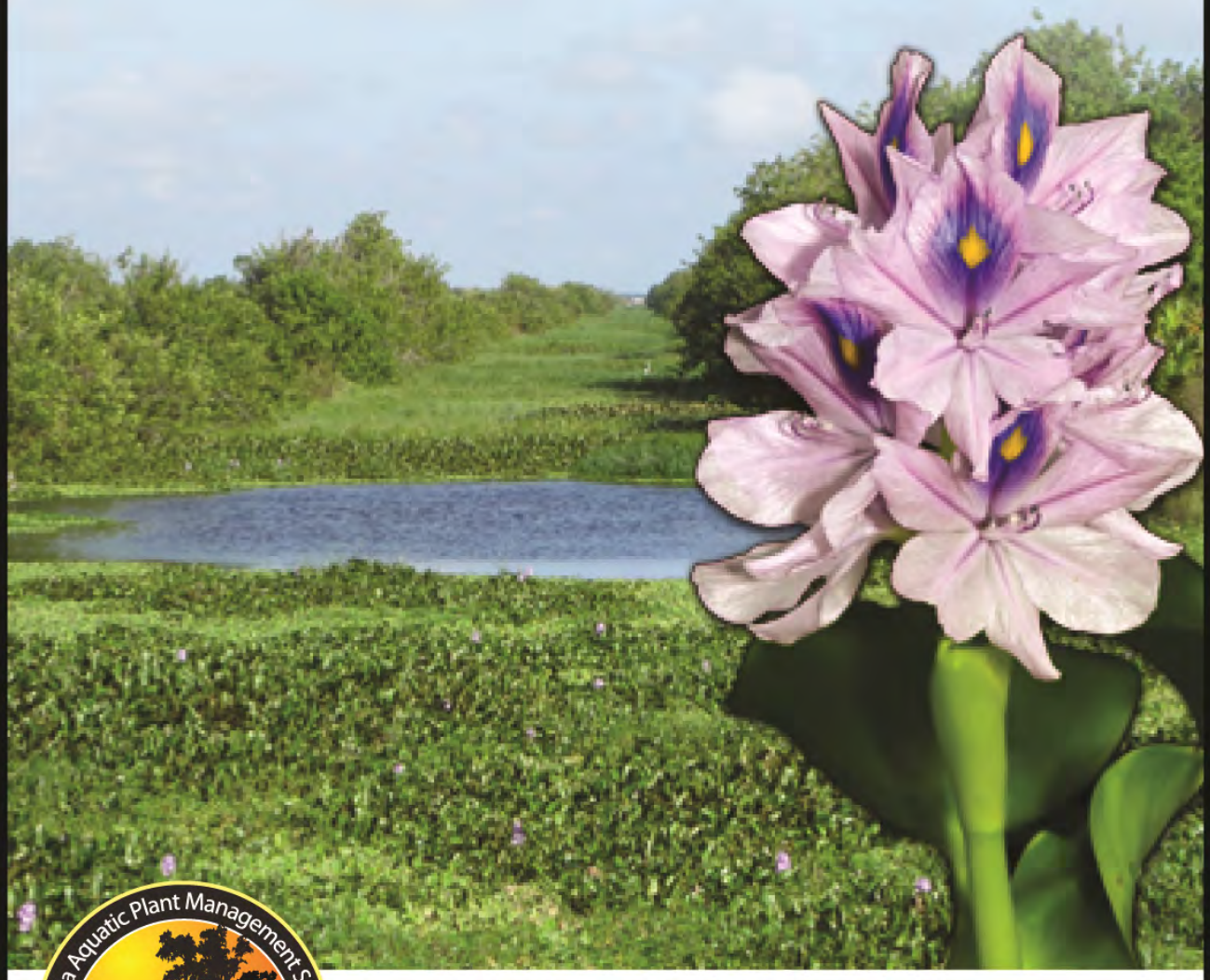
FAPMS

# 40th Annual Training Conference



## Florida Aquatic Plant Management Society

established in November 1976

**October 17-20, 2016 – Daytona Beach FL**

# Book of Abstracts

## Tuesday, October 18

***Keynote: FAPMS - 40 years of preserving Florida's water heritage***
***Joe Joyce,*** University of Florida IFAS (retired)
Email: joejoyce@ufl.edu

Why and who established Florida Aquatic Plant Management Society (FAPMS) four decades ago? Aspects discussed will be the politics and status of aquatic weed control, characteristics of aquatic weed control personnel, herbicide labeling, the people who led the effort, and the purposes for which FAPMS was established.

