



**45th Annual Training Conference  
October 12-14, 2021  
St. Petersburg, Florida**

## About the cover:

Images from UF Center for Aquatic and Invasive Plants. Photo and design courtesy of Kristine Krebs.

This program has been approved for Continuing Education Units by the Florida Department of Agriculture and Consumer Services

### APPROVED CEUs

<b>CORE (482 or 487)</b>	<b>3</b>
<b>Aquatic</b>	<b>14</b>
<b>Natural Areas</b>	<b>14</b>
<b>Right-of-Way</b>	<b>14</b>
<b>Private</b>	<b>14</b>
<b>Demo &amp; Research</b>	<b>14</b>
<b>Public Health</b>	<b>1.5</b>

### **Program Chair**

Brett Wells Bultemeier

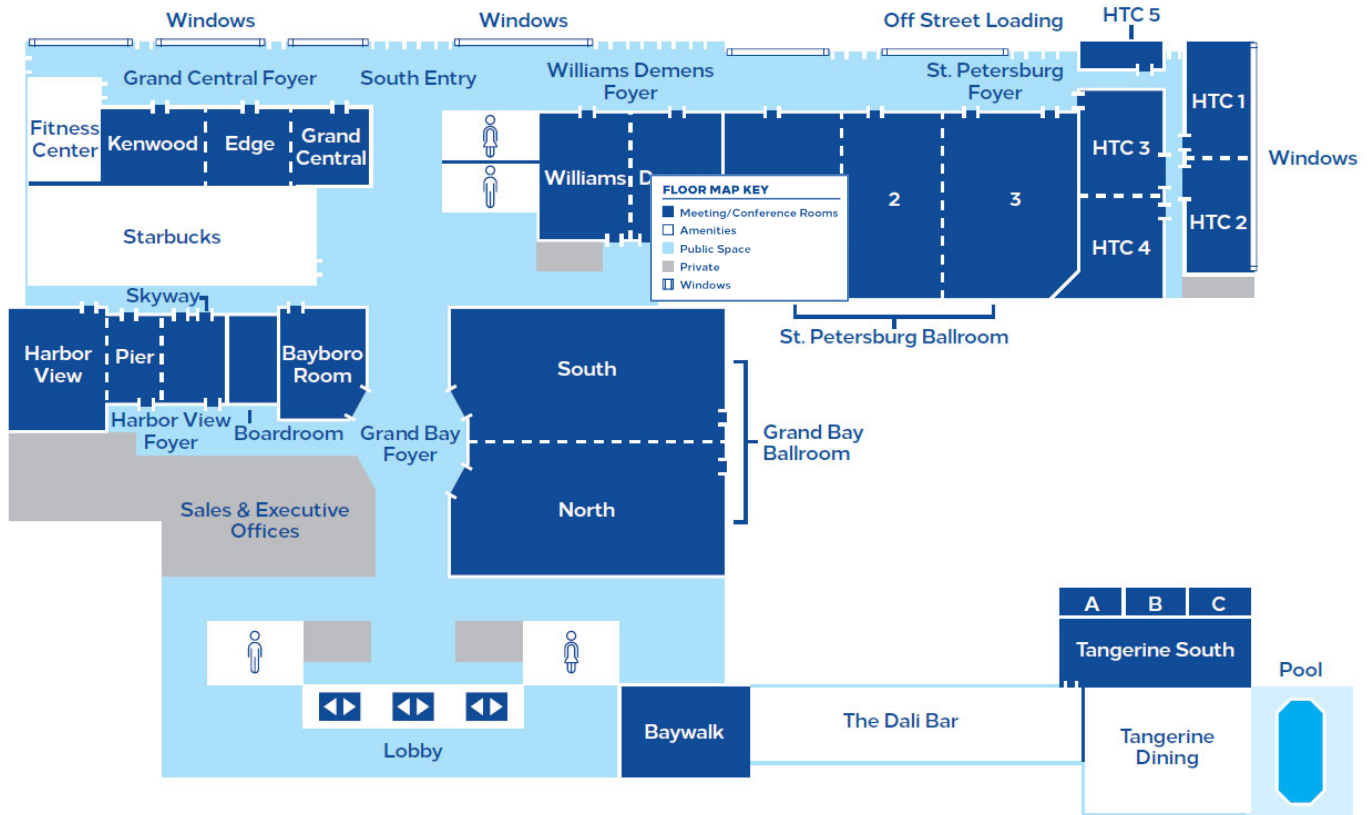
### **Recommended format for citing abstracts from this program:**

*Author names. 2021. Title. Proceedings of the 45th Annual FAPMS Conference, page #.* Florida Aquatic Plant Management Society. St. Petersburg, FL. (abst.)

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# Hilton St. Petersburg Bayfront

## Lobby Level



333 1st St SE, St. Petersburg, Florida, 33701-4342

**Sponsor exhibits:** St. Petersburg Ballroom

**Sessions:** Grand Bay Ballroom

**Awards banquet:** Grand Bay Ballroom

**Duck races:** Poolside

**Presidential reception:** offsite at MacDinton's, 242 1st Ave. N. – about a 10-minute walk  
Go north on 1st St. S. for about 0.3 mile, then left onto 1st Ave. N. for about 0.2 mile.  
MacDinton's will be on the left.

