhaps a mile in under 10 minutes. Next, you would figure out how fast you can run right now. Then, you would track your time with every run to see the progress you were making towards your goal. We instinctively do this because measurement is necessary to effectively reach our goals. This is why measurement is used in our daily lives, science, marketing, and anything else related to change. H₂OSAV is a UF/IFAS Extension Program that applies this thinking to water conservation. This program measures real-time metered water data to help utilities, Extension agents, the Florida public, and other stakeholders in their efforts to reduce water consumption.

H₂OSAV stands for Water Savings, Analytics, and Verification. It is a collaborative effort under the UF/IFAS Program for Resource Efficient Communities within the center. It was born from the need to quantify the impact of water conservation efforts. To address that need, regularly updated data is used to understand water use in the past, address issues in the present, and share insights and trends for the future. The goal is to measurably reduce water use to minimize the effect on Florida's natural resources.

By providing tools and sharing our insights, conservation efforts can be quickly and easily implemented.

Utilities across Florida, along with their Water Management Districts, work with H₂OSAV. Partners provide data that H₂OSAV screens, clarifies and enhances. Utility records are combined with several open data sources including county property appraisals, Florida Department of Revenue, and the U.S. Census. H₂OSAV manages over 86 million rows of data, and that number is continuously growing. Using this data has many benefits over traditional modeling systems. Other systems may predict or model water consumption, but H₂OSAV uses real-time metered water data monitored by the utilities. By using this data, changes in consumption that are due to behavior are caught and measured.

This enriched data provides insights about water consumption, development, and the effectiveness of individual conservation programs. These

insights are shared directly with the utilities and to a broader audience through publications. When a partner has a more specific question or need, the H₂OSAV team provides custom analyses, interactive tools, and targeting assistance. This work is mutually beneficial, as custom requests from users lead

“H₂OSAV has provided a way to **QUICKLY PRIORITIZE** high water demand areas for further education and communication.

I appreciate how the **PROGRAM HELPS** our utility comparatively determine the **EFFECTIVENESS** of our **VARIOUS CONSERVATION EFFORTS.”**

Mike Sweeney, Deputy Executive Director for Toho Water Authority

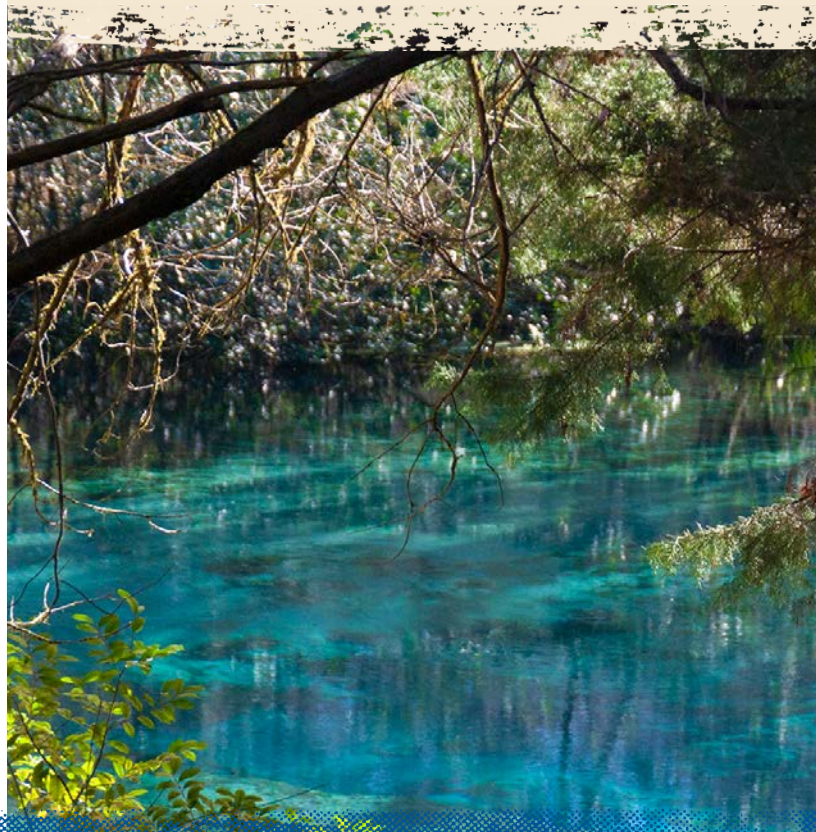
to advancements in how insights are generated and sometimes even lead to the creation of entirely new tools.