***Florida's invasive plants: A capital concern***
***Sarah Busk,*** The Advocacy Group at Cardenas Partners
Email: sjb@cardenaspartners.com

An update on the policy, politics and legislature that affect Florida's Invasive Plant Management Program

***Intervening in major algal "blooms" in Florida***
***John Rodgers, Jr.,*** Tyler Geer, Alyssa Calomeni, Kyla Iwinski and Ciera Kinley, Clemson University
Email: jrodger@clemson.edu

Recently, factors that could be considered a "perfect storm" resulted in a massive algal "bloom" in south Florida. Scientists are well aware that our ability to accurately predict the onset of an algal "bloom" is limited as the causes are multifaceted and there are usually several to many moving parts. As scientists and practitioners recognize, dealing with a 'bloom" like this is best approached in a tiered fashion. If the algal "bloom" is massive, and the affected area is concomitantly large, usually limited resources are focused on management units in the affected area that are prioritized by the critical services that they provide (e.g., potable water, swimming, boating, habitat, etc.). The tools (mechanical, chemical, etc.) for management of algae in critical water resources are limited. Through adaptive water resource management, the most efficient approaches can be brought to bear on an algal "bloom".

***UPI - Tools for a successful aquatic plant management program***
**Jeremy Slade** and Justin Nawrocki, United Phosphorus, Inc.
Email: Jeremy.slade@uniphos.com

The active ingredient endothall has been used as an herbicide since the late 1950's. Endothall is currently manufactured by United Phosphorus, Inc. (UPI) as an aquatic herbicide under the trade names: Aquathol K, Aquathol Super K, Hydrothol 191, and Hydrothol Granular. More recently endothall has been formulated as a premix with diquat, with the tradename AquaStrike. UPI also has its own brand of copper

products, Current and Symmetry. In this presentation I will discuss technical information (product labels; treatment rates, PPE and restrictions, regulatory status) on current endothall and copper products, including control of several aquatic plants and algae at varying rates alone and in combination with other aquatic herbicides. Collaborative treatment regimes and services will also be discussed. UPI is committed to providing superior product stewardship and services to insure aquatic plant management programs are effective and cost competitive.

***Innovating algae and weed management: new and not so new approaches***
**Michael Shaner**, SePRO
Email: michaels@sepro.com

Weed and algae management has not gotten any less complicated during the past two decades. With eutrophication of lakes, higher stake-holder expectations, and different weather patterns, the need for innovation solutions has never been higher. In 2017, two new innovations are coming: TIGR and Procellacor. TIGR is a selective grass herbicide, while Procellacor is a new solution for some of our most troublesome problems: Hydrilla, baby tears, Hygrophila, Rotala, Limnophila and many more. Eutrophication of lakes has led to the constant algae management regime: treat and repeat with little improvement. SePRO has developed a concept called the hammer and broom approach to algae management, changing the paradigm. Lastly, with increasing flow dynamics, Sonar pellets provide better and improved results over traditional liquid solutions. Utilizing better formulations is innovating the management options for aquatic applicators.

***Syngenta industry updates***
**Scott Jackson**, Syngenta
Email: Scott.jackson@syngenta.com

This presentation will include a brief overview of Sygnenta aquatic products and a discussion of current status of reregistration of diquat.

***Product update from CPS***
**Moe Finke**, Crop Production Services
Email: mdfinke@icloud.com

This presentation will discuss water quality and its effect on weak acid chemistry. Along with the adjuvants (Choice Weather Master and LI 700) they will help to get the best performance from the weak acid chemistries. This talk will also include product updates for Tactic, Liberate, Spreader 90 and Aqua Mark AquaticDye (Blue and Black).

***Advancements in peroxygen algacide***
**Tom Warmuth**, BioSafe Systems
Email: TWarmuth@biosafesystems.com

BioSafe Systems' presentation will be geared towards giving a brief overview of the products that we offer to businesses in the Aquatic industry. This will include a brief synopsis of BioSafe Systems as a company, our mission, and our products and services. Following this introduction the presentation will move into a short PowerPoint presentation that focuses on our Aquatic products GreenCleanPRO, a granular algaecide, and GreenClean Liquid 5.0, a Peroxygen based liquid algaecide, Calcis Liquid Pond Lime, and the GreenClean Pond Block, our newest bacterial product. There will be an overview on the chemistry of both GreenCleanPRO and GreenClean Liquid 5.0. The presentation will end with new developments and techniques with both GreenCleanPRO and GreenClean Liquid 5.0, a quick discussion regarding the direction BioSafe Systems is heading in and our willingness to work closely and cooperatively with distributors/applicators/researchers, and finally a few minutes for questions at the end.