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**Monday, October 11, 2021**

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1:00-6:00            *Exhibit/Vendor/Poster Setup – St. Petersburg Ballroom*

2:00-4:00            *FAPMS Board of Directors meeting – Bayboro*

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**Tuesday, October 12, 2021**

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8:00-10:00 *Past Presidents Meeting/FAPMS Research and Scholarship Foundation Meeting – Hilton Training Center 1*

**Session 1: Communicating with Stakeholders (Grand Bay Ballroom)**

**FDACS program # 31808; CEUs: 1.5 Aquatic, 1 CORE; Moderator: Brett Bultemeier**

10:00-10:25 Presidential Address – Communicating with Stakeholders  
**Jeremy Slade (UPL)**

10:25-10:50 The Nature of Science Communication  
**Raychel Rabon & Christine Krebs (UF CAIP)**

10:50-11:15 Taking Aquatics from the Field to Social Media  
**Olivia Doyle (UF CAIP)**

11:15-12:05 Are the Products on My Shelf Still Good?  
**Fred Whitford (Purdue University)**

**12:05-1:15 LUNCH (on your own)**

**Session 2: All Things Algae (Grand Bay Ballroom)**

**FDACS program # 31809; CEUs: 2 Aquatic; Moderator: Ben Sperry**

1:15-1:20 PRIZE DRAWING

1:20-1:45 Algae Are People Too  
**Tom Warmuth (BioSafe)**

1:45-2:10 Chelation and Emulsification Technology Applied to Copper Algaecides and Herbicides  
**Bill Ratajczyk (SePRO) & Brett Bultemeier (UF PIO)**

2:10-2:35 Non-Copper Algal Control Strategies  
**West Bishop (SePRO)**

2:35-3:00 Impact of Harmful Algae Blooms on Fish and Water  
**Justin Nawrocki (UPL)**

**3:00-3:20** ***BREAK (St. Petersburg Ballroom)***

**Session 3: Laws and Regulations (Grand Bay Ballroom)**

**FDACS program # 31810; CEUs: 0.5 Aquatic, 2 CORE; Moderator: Jay Ferrell**

3:20-3:25 PRIZE DRAWING

3:25-3:50 Regulatory and Licensing Update From FDACS  
**Tamara James (FDACS)**

3:50-4:40 How to Read a Label and Beyond  
**Brett Bultemeier (UF PIO)**

4:40-5:05 Florida Fish and Wildlife Conservation Commission Aquatic Plant Management Update  
**Matt Philips (FWC)**

5:05-5:15 Aquatic Ecosystem Restoration Foundation Update  
**Carlton Layne (AERF)**

5:15-5:30 RISE Industry Issues Update  
**Megan Striegel (RISE)**

**END TUESDAY REGULAR SESSIONS**

**5:30-6:00** ***Poster competition (Outside St. Petersburg Ballroom)***

Florida Species and Habitat Monitoring Programs Catalog (Terra-CAT)  
**Amanda Christiansen**

Unmanned Aerial Application Systems for Aquatic Plant Control: Case Studies in North Carolina  
**Andrew W. Howell, J. Tyler Harris, Rob Richardson**

Integrated Management: Biological Controls  
**Lee Martin \*applicator**

Reestablishment Potential of Hydrilla Fragments Following Desiccation  
**Taylor L. Darnell, Candice M. Prince, Benjamin P. Sperry \*student**

**6:00-8:00** *President's Reception (MacDinton's: 242 1<sup>ST</sup> Ave. N)*

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**Wednesday, October 13, 2021**

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**Session 4: What's the Industry and Student Word? (Grand Bay Ballroom)**

**FDACS program # 31811; CEUs: 2 Aquatic; Moderator: Candice Prince**

8:00-8:05 PRIZE DRAWING

8:05-8:15 Industry Update from Helena  
**James Boggs (Helena)**

8:15-8:40 Using Long-Term Datasets to Understand Impacts of Aquatic Plant Management  
**Candice Prince (UF CAIP)**

8:40-9:05 Evaluating Subsurface Field Applications of ProcellaCOR® SC (a.i. florpyrauxifen-benzyl) for Suppressing Hydrilla  
**Kelli Gladding (UF CAIP)**

9:05-9:20 Mechanisms of Triclopyr Non-Target Injury Following Basal Bark Treatments  
**Conrad Oberweger (UF CAIP) \*student**

9:20-9:45 *Hydrilla verticillata* Response to Intermittent Pulsed Endothall Herbicide Treatments  
**Taylor Darnell (UF CAIP) \*student**

**9:45-10:00** *BREAK (St. Petersburg Ballroom)*

**Session 5: Mosquito Wars (Grand Bay Ballroom)**

**FDACS program # 31812; CEUs: 2 Aquatic, 2 Public Health; Moderator: Brett Bultemeier**

10:00-10:05 PRIZE DRAWING

10:05-10:30 Aquatic Weed and Mosquito Management – Why Controlling Both Pests Requires Coordination

**Amy Solis (Reedy Creek Improvement District)**

10:30-10:55 Managing a Crisis, Mosquito Outbreak Lessons for Aquatics

**Lyle Clarke (Clarke)**

10:55-11:20 Lee County Mosquito Control District: 60 Years of Innovative Mosquito Management

**Eric Jackson (Lee County Mosquito Control District)**

11:20-11:30 Industry Update from Brewer

**Jesse Cruz (Brewer International)**

11:30-11:45 The Ecology of Submersed Aquatic Vegetation Communities Under Management in Select Florida Lakes

**Jacob Thayer (UF CAIP) \*student**

***11:45-12:55 LUNCH (on your own)***

**Session 6: New Technologies New Techniques (Grand Bay Ballroom)**

**FDACS program # 31813; CEUs: 2 Aquatic; Moderator: Brett Bultemeier**

12:55-1:00 PRIZE DRAWING

1:00-1:25 Glyphosate, Manatees, and More

**Jay Ferrell (UF CAIP)**

1:25-1:50 Mobile Mapping Application to SAV Monitoring and Restoration Project Site Assessments