For example, in July 2020 Toho Water Authority (TWA) in Osceola County secured funding through the South Florida Water Management District (SFWMD) Alternative Water Supply Funding Program to install smart irrigation controllers and efficient irrigation heads for 100 of their residential customers. H₂OSAV has been providing guidance and technical support to help TWA target users with high landscape irrigation (more than five times the average). With this focused effort, the target group could see a reduction of as much as 120,000 gallons of water per day. If savings persist over 5 years, as expected, this will be one of the most cost-effective water conservation programs ever implemented in Florida.

Nick Taylor, Kaitlin Robb Price, Bradley Spatz, and Parker Johnson, CLUE faculty and staff

H₂OSAV HIGHLIGHTS

- Supporting **14** utility service territories in **10** counties, representing **MORE THAN 25%** of Florida's population
- Tracking water savings for **68** water conservation programs
- Providing tools and insights that help partners:
 - find opportunities for the most efficient water savings
 - evaluate the effectiveness of individual conservation programs
 - visualize patterns of high water use in specific areas
 - target individuals for conservation programs
 - plan for future development
- Developing publications that have:
 - shared basics on water consumption for the Gainesville Regional Utility service territory
 - evaluated residential irrigation water costs in Osceola and Orange counties
 - introduced H₂OSAV to a wider audience on IFAS Blogs



Moving to a Virtual Platform: 2020 Ag BMP Summit

Originally planned as a traditional face-to-face event for May 2020, the Ag BMP Summit was redirected to a series of virtual sessions offered in April through June. The goal of the event was to highlight current BMP-related research and education, connect with stakeholders such as FDACS, WMD's, FDEP and grower organizations. Across 13 sessions with 17 speakers, nearly 1,238 live participants and 438 viewing recordings were reached. This was the first such event for the Ag BMP program since 2009.

FUNDING AG BMP PROJECTS THROUGH A MINI-GRANT

The UF/IFAS Research Dean's Office, the Florida Department of Agriculture and Consumer Services (FDACS) Office of Agricultural Water Policy (OAWP), and CLUE distributed a funding RFP to IFAS faculty. A total of 26 proposals were sent to OAWP and the following received funding for 2020-2021.

- Equine manure management through composting: a look at compost system design and management
- Statewide soil moisture sensor network to build capacity and collaboration with UF/IFAS Extension agents, specialists, and FDACS technicians while encouraging producers to implement Best Management Practices
- Development of BMP guidance for using controlled release fertilizers in corn and watermelon
- Sustainable fertilizer type and application methods for north Florida field corn production

- Hands-on training on utilizing soil mapping and nitrogen calibration strips to optimize row crop nitrogen use in Florida
- Quantification of leaching potential across irrigation management levels in drip irrigated tomato
- Demonstration of cover crop BMPs to promote water conservation in western Florida
- Maximizing phosphorus bioavailability for potato production in Hastings
- Promoting water quality and conservation, on cattle ranches, through Best Management Practices via a demonstration plot at the Hendry County Extension Office
- Development of BMP application for using controlled release fertilizer in north Florida potato production

INCORPORATING SENATE BILL 712 INTO AG BMP EDUCATION

Senate Bill 712 became the Clean Waterways Act in July. Immediately UF/IFAS began to receive numerous questions about the law. Working together, FDACS OAWP and Extension Agent Mark Warren developed an FAQ letter to address many of the questions. As a follow up, questions were collected from IFAS faculty to create an FAQ list. Finally, an in-service training was offered to further educate county faculty and have their questions addressed directly by OAWP.

Michael Dukes, Lakesh Sharma, Emily Eubanks, Mark Warren, CLUE faculty, staff, and Ag BMP faculty

Taking Responsibility for Protecting Earth's Resources with the Sustainable FloridiansSM Program

The UF/IFAS Sustainable FloridiansSM (SF) program guides Floridians on how to take individual responsibility for protecting Earth's limited resources.