***Restoring the earth one foot at a time***
**Brian Fischer**, Lake & Wetland Management, Inc.
Email: brian.fischer@lakeandwetland.com

This presentation will focus on new innovations in the erosion control industry. Brian will be doing a product update of a new method of shoreline restoration called Dredgesox, featuring amphibious work boats.

***Texas Aquatic Harvesters and much more***
**Mike Hulon**, Texas Aquatic Harvesting
Email: texasaquaticmh@aol.com

Texas Aquatic Harvesting, Inc. (TAH) has been in business in Florida since 1995. TAH has some of the largest in-lake mechanical harvesters available to work in fresh water. Not only do we construct our own harvesters but we also manufacture shredder or "Cookie Cutter" type machines. We operate our havesters daily and some have been working since the 1980's. Recently TAH staff manufactured 10 brand new Tiger Cut machines and sent them to Iraq for work in the Euphrates and Tigress Rivers. This presentation will introduce attendees to TAH staff, machinery and all necessary equipment needed to assist with any large scale aquatic plant related problem.

***Product updates from WinField***
**Dharmen Setaram**, WinField Solutions
Email: DSetaram@landolakes.com

This presentation will include a brief overview of WinField's aquatic and natural areas products and a discussion related to product updates.

***Invasive Plant Management Association (IPMA) state FY 2015-16 summary and FY 2016-17 legislative session update***

**Jim Burney,** Invasive Plant Management Association
Email: jburney@avcaquatic.com

In response to the continual challenges facing the funding of invasive plant management operations during each State Legislative Session and the potentially negative influence on Florida's natural resources and those dependent on managing natural lands and waters, the not-for-profit 501(c)(6) advocacy organization, Invasive Plant Management Association (IPMA), was incorporated in 2012. IPMA was organized with the intent to provide the voice of upland and aquatic invasive plant management during our inaugural legislative session with the Mission being: "To foster sustained State funding for invasive plant management measures as an integral part of managing Florida's natural lands and waters". In 2014, the Strategic Outlook remained to foster an ingrained culture of sustainable State funding for invasive plant control through continued representation by the lobbying firm Lewis, Longman & Walker, P.A. Specific goals for the 2015 Legislative Session (FY 2015-2016) and those for the current FY 2016-2017 include: Maintaining (or increasing) the Invasive Plant Management Trust Fund; Representing invasive plant management as an integral component of Amendment 1; and Continuing discussions for support of dedicated funding for invasive plant management on other State lands (in lieu of FWC Trust money) and prevention. The purpose of this presentation is to provide a summary of FY 2015-16 and a FY 2016-17 update of the current Session.

***FAPMS partnering with CISMAs***

**Kelli Gladding,** East Central Florida Cooperative Invasive Species Management Area
Email: kellig@sepro.com

What is a CISMA (another acronym to learn) and why are they important? Is there a CISMA near me? Should a FAPMS member be involved? This past spring, FAPMS Board of Directors approved to monetarily support an aquatics workshop organized by the Central Florida and East Central Florida CISMA's. These workshops typically offer free CEU's, learning plat form for EDRR species and occasionally lunch. This type of support is a good way for FAPMS to help provide education and outreach to the membership throughout the year.

***Invasive plant education – Invading a classroom near you!***

**Dehlia Albrecht** and Karen Brown**,** University of Florida IFAS
Email: dehliadee@ufl.edu

For the past 11 years, the University of Florida/IFAS Center for Aquatic and Invasive Plants has been collaborating with teachers throughout the state of Florida to develop educational curricula for grades 2 through 12 on the topic of invasive plants and plant management. Two key components of these outreach efforts are a 5-day teacher training workshop, Plant Camp, and on-site classroom demonstrations of Lakeville – A Natural Resource Management Activity. FAPMS has generously supported both activities. These activities were developed with the goal of motivating educators and outreach specialists to learn more about invasive species and then bring their new knowledge back to classrooms, workshops, associations, or other venues serving current and future citizens. This presentation will provide an overview on CAIP, Plant Camp and Lakeville and present key findings from our pre- and post-test results and evaluations from both Plant Camp and Lakeville.

***FDACS compliance, an applicator's perspective - or why it's important to read labels thoroughly and often***

**Jerry Renney,** Applied Aquatic Management
Email: jerry@appliedaquaticmgmt.com

Discussion will include examples of label variations between differing trade names and production cycles of same trade names. Frequency data regarding FDACS use inspections by industry will be covered as well as common points of discussion during use inspections within Aquatics.

***A little rebellion now and then is a good thing***

**Carlton Layne,** Aquatic Ecosystem Restoration Foundation
Email: CLayne@Aquatics.org

This presentation is a reflection on the creation of the FAPMS and its inception.