**Danielle Rogers (SWFWMD)**

1:50-2:15 Low-Volume Foliar Herbicide Applications

**Ben Sperry (USACE)**

- 2:15-2:20 Product and Industry Update from BioSafe  
**Tom Warmuth (BioSafe)**
- 2:20-2:25 Product and Industry Update from SePRO  
**Rory Roten (SePRO)**
- 2:25-2:40 Syngenta Product, Research, and Label Update  
**Scott Jackson (Syngenta)**
- 2:40-3:30 De-escalating Conflict for Aquatic Plant Managers  
**Megan Cantrell (UF Dept. of Ag. Education & Communication)**
- 3:30-3:50 BREAK (St. Petersburg Ballroom)**

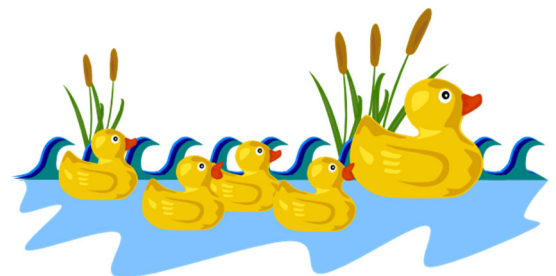
**Session 7: Resources and Updates (Grand Bay Ballroom)**  
**FDACS program # 31814; CEUs: 1 Aquatic; Moderator: Dharmen Setaram**

- 3:50-3:55 PRIZE DRAWING
- 3:50-4:10 FAPMS Business Meeting  
**Jeremy Slade**
- 4:10-4:25 Integrated Management: Biological Controls  
**Lee Martin (Lee County Hyacinth Control) \*applicator**
- 4:25-4:45 Utilizing Drone Technology in Aquatic Plant Management  
**Jason Cull (Lee County Hyacinth Control)**
- 4:45-5:30 Resource Demonstration of Drones (nearby location)

**END OF REGULAR SESSION**

**5:30-6:30: Duck Races (Poolside)**

**7:00-9:30: Annual Awards Banquet (Grand Bay Ballroom)**





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Thursday, October 14, 2021

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**Session 8: Beyond the Treatment (*Grand Bay Ballroom*)**

**FDACS program # 31815; CEUs: 2 Aquatic; Moderator: Matt Phillips**

- 8:00-8:05 PRIZE DRAWING
- 8:05-8:25 Lake Volume Dynamics: APM in the 3rd Dimension  
**James Leary (UF CAIP)**
- 8:25-8:40 Early Detection and Rapid Response for *Nymphoides cristata* on St. Johns River: Is It Gone?  
**Tim Harris (USACE)**
- 8:40-8:55 Herbicide Uptake from Sediments in Submersed Aquatic Vegetation  
**Bill Haller (UF CAIP retired)**
- 8:55-9:20 Implementation of a Standardized Protocol for Freshwater Fish Health in Florida  
**Daniel Nelson (FWC)**
- 9:20-9:45 Water Chemistry, Aquatic Plants, Fish, Wildlife, and Finally Hydrilla  
**Mark Hoyer (UF LAKEWATCH)**
- 9:45-10:00 BREAK (*St. Petersburg Ballroom*)**

**Session 9: The Last Stand (*Grand Bay Ballroom*)**

**FDACS program # 31816; CEUs: 2 Aquatic; Moderator: Scott Glasscock**

- 10:00-10:05 GRAND PRIZE DRAWING
- 10:05-10:25 More Trials to Evaluate “Natural” Herbicides for Aquatic Weed Management  
**Lyn Gettys (UF FLREC)**
- 10:25-10:40 Update from the Aquatic Plant Management Society  
**Jay Ferrell (UF CAIP)**
- 10:40-10:55 Product, Label, and Industry Update from UPL  
**Dean Jones (UPL)**

10:55-11:20 The Continued Refinement of Triclopyr Use Patterns for Invasive Plant Control  
**Stephen Enloe (UF CAIP)**

11:20-11:45 Spray Tracker Technology for Aquatic Vegetation Control with FWC  
**Alex Dew (FWC)**

***END OF CONFERENCE***

# VOTING SLATE FOR PRESIDENT-ELECT AND BOARD OF DIRECTORS

## **President-Elect: Dr. Lyn Gettys, Associate Professor of Agronomy**

Dr. Lyn Gettys is an Associate Professor of Agronomy (Aquatic and Wetland Plant Science) and has been based at the University of Florida IFAS Fort Lauderdale Research and Education Center in Davie since 2012. Prior to that, she worked as a post-doctoral researcher and a research assistant scientist at the UF-IFAS Center for Aquatic and Invasive Plants in Gainesville. She holds a bachelor's degree in horticulture from the University of Florida, a master's degree in plant breeding from North Carolina State University and a Ph.D. in plant genetics from the University of Florida. Dr. Gettys' research is focused on the biology and ecology of native and introduced aquatic and wetland plants and evaluation of control methods for managing invasive species. She coordinates the UF-IFAS Aquatic Weed Control Short Course, which draws over 400 attendees annually. She also has statewide Extension responsibilities for aquatic weed control, including serving as a speaker and provider of Continuing Education Units. Dr. Gettys has authored or co-authored over 240 publications, including more than 50 journal articles and 100 abstracts, and was lead editor for the 2nd, 3rd and 4th editions of the Aquatic Ecosystem Restoration Foundation's Best Management Practices Manual.