TEAMING UP WITH DEVELOPERS

The program is focused on measurable sustainability performance of new, large-scale developments with the Sustainable Floridians Benchmarking and Monitoring Program. By taking a holistic approach addressing all phases of land development (planning, construction, and post-construction) and establishing a comprehensive and phased framework for benchmarking and iteratively measuring, monitoring, and verifying sustainability elements (e.g., soils health, water quality, operational efficiency, energy and water conservation, habitat protection, and mobility) of Florida's new land development projects, the SF Benchmarking and Monitoring Program aims to shift the Florida built community status quo from resource depleting to replenishing, restorative, regenerative, and resilient.

Initial Benchmarking and Monitoring Program's pilot projects and "living laboratories":

- A 59,000-acre master development of regional impact with a 50-year build out timeline
- A 30,000-acre "Eco-Life" residential development focused on preserving a natural freshwater chain of lakes in Central Florida
- And a 2,000-acre residential community being planned as a "5-generation Sustainable Small Village" that is anchored by a sustainable communities education center.

By partnering with these project's lead consultants and development team professionals, Sustainable

FloridiansSM has the capacity to creatively explore and push the bounds of resource conservation and sustainable living performance for tens of thousands of homes and Florida residents for generations to come.

TRAINING CITIZENS

Developed in partnership with the Florida Energy Systems Consortium (FESC), SF uses team teaching, co-learning, and an innovative "discussion-to-action" format to engage, inform, and empower participants. This approach allows participants to implement conservation and efficiency actions in their own lives and to serve as leaders of sustainability in their Florida communities. The program includes modules on consumerism, food systems, energy, water, climate change and sea-level rise, transportation, and community leadership.

Jennison Searcy Kipp, CLUE faculty

INSPIRING BEHAVIOR CHANGE USING THEMES

FOOTPRINTS: adverse ecological impacts of our behavior

HANDPRINTS: positive actions to reduce individual footprints

CONNECTIONS: thinking critically and holistically about the relationships among community vitality, the natural environment, and economic systems

On the Airwaves: Florida-Friendly Landscaping™ on Radio & Television

Florida-Friendly Landscaping™ (FFL) takes to the radio and television airwaves to expand its public outreach. Launched during 2020, the *FFL in a Minute* radio show airs twice each weekday on the University of Florida's public radio station WUFT-FM. Upcoming in 2021, UF/IFAS Extension will present a new television program, *Flip My Florida Yard*, premiering on ABC affiliates statewide in April. The show will highlight FFL's sustainable landscaping practices.

RADIO

FFL in a Minute airs for one minute in the morning during NPR's *Morning Edition* and one minute in the afternoon during *All Things Considered*. A new segment airs each weekday. The WUFT-FM listening area includes 19 counties in north central Florida, reaching up to 80,000 listeners

per week. Daily radio topics include all aspects of FFL principles. Scripts and the original air date are archived on the FFL website, along with the audio recording of each segment. The website also provides links to additional resources on each topic.

TELEVISION

The *Flip My Florida Yard* television show will feature Florida-Friendly Landscaping™ sustainable practices that can be incorporated into a show-stopping yard makeover.

Filming began in mid-2020 and the ten half-hour shows of the first season are nearly ready for the April 2021 launch. The ten homes selected for the first season were chosen from over 1,200 applicants located all over Florida. Each show

Image was taken prior to national guidelines of face coverings and social distancing.





centers on a dramatic yard “flip” accomplished within eight hours of organized chaos. Ordinary yards are transformed into a showcase Florida-Friendly yard.

Each of the ten makeovers is professionally designed and installed by a team of expert landscapers, in consultation with FFL staff and other UF/IFAS Extension experts. The Florida Department of Environmental Protection (FDEP) sponsors the program and reviews show content to ensure that they project a consistent statewide message reflecting FDEP’s and FFL’s mission for water conservation and pollution prevention.

For each show, host and show creator Chad Crawford guides the audience through the flip. It starts with the homeowner’s original yard and caps off with the big reveal to the homeowners

who have been whisked away for the day for a visit to a nearby state park. Along the way, host Chad checks in with the professional landscaping crew doing the install while also querying local Extension agents on the why’s of the nine FFL principles and how they were leveraged to solve the landscaping challenge addressed in that week’s episode.