## Wednesday October 19

***Welcome to the jungle: Hydrilla with an appetite for destruction!***

**Amy Giannotti** and Timothy Egan**,** City of Winter Park
Email: agiannotti@cityofwinterpark.org

The City of Winter Park has been actively managing hydrilla in its lakes for 60+ years. Historically, during the 1960s-80s, aquatic plant management efforts focused on a combination of mechanical removal and (sometimes heavy) doses of Hydout. With the advent of fluridone in the 1990s, whole lake treatments performed every 3-8 years were adequately controlling hydrilla throughout the city until 2005. In just two short years, the cost of chemically controlling hydrilla more than tripled, and high rates of fluridone posed a danger to native plant communities. Whole-lake treatments using endothall during winter months seemed to initially control hydrilla then, but in 2009, the first case of cross-resistant hydrilla (tolerant to both fluridone and endothall) was documented in Lakes Maitland and Minnehaha. This added challenge, coupled with luxury real estate properties in an urban setting, further complicated management efforts. Recent data illustrate the importance of herbicide rotation and altering products with differing modes of action to in order to properly manage and control hydrilla abundance and distribution. This update will provide information on chemical rotation and the integration of grass carp as effective tools for hydrilla management.

***New IPM approach for hydrilla management: Research update***

**Jim Cuda,** E. Weeks, J. Shearer, M. Jackson and M. Hoyer, University of Florida IFAS, USACERDC and USDA ARS
Email: jcuda@ufl.edu

Resistance and/or tolerance to the herbicides fluridone and endothall have been confirmed in several populations of the aquatic weed hydrilla (*Hydrilla verticillata*) in Florida, USA. This is a serious problem because these herbicides have been widely used in aquatic systems for over 30 years. In this study, we tested a novel IPM approach for hydrilla control by integrating selective insect herbivory by the hydrilla tip miner *Cricotopus lebetis* with a disease causing fungal pathogen *Mycoleptodiscus terrestris* (Mt) and low concentrations of the acetolactate synthase (ALS) inhibiting herbicide imazamox recently registered for aquatic use.

***The effect of burial duration, daylength and desiccation on sprouting of crested floatingheart***

**Ian Markovich,** Lyn Gettys and Kyle Thayer, University of Florida IFAS
Email: ijmarkovich@ufl.edu

Crested floatingheart (*Nymphoides cristata*) is an attractive aquarium and water garden plant that escaped cultivation in the 1990s. It has since invaded Florida's aquatic systems and has caused such severe impacts that the species is now listed as a noxious weed by FDACS. Crested floatingheart reproduces mostly through the production of ramets, which are clusters of rhizomes produced at each juncture of leaf and petiole. Previous research showed that ramets buried under as little as 2 cm of substrate failed to sprout (and therefore did not produce new plants) during an 8-week culture period, but little is known about how burial duration affects sprouting. These same studies also showed that desiccation prevented sprouting, but the shortest "dry" interval examined was 1 month. In addition, there are no reports on the effects of daylength on sprouting. This presentation will outline the results of research projects conducted at the UF IFAS Ft Lauderdale Research and Education Center that were designed to provide information about the effects of burial duration, short-term desiccation and daylength on sprouting of crested floatingheart ramets.

***Inventory and potential harvesting of non-native aquatic plants in coastal urban waters***

**Phillip Bellamy** and Hyun Cho**,** Bethune-Cookman University
Email: philip.bellamy@students.cookman.edu

Non-native aquatic plants can outcompete natives and disturb ecological processes as well as commercial and recreational activities. In coastal areas of Florida, aquatic plants can also spread through surface runoff and channelized flows into canal systems which are often connected to coastal ecosystems that support an abundance of fish and wildlife. Floating plant fragments can travel with increased stormwater to areas of higher salinity at the outlets of outfall canals, and become a source of additional organic matter and nutrients to the coastal water bodies. This project goal is to delineate areas that contribute to high surface runoff to a canal system in Daytona Beach, FL. Plant surveys were conducted in nearby ponds, ditches, and canals. Floating plants including, but not limited to, *Egeria, Lemna sp., Salvinia minima, Eichhornia crassipes,* and *Pistia* were found in the man-made waterbodies. Digital Elevation Model, Land Cover/Land Use Image, and soil data were used to calculate a percent runoff coefficient per pixel (10m) to assess potential areas for a diversion pond to harvest and divert floating plants and plant fragments harvesting ponds.

***Aquatic and upland grasses***
**Candice Prince,** University of Florida IFAS
Email: cprince14@ufl.edu

Non-native grasses pose severe threats to native vegetation and ecosystem functions in both wetland and upland habitats throughout the state of Florida. Identification and management can be a challenge for many of these species. The purpose of this talk is to provide an overview of the top invasive grasses in the state. Here, we will discuss the identifying characteristics of several aquatic and upland grass species, such as torpedograss, napier grass, cogongrass, etc. In addition to identification, we will address chemical, mechanical, and cultural control methods for each species, as well as preventative measures to limit dispersal into new sites.