## **Board of Directors: Dr. Brett Wells Bultemeier, Extension Assistant Professor**

Brett Bultemeier is the Extension Assistant Professor in the Pesticide Information Office at the University of Florida. He has over 20 years of working with and around pesticides. Over these 20 years he has worked in the field as an applicator, did a graduate program focused on pesticide usage in aquatic plant management, and spent over 8 years working in private industry before returning to UF. As part of the Pesticide Information Office Brett is tasked with overseeing pesticide testing, coordinating recertification curriculum and efforts, and overall developing a focus on pesticide safety throughout the state. He began this role in November of 2019. Brett has his BS in Biology and Environmental Studies from Manchester University, and a MS and PhD in Agronomy from UF.

## **Board of Directors: Samantha Sardes, Science Director, SOLitude Lake Management**

Sam Sardes received her B.S. from Florida Atlantic University and her M.S. from the University of Florida. The focus of her research has been on aquatic plant and algae management with a primary goal of integration of control methods for more efficient management programs. She has been with SOLitude Lake Management since 2016 and is currently their weed science director. Her research focuses on plant and algae management along with lake restoration and nutrient mitigation. She oversees their water quality lab which functions primarily as a way to investigate sources of algal blooms and to use what is learned to make data supported recommendations for their client's lakes. Her master's research focused on the interactions of IPM tools (herbicides and biocontrol agents) for the management of waterhyacinth. She has been a licensed applicator with 6 categories since 2013.

## **Board of Directors: Dharmen Setaram, Winfield United**

Dharmen Setaram resides in Central Florida and is married with two children. He received a Biology degree from The University of Central Florida in 1995. Dharmen has served on the board of the Florida Lake Management Society, The Florida Aquatic Plant Management Society and has served as president of the South Florida Aquatic Plant Management Society. Dharmen is currently employed by Winfield United as a field representative for Aquatic and Vegetation Management sales and support. Prior to working at Winfield United Dharmen worked for SePRO and UPL covering Florida. When not working he enjoys spending time with his family and friends and fishing with his boys.

# FAPMS OFFICERS 2020-2021

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Stephen Montgomery

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Scott Jackson

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Stephanie Walters

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Jennifer Myers

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Amy Giannotti

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Sam Yuan

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Telly Smith  
Nathalie Visscher

### **First year**

Jason Cull  
Jason Ferrell  
Alexandra Onisko

## FAPMS PAST PRESIDENTS

<b>1977</b> Leslie Bitting Sr.	<b>1992</b> Ken Langeland	<b>2007</b> Vicki Pontius
<b>1978</b> Leslie Bitting Sr.	<b>1993</b> Wayne Corbin	<b>2008</b> Chance DuBose
<b>1979</b> Harold Brown	<b>1994</b> Wendy Andrew	<b>2009</b> Mike Netherland
<b>1980</b> Bill Haller	<b>1995</b> Mike Hulon	<b>2010</b> Mike Bodle
<b>1981</b> Joe Joyce	<b>1996</b> Don Doggett	<b>2011</b> Vernon Vandiver
<b>1982</b> William Maier	<b>1997</b> Ernie Feller	<b>2012</b> Jerry Renney
<b>1983</b> Carlton Layne	<b>1998</b> Francois Laroche	<b>2013</b> Tim Harris
<b>1984</b> Paul Myers	<b>1999</b> Jim Brewer	<b>2014</b> James Boggs Jr.
<b>1985</b> Clarke Hudson	<b>2000</b> Jeff Schardt	<b>2015</b> Ed Harris
<b>1986</b> David Tarver	<b>2001</b> Nancy Allen	<b>2016</b> Angie Huebner
<b>1987</b> Michael Mahler	<b>2002</b> John Rodgers	<b>2017</b> Andy Fuhrman
<b>1988</b> Eddie Knight	<b>2003</b> P.J. Myers	<b>2018</b> Keith Mangus
<b>1989</b> Bill Moore	<b>2004</b> Steve Weinsier	<b>2019</b> Kelli Gladding
<b>1990</b> Brian Nelson	<b>2005</b> Keshav Setaram	<b>2020</b> Scott Jackson
<b>1991</b> Dan Thayer	<b>2006</b> Bill Moore	

## HONORARY LIFETIME MEMBERS

<b>1996</b> Leslie E. Bitting, Sr.	<b>2011</b> William H. Moore	<b>2014</b> Jeff Schardt
<b>1997</b> Edward D. Knight	<b>2012</b> Carlton Layne	<b>2016</b> Joe Joyce
<b>2006</b> William T. Haller	<b>2013</b> Ken Langeland	<b>2018</b> Mike Netherland
<b>2006</b> Andy L. Price, Sr.	<b>2013</b> Don Doggett	
<b>2006</b> Vernon V. Vandiver, Jr.	<b>2014</b> Stephanie McCarty	