Each half-hour show also includes a short stand-alone *Yard Science* segment featuring UF/IFAS specialists and other experts discussing how FFL landscaping contributes to preserving Florida’s environment. In addition, viewers are pointed to information resources available to them so that they can envision their own yard flip.

Esen Momol, Tom Wichman, Claire Lewis, Jennifer Marvin, John Bossart, CLUE faculty and staff

Certifying Landscape Professionals for Florida's Sustainable Future

The Florida-Friendly Landscaping™ (FFL) program offers two professional certifications to help ensure that future Florida landscapes are sustainable and resilient.

GREEN INDUSTRIES BEST MANAGEMENT PRACTICES

The Green Industries Best Management Practices (GI-BMP) training program is legislatively mandated for those landscape professionals who apply fertilizer commercially. Despite the disruption in 2020 due to the pandemic, the GI-BMP program still trained 3,002 individuals statewide, of whom 2,686 received their GI-BMP certification. This was made possible by adding Zoom trainings to the online and DVD options already available. Since the GI-BMP program's inception in 2006, 67,705 individuals have been trained and 56,922 were awarded GI-BMP certification.

FLORIDA-FRIENDLY LANDSCAPING™ CERTIFIED PROFESSIONAL (FFLCP) PROGRAM

In 2019, the FFL program instituted the Florida-Friendly Landscaping™ Certified

Professional (FFLCP) Program. This program builds on FFL's foundational goals of nonpoint source pollution prevention and water conservation. It recognizes the ever-evolving landscape paradigms and places an emphasis on biodiversity and landscape ecology. Intended to compliment other professional landscape certifications, the FFLCP program has a focused emphasis on mitigating nonpoint source pollution and improving water quality. It certifies those professionals who have demonstrated the ability to apply FFL's environmentally sustainable landscape management practices. The FFLCP program target audience includes local government code enforcement staff and other landscape professionals, including landscape designers, installers, and maintenance contractors. Since its launch in December 2019, 60 individuals, including 20 instructors, have completed the training to be FFL Certified Professionals.

Esen Momol, Claire Lewis, Tom Wichman, Whitney Elmore, CLUE faculty, staff, and county partners



Engaging Gardeners through a Virtual Book Club

In April 2020, the Master Gardener Volunteer (MGV) Program invited Florida's gardeners to a community reading of *Foodscape Revolution*, by Brie Arthur. This was the beginning of the Florida Master Gardener Volunteer Book Club. Four books later, reading and growing together with hundreds of Master Gardener Volunteers (MGVs) and gardening enthusiasts has been one of the highlights of this challenging year.

Titles were selected to appeal to MGVs and Florida's gardening community. Each book aligned with Extension's mission of supplying science-based solutions to everyday problems and touched on a seasonally appropriate area of gardening. The 2020 books included "*Foodscape Revolution*," by Brie Arthur; "*Pollinator Friendly Gardening*," by Rhonda Fleming Hayes; "*Seeds*," by Thor Hanson; and "*Bringing Nature Home*," by Douglas Tallamy. Reading continues in 2021 with "*Composting for a New Generation*," by Michelle Balz. All five of the authors communicated with the MGV Program and three have agreed to co-host live, virtual book club meetings.

Throughout the year, the Florida MGV Book Club invited participants to share their thoughts as they read along by publishing a reading schedule and posting regular prompts. We held ongoing book discussions, primarily through the MGV Program's Facebook Page, the private Florida MGV Book Club Facebook discussion group, and posts to the MGV Instagram account. Weekly posts offered relevant Extension content as well as questions and excerpts for discussion. A final live discussion concluded each title and included members, Extension experts, and the author (if available) in the discussion.

Launching a statewide book club was no small undertaking but the response from Florida's

gardeners has been fantastic. Over the course of nine months, over 200 social media posts were produced and received thousands of comments, posts, reactions, and shares in response. Live-streamed meetings with the authors were particularly popular, with as many as 108 readers taking part in live discussion. As a result, members report adopting a variety of Extension recommended practices, and volunteers and Extension agents shared plans to implement what they learned through local outreach. Some county Extension programs even started their own local book clubs because of the statewide example. The Florida MGV Book Club membership numbers more than 600 at the end of 2020 and will continue to read and grow in the new year.