***Invasive grass control with sethoxydim in Florida***
**Stephen Enloe,** University of Florida IFAS
Email: sfenloe@ufl.edu

Invasive grasses are a major threat to many aquatic systems in Florida. Species such as torpedograss, paragrass, and West Indian marsh grass often form dense monotypic stands that are very difficult to selectively control. Sethoxydim is a grass-selective herbicide that received an experimental use permit for Florida in 2015. Sethoxydim has considerable promise for controlling many troublesome species with minimal non target damage. This talk will present the results of several studies conducted in 2015 and 2016 that examined the role of sethoxydim for aerial and spot treatment to control species including torpedograss, paragrass, and West Indian marsh grass.

***Treatments and trials around south Florida***
**Mike Bodle,** South Florida Water Management District
Email: mbodle@sfwmd.gov

Lake Okeechobee treatments to manage cattails have opened habitat that roosting and breeding birds now utilize near their rookeries. Also, some cattail work has been done to improve safety of boat trails. Brazilian pepper work has been done on Lake O to improve habitat of the several hundred acre Observation Island along the western perimeter of the lake. Outlier melaleuca have been controlled in order to maintain the years of management there that has eliminated thousands of acres that had spread since their being planted there in the 1960s. Also, included will be preliminary results from field trials of “new” combinations to control roundleaf toothcup (*Rotala rotundifolia*) and crested floating heart (*Nymphoides cristata*).

***Taxonomic results and identification of the Ludwigia uruguayensis complex in Florida***
**Colette Jacono,** University of Florida IFAS
Email: colettej@ufl.edu

Results of cytological and morphological analysis on the *Ludwigia uruguayensis* complex reveals that the two taxonomic types, *L. hexapetala* and *L. grandiflora*, are present and can be clearly separated as discrete species in Florida. In addition, three distinct and stable entities within the *L. grandiflora* type are entirely set apart, two large with broad leaves and one small with narrow leaves. The small entity deserves species standing of its own and compares best with historic specimens from the southeast and Florida. Of the two large, broad leaved entities, the highly branching genotype found in the upper basins of the Kissimmee and the St. Johns rivers is severely invasive. Details will be presented for field managers to comfortably recognize *L. hexapetala* from the *L. grandiflora* types and from the other five-petaled species occurring in Florida.

***Efficacy of herbicides on Ludwigia hexapetala and Ludwigia grandiflora types in Florida***
**Afsari Banu** and Stephen Enloe**,** University of Florida IFAS
Email: afsari@ufl.edu

*Ludwigia hexapetala* and three taxonomic types of *L. grandiflora* identified in our larger study demonstrate phenotypic differences in growth habit and population structure. Whether taxonomic or phenotypic differences demonstrate differential sensitivity to herbicide management has not been determined. The objective of this study is to evaluate taxonomic types in Florida for their response to aquatic herbicides. Four herbicides were tested on five representative accessions of one month old plants in the greenhouse. Each herbicide was applied at seven different doses and on each accession in replicates of four. Shoot biomass was harvested 30 days after treatment (DAT) and total biomass after 60 to 75 DAT. Nonlinear regression analysis was performed on biomass dry weight by using the drc package in R by using three parameter log-logistic model and ANOVA was conducted to determine whether the regression model was an appropriate fit to data. Preliminary data indicated significant differences in population response to herbicide treatment. Final data will be presented.

***Maximum penetration or not? *applicator paper****
**Matthew Cole,** St. Johns River Water Management District
Email: mcole@sjrwmd.com

This presentation will focus on comparing the efficacy of three current surfactants to determine how they affect herbicide uptake.

***The use of anionic polymer blends to manage nutrients, keep water clean, and improve productivity***
**Eddie Snell,** Applied Polymer Systems
Email: Eddie.Snell@siltstop.com

Land activities around water dislodge small particles (turbidity and particulate) into the water body during construction, maintenance, and stormwater events. These materials cause many negative impacts upon a

water body. Water soluble anionic polyacrylamide (PAM) technologies can be utilized to enhance current Best Management Practices (BMPs). We are able to greatly reduce the loss of sediment from a site as well as mitigate impacts of sediment and or nutrients to a given water body. Water treatment versions of PAM in the anionic form have shown very low to no aquatic toxicity potential to the environment. Through various research and tests using polymer enhancement in conjunction with known BMPs have achieved 70-95% reductions in phosphorus along with 95% reduction in turbidity NTUs.