## MIKE NETHERLAND AWARD

**2019** William Haller **2020** Jeff Schardt

## FAPMS CHARTER MEMBERS

Abramson, Stanley	Day, Ronald L.	Hudson, Clarke	Moore, William H.	Steward, Kerry K.
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Almand, C. William	Deets, Peter J.	Jenus, Joseph, Jr.	Mullens, Thomas C.	Stoll, Richard H.
Anderson, Paul	Dequine, John F.	Johnston, Donald C.	Murningham, Jack	Sutton, David L
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Blackburn, Candy	Fredell Sr., Oran	Land, W. E.	Pieroni, Alfi M.	Tucker, Sr., Marvin R.
Blackburn, Robert	Friedman, Herbert J.	Lawson, Walter R.	Price, Andy L.	Tye, Carl
Blakely, Robert	Frizzell, Johnie	Layer, John L.	Pruitt, Gary W.	Vance, Grady
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Brightwell, R. E.	Gates, Robert J.	Lee, Donald V.	Rapp, James B.	Walker, Billy Joe
Brooks, Thomas	German, Louis	Lee, Russell C.	Raulerson, Edgar W.	Waters, Donald B.
Brown, Deanna	Glenn Jr., John E.	Lowder, Edward C.	Rivelli, Thomas A.	Weber, Richard Lee
Brown, Donald W.	Grote, J. C.	Lowe, Glen L	Rushing, William N.	Weedon, J. Stanley
Brown, Harold F.	Hale, Lee	Maddox, Larry L.	Sassic, Nicholas	Widmann, Donald C.
Brown, Martin	Hall, B. Lamar	Madison, Edward, Jr.	Scherer, Lester E.	Williams, James L.
Burkhalter, Alva P.	Haller, Bill	Mahler, Michael J.	Schweigart, Joe	Wilson, Frank
Campbell, Edward	Hardy, Paul E.	Maier, Bill	Sconyers, Max C.	Woodman, William J.
Carson, Webster B.	Hargrove, Chuck	McCarty, William A.	Seaver, Harry R.	Worsham, W. A.
Carter, Chris C.	Harp, Jean B.	McDonald, Eugene E.	Sheppardson, Terry	Wright, Lewis
Chandler, Lawrence	Harper, George L.	McKinney, Larry M.	Shinholser, James F	Wunderlich, William E.
Christian, Donald G.	Hestand, Rue S.	McMillian, William H.	Smith, Robert W.	Yager, J. L.
Clark, James E.	Hinkle, Joe C.	Merritt, Ralph	Sparkman, Perry L.	Yoder, Phillip J.
Clark, Roy P.	Hogan, William D.	Mickler, Hampton J.	Spirnock, Ray A.	Young, Phillip
Cook, Jon	Holmes, Pennie	Miller, Edward J.	Stafford, Jr., Frank S.	
Cool, Carl	Hope, Donald E.	Minter, Tom	Stanley, J. G.	
Cribbs, Benjamin	Hopkins, Jr., Sam B.	Moherek, Emil A.	Steward, Charles W.	
Cummings, Herb	Huckabee, Alvin B.	Monahan, William T.	Steward, Frank E.	

## **Abstracts: Tuesday, October 12, 2021**

### **Communicating with Aquatic Stakeholders – Jeremy Slade**

A brief discussion about commercial, public and private applicators professionalism, communication, and training in the field as it relates to public interaction. The aquatic plant management industry is experiencing higher levels of public pressure against pesticide use mainly from a misunderstanding of what is being done, how it's being done, why it's being done and the benefits from doing it. Some tools (e.g., communication class or conflict resolution training) that could be helpful to an applicator will also be suggested.

### **The Nature of Science Communication – Raychel Raybon and Christine Krebs**

This presentation will help industry professionals understand and utilize science communication principles to engage with diverse stakeholders. This presentation will explore what science communication is and how to use it in the aquatic plant management industry. The presenters will also introduce education and outreach materials developed by the UF/IFAS Center for Aquatic and Invasive Plants that are available for use.

### **Taking Aquatics from the Field to Social Media – Olivia Doyle**

This session will cover how individuals involved in aquatic plant research, education and management can effectively utilize social media for education and outreach. This session will include what to do and what not to do when posting on social media and how to incorporate herbicide information and aquatic plant identification content on various social media platforms. Proper plant ID, management discussion, and stewardship development will be emphasized.

### **Are the Products on My Shelf Still Good? – Fred Whitford**

With the high costs associated with purchasing, applying and disposing of pesticides, it seems more important today to make sure that these products are being stored correctly and inventory managed to move the pesticides in and out quickly. We will discuss guidelines that can help you to better manage your inventory of pesticide products. By better managing your product inventory, you will no longer have to ask, "Is this product on my shelf still good?"

### **Algae are People Too – Tom Warmuth**

There is a growing focus on algae and cyanobacteria and their function and place in the lake management. Historically "APM" programs focused heavily on topics involving aquatic plants. This presentation will briefly highlight the basic biology of algae and cyanobacteria, the differences between them, how and why they grow, and general identification.

### **Chelation and Emulsification Technology Applied to Copper Algaecides and Herbicides – Bill Ratajczyk and Brett Bultemeier**

Water Resource Management has evolved into an interdisciplinary science, involving application of data to respond to site specific problems. Copper Algaecide and Herbicide Technology has evolved over the last 50 years most notably based on the use of Chelation Technology considering the effects of water perimeters and the target Algae/Macrophyte; while working to increase the margin of safety to non-target organisms.

Emulsification Technology has been added to enhance activity on difficult to control species. To maximize the use of these products it is of value to understand their characteristics, developed use plans, and then align the proper product to the target and the specific site.

### **Non-copper Algal Control Strategies – West Bishop**

There are numerous non-copper methods of controlling nuisance algae that will be briefly covered in this presentation. These include other chemical control strategies, which may be registered or non-registered pesticides with the USEPA. Some additional registered products include active ingredients like peroxide and peroxyacetic acid, dyes, endothall or diquat dibromide. Other non-registered chemical treatments may be focused on nutrient mitigation such as aluminum sulfate or lanthanum modified bentonite or just flocculation of particulates in the water. Other additives to aquatic systems may be biologically based and include bacteria, enzymes or plant extracts or just ecological manipulations. Physical and mechanical control techniques include (in part) aeration, oxygenation, ozonation, sonication, mixing or just raking. A brief overview of some of the available techniques that may be implemented to control algae, and some pros and cons of each will be covered in this presentation.

### **Impact of Harmful Algae Blooms on Fish and Water Use – Justin Nawrocki**

The frequency and longevity of harmful algae blooms (HABs) appears to be on the rise with several recent cases gaining national spotlight. In August of 2014 a bloom in Lake Erie shut down the water supply to Toledo for nearly a week. The largest fish kill in North Carolina history was due to an alum treatment that occurred to sequester nutrients feeding a bloom. Lastly Lake Okeechobee has been experiencing yearly HAB issues in recent history. When toxins are produced by HABs it can have serious acute and chronic outcomes affecting the delicate ecological balance of these water-bodies. This presentation will give a general background on the ecological toll on both humans and aquatic organisms due to harmful algae blooms.