Wendy Wilber and Madeline Lyer, CLUE faculty and staff



Despite a Pandemic, Volunteers Still Served in 2020

The Florida Master Gardener Volunteer (MGV) program is active in 58 counties with 3,900 volunteers. Even during a pandemic, the Florida MGVS were able to contribute to the UF/IFAS Extension service and volunteered 186,000 hours. A volunteer hour is valued at \$24.93 in the state, resulting in a contribution worth \$4.6 million to the citizens of Florida. Despite the limitations of stay-at-home orders, MGVS were able to volunteer by answering horticulture questions via phones and email. They also held horticulture trainings for Extension clientele via online learning platforms such as Zoom. And they were able to increase their personal horticulture expertise by logging over 60,000 continuing education credits. Additionally, 700 new MGV trainees were trained to become active in the organization.

Wendy Wilber, CLUE Faculty

FLORIDA MGV PROGRAM: 2020 BY THE NUMBERS

58 COUNTIES

3,900 VOLUNTEERS

700 MGV INTERNS TRAINED

186,000 VOLUNTEER HOURS
that contributed **\$4.6 MILLION**

Over **60,000 CONTINUING**
EDUCATION UNITS

Master Gardener Volunteers Impact Urban Agriculture

Master Gardener Volunteers are making an impact in urban agriculture in Broward County. To address issues unique to the growing conditions of urban Broward County, MGVS began a quarter-acre demonstration vegetable garden in 2018.

Broward County is the second-most populous county in Florida. The eastern third is fully developed. The marsh of the central Everglades spans its western two-thirds. Most of the older

residential properties cover less than a quarter-acre. New developments produce stacks of houses on plots with zero lot lines, as buildable land is becoming scarce. The county sits on mainly sand-covered limestone or back-fill rubble that offer little organic nutrients and high porosity. Surface water and rainfall seem plentiful in South Florida, but water consumption likely outpaces water retention at times during the year. The need

for fresh, locally grown produce is evident in the number of community gardens, urban farms, and green markets that have developed in the last ten years.

The Broward County MGVS vegetable gardening team teaches future vegetable gardeners techniques to maximize edible production in school gardens and home gardens. They provided free workshops and YouTube videos for teachers in the Broward County public school system, as well as the general public. Granted with the 2019 Florida MGVS Legacy Award, the vegetable gardening team was able to increase the demonstration garden with earth boxes, self-watering grow buckets, grow bags, and other alternative gardening techniques.

This program grew 150 pounds of fresh vegetables in the demonstration garden and donated this produce to LifeNet4Families, a non-profit serving Broward's homeless and hungry citizens. Along with the UF/IFAS and Broward County Family Nutrition Program, MGVS provided vegetable education to 640 elementary students.

These Master Gardener Volunteers continue to make an impact in urban agriculture in Broward County.

Lorna Bravo, MGVS faculty

Using Past Experience to Engage Current Issues: Victory2020 Gardeners

With a renewed public interest in vegetable gardening in 2020, the virtual Victory2020 Garden Community was developed as a multi-generational program. Based on the concept of the historical victory gardens of the 1930s, this modern version originated in Columbia and Marion counties, and quickly spread to Orange and Sumter counties as well. The goal was to use various media formats to reach clientele during the pandemic.

Extension agents from all disciplines created presentations and resources using a wide range of social and digital media platforms. Over 2,300 local, national, and global participants were engaged through seed packet mailings, youth record books, educational posters, social media posts, YouTube videos, and emails to participants.

The successful cross-programmatic efforts from the Victory2020 Garden Community Program

reached gardeners worldwide in five countries, two districts/territories, and 40 states. The program created a sense of community and provided education related to gardening, personal well-being, food safety, history, and careers in plant science.

Erin Harlow, Maxine Hunter, and Tia Silvasy, CLUE Affiliates, MGVS Faculty, and FFL Faculty

**90% reported
INCREASED KNOWLEDGE** of gardening.

**76% reported
INCREASED HOUSEHOLD
CONSUMPTION**
of fresh vegetables.

Communicating through Digital Platforms

WEBSITES

Gardening Solutions (<https://gardeningsolutions.ifas.ufl.edu/>) is the flagship consumer gardening website for UF/IFAS. Gardening Solutions brings homeowners and gardeners the best information about Florida-Friendly plants, sustainable landscape practices, and ways to beautify their yards and gardens.