***There's an app for that***

**Tony Pernas,** Big Cypress National Preserve
Email: tony_pernas@nps.gov

Smartphones, tablets and their apps (application software) have become a useful tool in invasive plant control. The low cost of smartphones/tablets coupled with their computing power, sensors and information transfer have allowed for a variety of practical applications to be developed. These apps are contributing to the rapid collection, interpretation, and dissemination of invasive plant control data and are replacing many traditional handheld sensors, calculators, and data storage devices. In this presentation we will review many apps that may be useful to invasive plant control specialists in the field.

***EcoAnalytics and Canopeo: New tools to assist with surveying aquatic plant communities and monitoring aquatic plant management impacts***

**Dean Jones,** Ryan Moore and Michael Netherland, University of Florida IFAS, Gator Creek Technologies, LLC and USACERDC
Email: kdjones@ufl.edu

In recent years, point intercept survey methodology was modified to include simple subjective density ratings of sparse, moderate and dense in order to account for plant abundance. In addition, species density layers were combined with complementary hydroacoustic biovolume (% of water column occupied by vegetation) data utilizing simple GIS overlay methodology to form a more complete survey and picture of both species distribution and abundance. EcoAnalytics is a technology solution that automates processing, analysis, and visualization of point intercept data and overlay with processed hydroacoustic data without the need for complex or expensive GIS software packages. EcoAnalytics is a cloud based system comprised of three components including a field collection application, database and website for viewing processed data. EcoAnalytics greatly reduces the time associated with point intercept survey data collection and processing. Canopeo is a rapid and accurate green canopy cover measurement tool developed by Oklahoma State University, Department of Plant and Soil Sciences. Canopeo is used to quantify the percent canopy cover of live green vegetation based on a downward facing photo with a mobile device. It is also a cloud based system comprised of a field application, database and website. Although developed for use on agricultural crops, turf or grasslands, it has proven to be adaptable and useful in aquatics for monitoring treatment efficacy, impacts to non-target vegetation, and plant phenology studies. Examples of several studies conducted on Lake Kissimmee in central Florida will be used to demonstrate these technologies. Lake resource managers and researches utilizing these technologies for monitoring aquatic vegetation communities have the ability to rapidly generate data to guide and support management decisions as well as address stakeholder concerns.

***Practicing what we preach: Herbicide safety and awareness***
**Stephen "Monty" Montgomery,** Allstate Resource Management
Email: smontgomery@allstatemanagement.com

As properly trained and educated applicators we are aware of the need for a healthy respect for products we use on a regular basis. Familiarity in any job can lead to a lowering of alertness and an increased chance for accidents. In the field of vegetation management, such accidents have far reaching consequences. Personal safety, public safety as well as environmental concerns all can come into play when an applicator does not adhere to the regulations. This presentation will discuss the individual's role in safe herbicide applications and the responsibility entrusted to us as licensed professionals. It will also discuss label terminology, personal protection, accident prevention and spill management.

***USACE UAS applications for aquatic plant management***
**Victor Wilhelm,** US Army Corps of Engineers
Email: Victor.L.Wilhelm@usace.army.mil

USACE is at the forefront of using Unmanned Aircraft Systems for the management of aquatic plant growth. UAS provides field personnel a tool to map aquatic plants and delineate non-native and nuisance species from native and beneficial species. UAS is also being studied as a tool to release biological controls for invasive species management in difficult to access areas. The presentation will focus on efforts to use UAS for aquatic plant mapping and the releasing *Megamelus scutellaris* biocontrol for Waterhyacinth.

## Thursday October 20

***Introduction to the biology and ecology of cyanobacteria***
**Bruce Richards,** Weedoo Greenboat
Email: Bruce@weedooboats.com

*Cyanobacteria* (Blue-Green Algae or BGA) is likely the first photosynthetic organism on earth emerging from the primal ooze some *3.5 billion years ago*, creating molecular breathable oxygen and fundamentally driving the ecological balance for all marine and freshwater systems on the planet. This organism alters nutrient cycling, impacting the growth of native & exotic aquatic vascular plants. In highly eutrophic systems, cyanobacteria will dictate the balance of fish, macrophytes, plankton, zooplankton and invertebrate populations. *In Florida, the blooms of BGA, usually confined to freshwater, are now encroaching on estuarine channels decimating aquatic habitat as well as curtailing recreational usages*. Recent misconceptions about BGA have led to misguided public policy decisions relative to water usage. Cyanobacteria is harmful to mammalian health, producing toxins that damage internal organs; dogs, cats and even children have perished during extensive blooms. This session will introduce the participants to the critical role cyanobacteria plays on all aquatic life. We will also cover a summary of current remediation techniques that lessen the negative impact of this elusive, but fascinating creature.