### **Regulatory and Licensing Update from FDACS – Tamara James**

The Florida Department of Agriculture and Consumer Services (FDACS) regulates approximately 60,000 pesticide applicators. Authority for regulation falls under one of three Florida Statutes: The Structural Pest Control Act (Chapter 482), the Florida Pesticide Law (Chapter 487), and Public Health Mosquito Control (Chapter 388). This presentation will explore and discuss the different license and certification types available to those who wish to perform pest control in Florida. Additionally, changes that will be affecting the future of the pesticide licensing and regulatory program will be discussed which include C&T rule changes, technology advances, and other projects on the horizon.

### **How to Read a Label and Beyond – Brett Bultemeier**

This presentation will explore the logic behind how a pesticide label is organized. Each section will be discussed as to its purpose and how it is organized. Additionally, a discussion about interpreting a label and other considerations will be discussed as well.

### **Florida Fish and Wildlife Conservation Aquatic Plant Management Update – Matt Phillips**

Will discuss the changes in the FWC's Invasive Plant Management program including the Technical Assistance Group (TAG), RFI for alternatives to herbicide control, contractor oversight, Habitat management plans and



many other operational changes in the program. Will also give an overview of this past year's operations and herbicide use patterns.

### **Aquatic Ecosystem Restoration Foundation Update – Carlton Layne**

An update from AERF on the Best Management Practices manual, current harmful algae bloom activities, research project updates. Overall “state of aquatics” will be given as well, along with important NPDES updates.

### **RISE Industry Issues Update – Megan Striegel**

Join RISE (Responsible Industry for a Sound Environment), the national trade association representing manufacturers, formulators, distributors and other industry leaders in the specialty pesticide and fertilizer industry to learn about some coming legislative, regulatory, and judicial opportunities and challenges in the specialty pesticide space, especially impacting the aquatics segment.

## **Abstracts: Poster Session**

### **Florida Species and Habitat Monitoring Programs Catalog (Terra-CAT) – Amanda Christiansen**

The Florida Species and Habitat Monitoring Programs Catalog (Terra-CAT) is a user-friendly and publicly accessible website that catalogs habitat- and species-related monitoring efforts within Florida. The purpose of the online catalog is to ensure that all monitoring agencies know about monitoring activities in Florida, including who (organization or individual carrying out monitoring); what (medium and habitat type being monitored); where (geographic location of monitoring activities); and when (the period of record for sampling efforts, frequency of sampling, etc.) of all monitoring efforts. This ongoing project supports the maintenance of the catalog and the website to ensure that it remains up-to-date and accessible to all users.

### **Unmanned Aerial Application Systems for Aquatic Plant Control: Case Studies in North Carolina – Andrew W. Howell, J. Tyler Harris, Rob Richardson**

The recent integration of small unmanned aerial systems (sUAS) in aquatic plant management has generated several avenues for researchers and managers to explore. Commonly, sUAS are deployed as optical sensing evaluation tools for invasive plant detection, documenting species composition and cover, or capturing visual control assessments during active management. However, some sUAS also provide opportunity to remotely deliver herbicide applications. Within a given aquatic system, there are often inaccessible or difficult to treat regions due to shallow water, lack of boat launch facilities, or potential obstructions and hazards in the treatment zone. Many managers anticipate the potential benefits of deploying herbicide delivering sUAS, specifically as an opportunity to treat areas where using watercraft is not feasible, or convenient. Likewise, there is an added benefit of reduced human exposure during application. While interest in sUAS sprayers remains high, these systems are not commonplace for management yet, often due to regulatory and payload constraints. To provide validation of operational use, we evaluated an off-the-shelf sUAS sprayer in different weed scenarios to control submersed and floating vegetation (*Myriophyllum heterophyllum* and *Nymphoides peltata*, respectively). Some items tested included spray nozzle selection, effort and ease of operation, and visual control levels of target plant species. Manual and semi-autonomous capabilities were also documented. Discussion will provide summary of system constraints and the effectiveness of sUAS sprayers as a unique management tool. Further evaluations are planned to determine application tactics for floating plant control.

## **Integrated Management: Biological Controls – Lee Martin \*applicator**

IPM stands for “Integrated Pest Management.” It’s an approach to manage insects, diseases, weeds, animals and other “pests” that cause damage by combining biological, cultural, mechanical and chemical practices. Lee County Hyacinth Control District has utilized multiple species of biological controls including triploid grass carp (*Ctenopharyngodon idella*), alligatorweed flea beetle (*Agasicles hygrophila*), water hyacinth plant hopper (*Megamelus scutellaris*), and eastern mosquitofish (*Gambusia holbrooki*). We are always looking for better ways to manage invasive aquatic vegetation and one effective method is the use of biological species. LCHCD continues to explore the value of biological control agents, as these have been very effective and are often referred to as an “essential management tool in the aquatic tool belt.”