In 2020, 2.2 million people visited Gardening Solutions. With over 2,000 pages, the most popular are about native plants and vegetable gardening. We added 79 new articles to Gardening Solutions this year and revised dozens more. With more than 60% of visits now coming from mobile devices, the next step for Gardening Solutions is a responsive redesign.

The UF/IFAS Extension Florida Master Gardener Volunteer (MGV) website (<https://mastergardener.ifas.ufl.edu/>) not only provides information about the program, but is also home to the *Neighborhood Gardener* newsletter, the MGV book club, the center's gardening and landscaping webinars, and a very popular event calendar. As the pandemic closed the doors of our county Extension offices, agents and Master Gardener Volunteers moved their educational events online, making the event calendar a central location for counties to share their efforts.

The new UF/IFAS CLUE website (<https://clue.ifas.ufl.edu/>) launched January 2020. Plans for the site include incorporating the Program for Resource Efficient Communities (PREC) and H₂OSAV program's web content.

The CLUE communications office has also taken on management of the Agricultural Best Management Practices website (<https://bmp.ifas.ufl.edu/>).

In addition to these efforts, the Florida-Friendly Landscaping™ Program team has been working on a website redesign throughout 2020. Launching in early 2021, the new website will be organized by audience and have fresh content.

SOCIAL MEDIA

In 2020, COVID-19 kept millions of Americans at home, pushing them to connect virtually in record numbers. In response to social distancing, content published by CLUE on social media this year was more hands-on and engaging than ever before. Weekly DIY articles were published to help followers enjoy some garden therapy during periods of heightened stress. A surge in home vegetable gardening led us to prioritize content for new and novice vegetable gardeners. A weekly plant identification trivia game launched, as well as the Florida MGV Book Club. All of these efforts engaged a remote audience entirely through social media platforms.

Our social media accounts experienced significant growth in 2020. The Master Gardener Volunteer (MGV) program's Facebook account gained 10,096 followers during 2020, putting the end-of-year total at 26,525. During this period, 109,001 people clicked on Facebook posts and a total of 1,879,811 impressions were made. By way of comparison, total impressions in 2019 was only 153,836.

Other MGVS accounts performed similarly well. Instagram activity resumed late in 2019 and the growth on this popular platform has been very encouraging. The MGVS account started the year with 2,089 followers and ended with 5,548 for a year of 265% growth. The MGVS Twitter account saw significant gains, from 1,843 to 2,073 followers.

In addition to the popular MGVS social media accounts, the CLUE (formerly CLCE) Twitter account and YouTube channel also saw growth. The CLUE Twitter account promotes the work and accomplishments of our faculty, as well as webinars and events like the Urban Landscape Summit. The CLUE YouTube channel supports a variety of Extension professionals' efforts by making their video content available and accessible to the public. In 2020, 39 original videos were added to the channel and playlists were created for a variety of Extension programs, including Victory2020Gardens, Sustainable Home Food Production, 4H Resources, and the Florida MGVS Book Club.

Finally, the Florida-Friendly Landscaping™ (FFL) program maintains an active presence on Facebook with 9,887 followers and since mid-2020, on Instagram as well with 1,081 followers. FFL's three target audience outlets, the Florida Yards & Neighborhoods, Green Industries Best Management Practices, and (since late 2020) Florida-Friendly Communities programs, each create three unique posts per week that are relevant to their target audience and FFL's core mission to reduce nonpoint source pollution through responsible and sustainable landscaping practices. For 2020, this amounted to over 250 posts promoting FFL topics that were distributed simultaneously through both Facebook and Instagram.

Emily Eubanks, Jennifer Sykes, Madeline Iyer, Natasha Roberts, Wendy Wilber, Jennifer Marvin,
CLUE faculty and staff



Meeting Learners Where They Are: Virtual Learning Events

In 2020, CLUE hosted 64 virtual learning events with 14,311 live participants and recorded views. Virtual learning events included webinars, conferences, book club meetings, and other Extension activities.