***Establishing aquatic plants in the Lower Withlacoochee River: Some observations and recommendations***

**Bruce Jaggers** and Robert Lovestrand**,** Florida Fish and Wildlife Conservation Commission
Email: Bruce.Jaggers@MyFWC.com

Aquatic vegetation and specifically submersed aquatic vegetation (SAV) has been mostly absent or present in extremely low abundance in the Lower Withlacoochee River for at least the last 50 years. Herbicide applications in upstream Lake Rousseau have been blamed for this lack of aquatic vegetation. However, recent investigations indicate that other factors are much more likely to be responsible. These factors include but are not limited to extreme physical alterations of the watershed and river channel, altered hydrology, dredging, limited littoral areas and suitable substrates, poor light environment, increased salinities and grazing (particularly by manatees). It is recommended to test hypothesis that grazing pressure is a primary factor preventing the establishment and growth of aquatic plants (particularly SAV) within the Lower Withlacoochee River. These observations and recommendation are consistent with recent findings in the Crystal River (Kings Bay) restoration efforts.

***PROCELLACOR™ – Development of a novel herbicide technology for aquatic plant management in Florida***

**Mark Heilman,** Michael Netherland, Rob Richardson, Erika Haug, Jens Beets, Ben Willis and Kelli Gladding, SePRO Corporation, USACERDC, North Carolina State University and University of Florida IFAS
Email: markh@sepro.com

Aquatic weed control is challenged by the low numbers of herbicides registered for use in and around water. Management of aquatic invasive and nuisance plants is faced with increasing regulatory and technical challenges such as herbicide resistance, new weed species introductions, threatened and endangered species and infestations in higher exchange systems. New herbicide technology is much-needed to sustain the long-term success of past and current management. PROCELLACOR™ is a novel herbicide technology under development for aquatic use and anticipated for USEPA approval by mid-2017. PROCELLACOR (4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxyphenyl)-5-fluoro-pyridine-2-benzyl ester) has unique, low-rate, systemic activity for selective control of multiple Florida aquatic weeds. Collaborative studies have documented that in-water treatments of 20 - 40 ppb with short exposures of 24 – 72 hours are providing effective control of hydrilla (*Hydrilla verticillata*) and crested floating heart (*Nymphoides cristata*). PROCELLACOR also has activity on rotala (*Rotala rotundifolia*), hygrophila (*Hygrophila polysperma*), and slender spikerush / road-grass (*Eleocharis baldwinii*). PROCELLACOR shows selective, in-water and foliar activity on water hyacinth (*Eichhornia crassipes*), and invasive primrose (*Ludwigia* spp.). The common Florida native submersed plants tapegrass (*Vallisneria americana*) and Illinois pondweed (*Potamogeton illinoensis*) are tolerant to the herbicide as well as most common emergent native plants such as grasses, bulrushes, and cattail. In studies for registration, PROCELLACOR shows no mammalian toxicity and an excellent environmental profile for use in water supportive of wide margins of safety to fish and wildlife. These properties along with much lower application rates compared to current herbicides with similar uses has made PROCELLACOR a reduced risk candidate in its current federal review. The technical properties of PROCELLACOR for its major aquatic weed control uses will be reviewed along with latest data from laboratory and outdoor mesocosm efficacy studies and experimental field trials.

***The basics of pesticide resistance (Part I)***
**Fred Fishel,** University of Florida IFAS
Email: weeddr@ufl.edu

Pesticide resistance was first documented in 1914 with San Jose scale being resistant to lime sulfur. Since that time, resistance to fungicides was reported in 1940; then, a population of spreading dayflower was identified in 1957 in a sugarcane field in Hawaii. Today, there are more than 400 known resistant weed biotypes in the world. Why does resistance occur and how does it develop? This presentation will explore mechanisms of resistance and present an overview of how it can be managed.

***The details of pesticide resistance (Part 2): aquatic herbicide screening and resistance***
**Lyn Gettys,** University of Florida IFAS
Email: lgettys@ufl.edu

Herbicide resistance is a major concern in all herbicide applications. This presentation will give examples of herbicide resistance and how to prevent or best manage applications to minimize the development of resistant weed populations. This talk will also include an overview of how the development of fluridone resistance in hydrilla drove research efforts to identify new herbicides for aquatic weed control and that screening program resulted in the labeling of a multitude of aquatic use herbicides in an extremely short period of time.