## **Reestablishment Potential of Hydrilla Fragments Following Desiccation – Taylor L. Darnell, Candice M. Prince, Benjamin P. Sperry \*student**

*Hydrilla verticillata* (hydrilla) is an aquatic invasive plant that forms dense mats in waterbodies. These mats break apart when watercraft pass through them, and lodge on different parts of the vessel and boat trailer. Stem fragments can subsequently be carried to other waterbodies where they can establish new populations; however, little is known about their ability to regenerate following periods of desiccation. Our objective was to evaluate the desiccation tolerance of individual and clumped fragments. Plant material was desiccated for predetermined intervals, rehydrated for 48 hours, and post rehydration, stems and tips were planted out and carried for two weeks and harvested. The regenerative capacity of fragments and clumps was a significant function of both desiccation time and fragment and clump size. Destructive dry weight data were regressed over desiccation time using three and four parameter log-logistic model which shows an ED<sub>50</sub> (effective time needed to inhibit 50% of the population from surviving values for individual fragments to be 0.90, 0.94, and 0.68 hours for fragment sizes of 7, 15, and 30 cm, respectively, with respective ED<sub>90</sub> values of 0.99, 1.02, and 1.03 hours. For clumps, ED<sub>50</sub> values were 1.24, 1.81, 1.95, 3.0 hours for 1, 3, 6, and 12 fragment clumps, respectively, while the ED<sub>90</sub> values were 2.13, 2.27, 3.6, and 6.15 hours. These data suggest that longer, denser clumps have an increased ability to establish new colonies elsewhere.

## **Abstracts: Wednesday, October 13, 2021**

### **Update from Helena – James Boggs**

This presentation will update new products and new research from Helena as it relates to aquatic plant management.

### **Using Long-Term Datasets to Understand Impacts of Aquatic Plant Management – Candice Prince, Amy Kendig, S. Luke Flory, Mark Hoyer, James Leary**

Over the past several years, Florida stakeholders have expressed concerns about the impacts of aquatic herbicide use on native biodiversity, water quality, and fish populations. While the direct, short-term effects of aquatic herbicide use have been well-studied, there is limited information about the effects of long-term herbicide use on public waterbodies. The Florida Fish and Wildlife Conservation Commission (FWC), Florida LAKEWATCH, and US Army Corps of Engineers (USACE) have maintained several long-term datasets on aquatic herbicide use, water quality, fish populations, and plant communities in Florida. With this project, we collated these datasets to address the following questions: 1) how effective is herbicide management of *Hydrilla verticillata* (hydrilla), *Eichhornia crassipes* (water hyacinth), and *Pistia stratiotes* (water lettuce); 2) how are

these invasive species impacting native plant communities; and 3) how is management of these species impacting native plant communities? To answer these questions, we identified common lakes among datasets and fit generalized linear mixed-effect models. Akaike Information Criterion (AIC) were used to evaluate the relative importance of explanatory variables in each model. Results showed that management is effective at reducing populations of *H. verticillata*, and that maintenance control is effective at maintaining populations of *E. crassipes* and *P. stratiotes*. Results also demonstrated an overall net-positive impact of herbicide use on native species, although the impact was dependent on native species habitat (emersed, floating, or submersed).

### **Evaluating Subsurface Field Applications of ProcellaCOR® SC (a.i. florypyrauxifen-benzyl) for Suppressing Hydrilla – Kelli Gladding, James Leary, Jacob Thayer, Jonathan Glueckert, Benjamin Sperry**

The goal of this proposed research is to build institutional knowledge on the operational use patterns of the new herbicide florypyrauxifen-benzyl (FPB) for controlling hydrilla under a variety of biophysical and environmental conditions that will support future lake management decisions by regional biologists. The objectives to meet this goal are to evaluate the efficacy of FPB on target hydrilla and the collateral symptoms of non-target species. Here, we will report on three lake sites ranging with one lake less than 40 ha and the other two each over 800 ha. These in-water treatments encompass 10-100% of the total water body and correspond to cove, littoral and whole-lake treatments, respectively. The study team is utilizing institutional survey methods and data standards used by the Florida Fish and Wildlife Conservation Commission augmented with high spatial resolution and temporal frequency. We'll be further highlighting the capabilities of satellite and airborne surveillance products enhancing the change detection profiles over space and time.

### **Mechanisms of Triclopyr Non-Target Injury Following Basal Bark Treatments – Conrad Oberweger, Stephen F. Enloe**

Triclopyr is used for woody plant control in Florida natural areas. Recently, an acid formulation (Trycera) was labeled for aquatic habitats and can be used for basal bark applications. However, flashback injury on non-target species in wetland environments has been reported. Two potential mechanisms of flashback include triclopyr root exudation and movement of triclopyr via flooding. To assess these pathways, two mesocosm studies were conducted over the summer and fall of 2020. Both studies utilized 16 (94-L) tubs, planted with *Schinus terebinthifolia*, *Celtis laevigata*, *Acer rubrum*, and *Cephalanthus occidentalis*. Sample wells were installed in each tub for water sampling. For study one, treatments included 1) basal oil only, 2) basal oil + triclopyr acid applied as Trycera herbicide (34 g ae/L), 3) basal oil + activated charcoal, and 4) basal oil + activated charcoal + triclopyr acid. The activated charcoal was layered 2.5 cm in depth across the entire surface of the tub just prior to treatment. For study two, treatments were similar, except flooding was applied instead of activated charcoal. Flooding was applied to a depth of 7.5 cm immediately following treatment and maintained for 21 days. Visual injury data and triclopyr analysis of water samples indicated triclopyr root exudation is very limited and not likely an issue. However, flooding can result in significant release of triclopyr into the water column with nontarget damage to certain species. Analysis of surface water samples from flooded mesocosms revealed concentrations of Triclopyr up to 3800  $\mu\text{g L}^{-1}$ . Concentrations of triclopyr in the water column increased for up to 21 days after treatment and then began to decline. These findings can assist wetland managers in good triclopyr stewardship to prevent non-target injury.