Webinars were the most popular virtual learning events and were held weekly throughout the year. Each presentation meets the needs of a specific audience. Monthly webinars are offered to Florida Master Gardener Volunteers and Florida-Friendly Landscaping™ Professional Landscape audiences.

In addition to webinars, several large virtual conferences were supported including the Ag BMP Summit, the Master Gardener Volunteer Leadership School, and the Northeast Regional

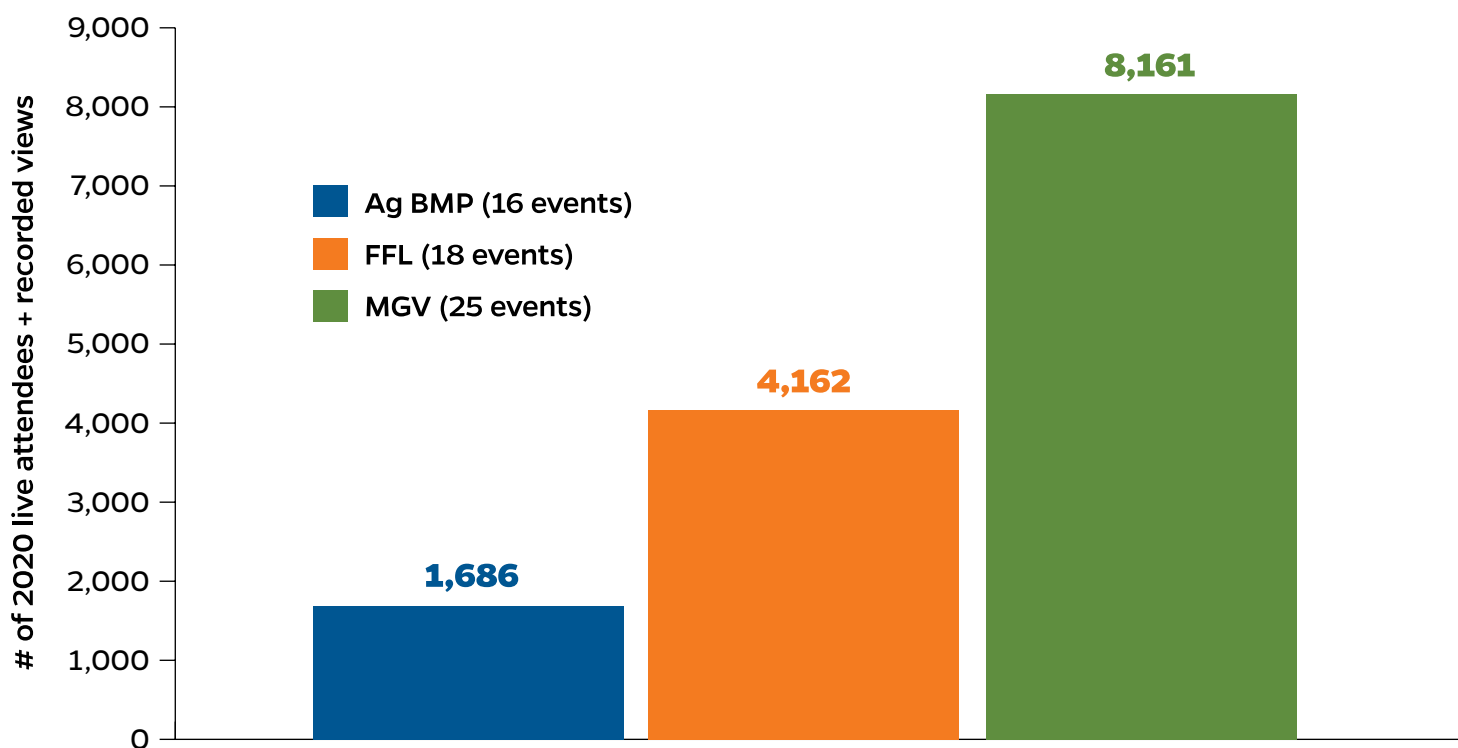
64 VIRTUAL
learning events

14,311 LIVE PARTICIPANTS
+ recorded views

Master Gardener Volunteer Conference. These conferences were offered in a variety of formats, ranging from three months of weekly webinars to two days of intensive learning.

Emily Eubanks, CLUE staff

VIRTUAL LEARNING EVENTS





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

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