***Evaluation of new herbicides for creeping water primrose (<u>Ludwigia hexapetala</u>) control***
**Stephen Enloe,** University of Florida IFAS
Email: sfenloe@ufl.edu

Creeping waterprimrose is an invasive emergent plant in many lakes and rivers in Florida. Its rapid spread within the State has prompted a quick and aggressive response by many aquatic managers. However, control is often very difficult as it rapidly recovers from underwater creeping stems. This talk will focus on research examining several new herbicides and herbicide tank mixes for *Ludwigia hexapetala* control.

***Evaluation of factors influencing growth and response to herbicides by the native grass <u>Paspalidium geminatum</u>***
**Jens Beets,** Carl Della Torre, Dean Jones and Michael Netherland, University of Florida IFAS and USACERDC
Email: jbeets@ufl.edu

*Paspalidium geminatum (*also called knotgrass and Kissimmee grass) is a native aquatic grass species widely distributed throughout Florida and in the Kissimmee Chain of Lakes (KCOL). Recent declines of extensive beds in the KCOL have been documented; however, there has been no clear cause and effect associated with this decline. In order to better understand this species, a series of growth studies and herbicide evaluations at the mesocosm and field scale were conducted. Initial trials indicate preferential growth in a sandy substrate as well as an increase in growth corresponding to increased fertilizer rates. Additional trials are underway exploring the influence of sediment organic matter on growth of knotgrass. We have also evaluated herbicides and herbicide combinations commonly used for invasive plant control

to determine how these products influence Kissimmee grass. Various treatments have included diquat, 2,4-D, 2,4-D + diquat, 2,4-D + flumioxazin, flumioxazin, flumioxazin + penoxsulam, imazamox, imazamox + carftentrazone, glyphosate, and glyphosate + flumioxazin. Results of these mesocosm and field studies will be discussed.

***Japanese climbing fern and Chinese tallowtree management in Florida***
**Greg MacDonald,** University of Florida IFAS
Email: pineacre@ufl.edu

Japanese climbing fern (JCF) and Chinese tallowtree are two of the most problematic invaders in central and north Florida. Both of these species are more likely to be found in hydric sites such as flatwood pines and hardwood bottomlands. JCF spreads primarily from spores while tallowtree produces copious seeds. Management of JCF targets the climbing fronds, utilizing chemical control with glyphosate and/metsulfuron methyl as the principal herbicides. More recent work linking herbicide timing as a function of spore formation has been conducted and will be discussed. Chinese tallowtree control also focuses on chemical methods, with herbicide delivery varying as function of tree diameter. New herbicides such as aminocyclopyrachlor have shown good results for long term control for basal, hack and squirt and cut stump applications. A better understanding of seed biology is also very important to prevent and predict re-infestation. Studies to determine seed viability overtime, and seedling emergence dynamics will also be discussed.

***Brazilian pepper tree (<u>Schinus terebinthifolius</u>) control in Florida's mangrove communities***
**Cody Lastinger** and Stephen Enloe**,** University of Florida IFAS
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The Brazilian pepper trees are taking over many of Florida's mangrove forest, growing in competition with all four species of the mangrove and causing a decline in the number and quality of these communities. Our objective was to test the effects of aquatic herbicides for selective control of Brazilian pepper tree that is invading these mangrove communities. We also tested aquatic labeled herbicides on the four native mangrove species, which are protected, to screen for sensitivity. Past observations from land managers around the state indicated that mangrove species were sensitive to the herbicides commonly used for Brazilian pepper tree control, and it is important to find a truly selective herbicide to protect the delicate mangrove communities in Florida.

***Integrating lake vegetation data into FWC'S freshwater fisheries long-term monitoring program***
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The Freshwater Fisheries Long Term Monitoring (LTM) Program of the Florida Fish and Wildlife Conservation Commission (FWC) began in 2006 with the intent to obtain standardized data that could be used by managers to determine trends in sportfish abundance, species composition, mortality, growth, size structure, and utilization by anglers for Florida's important freshwater fisheries. The LTM Program has

30 core lakes that are sampled annually for these metrics. With this program in place, there was a growing need to develop an efficient method of collecting habitat information in these lakes so that habitat quality and quantity could be monitored over time. Managers and researchers in FWC also thought that collecting habitat information could help explain changes in sport fish or fish community data and could help to focus future research and/or management actions. Therefore, our objective was to develop sampling protocols that would provide accurate lake-wide estimates of percent area covered and percent volume infested with submersed and emergent vegetation in lakes that are part of the LTM Program. After investigating different techniques used for sampling aquatic vegetation, we determined that two methods of remote sensing fit our objective. These include hydroacoustic sensing for mapping submersed vegetation and the interpretation of satellite imagery for mapping emergent vegetation. With sampling protocols developed, annual mapping efforts will take place during the peak growing season, and began in the summer of 2015 in conjunction with FWC's Invasive Plant Management Section.

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