## ***Hydrilla verticillata* Response to Intermittent Pulsed Endothall Herbicide Treatments – Taylor Darnell, Candice Prince, Benjamin Sperry**

Intermittent exposures to an aquatic herbicide can provide equivalent results to continuous exposure (Netherland 2015). Based on this principle, further investigations into this research, using the dipotassium salt of endothall (at  $2 \mu\text{g L}^{-1}$ ), in 100L mesocosms has resulted in data that shows that pulsed treatments of herbicide have similar effects to reducing biomass as compared to continuous treatments of herbicide. This study looks at three different pulse schemes involving initial treatment lengths, rest phases, and final herbicide treatment lengths. From initial data, a rest phase, following a static 8-hour treatment of longer than 40 hours, seems to reduce biomass more effectively than static 12- or 24-hour treatments. Moreover, it seems that increasing the initial exposure time to an herbicide treatment does have an effect at reducing biomass as compared to a static 24-hour treatment. These data are being evaluated as a potential method for reduced herbicide loading in flowing water systems.

## **Aquatic Weed and Mosquito Management – Why Controlling Both Pests Requires Coordination – Amy Solis**

The relationship between mosquito and aquatic plant populations is often over-looked. Identifying certain mosquito-plant associations is beneficial for applicators in *both fields*. By understanding their shared habitats, one can implement proper surveillance and achieve control of both pests.

## **Managing a Crisis, Mosquito Outbreak Lessons for Aquatics – Lyle Clarke**

Even the best mosquito management plans can see a disease outbreak occur. The key to managing these crises is a rapid response and adaptable solutions. Over the years Clarke has responded to mosquito outbreaks following storm events, seasonal disease outbreak, and even the Zika outbreak in South Florida. All of these required mobilizing resources and quickly training personnel all while managing public outreach and news requests. The lessons learned for managing these outbreaks has utility in aquatic plant management, particularly harmful algae blooms. This presentation will discuss the lessons learned and how those might apply to HAB management.

## **Lee County Mosquito Control District: 60 Years of Innovative Mosquito Management – Eric Jackson**

Since its inception in 1958, the Lee County Mosquito Control District has provided mosquito abatement for the citizens and visitors of Lee County, FL using innovative control technologies that are effective and sensitive to Southwest Florida's natural habitat. This presentation will provide an overview of the District, the various methods used to protect public health and provide a comfortable outdoor environment, and plans for the future.

## **Use of Adjuvants for Aquatic Plant Control – Jesse Cruz**

This presentation will discuss the key 5 aquatic adjuvants and how they fit within a plant management program. Key updates to products and technology around surfactants will additionally be discussed.

## **The Ecology of Submersed Aquatic Vegetation Communities under Management in Select Florida Lakes – Jacob Thayer, James Leary, Kelli Gladding, Candice Prince**

Submersed aquatic vegetation (SAV) is a major ecological component of Florida's shallow lake systems. Hydrilla (*Hydrilla verticillata* [L.F.] Royle) is a non-native SAV dominating many of these lakes and is often observed to be growing in large monotypic cultures exclusive to other native SAV community members. This invasive species is the number one priority for aquatic plant management in the state of Florida with desired outcomes to conserve native SAV diversity. We are studying the effects on SAV community ecology from selective hydrilla management activities. This investigation is being conducted in two mesotrophic systems, Lake Sampson (804 hectares) in Bradford County and Lake Mann (107 hectares) in Orange County. Surveys have been conducted before and after selective herbicide treatments that were administered in early spring of 2021. Data on species and abundance were recorded with point intercept, hydroacoustic, and airborne imagery surveys on monthly intervals offering community structure data with high spatial and temporal resolution. Here, we present on some of the basic attributes in community ecology consisting of native and nonnative patch networks along with local and lake-level diversity indices to describe patterns of environmental filtering and competitive exclusion. Furthermore, replacement series competition experiments were conducted in mesocosms between native and invasive species as a complement to the field trials. Selective hydrilla management should enhance local composition of native SAV communities.

## **Glyphosate, Manatees, and More – Jason Ferrell**

Aquatic pesticides continue to be in the news. Recently, news reports were released about glyphosate residues in manatee blood while diquat was implicated in bald eagle deaths. Though the news reports seem shocking, the actual published papers tell a different and less damning story. In this presentation, we will explore these two topics and seek to understand the true risk that glyphosate and diquat pose to the environment. We will primarily highlight the importance of herbicide stewardship and the intersection with invasive species.

## **Mobile Mapping Application to SAV Monitoring and Restoration Project Site Assessments – Danielle Rogers and Mark Walton**

Mobile mapping of Springs Submerged Aquatic Vegetation and Restoration Projects – We present two recent examples of projects undertaken by the Southwest Florida Water Management District using mobile mapping platforms to improve data collection efficiency and analysis. Routine monitoring of submerged aquatic vegetation in the nature coast springs and field evaluation of completed restoration projects have benefited from mobile mapping functionality such as tailored form structure, data controls, links to ancillary information, and real-time calculation. Real-time data synchronization to cloud-based mapping and dashboards enable spatial trends to be quickly identified and acted upon.

## **Low-Volume Foliar Herbicide Applications – Benjamin Sperry**

Experiments conducted from 2019 to 2021 investigated foliar application parameter effects on contact and systemic herbicide activity across several aquatic weed species. Carrier volume was the primary application parameter that consistently influenced herbicide efficacy across all species. In addition, similar research will be presented which explored factors affecting off-target spray deposition and spray retention on plant foliage. This presentation will review these research findings, discuss their operational implications, how to implement new application techniques, and propose future research directions.

### **BioSafe Update – Tom Warmuth**

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, GreenClean Liquid 5.0, Calcis, and GreenClean Pond Block. There will be an overview on the chemistry of both GreenCleanPRO and GreenClean Liquid 5.0. The presentation will cumulate and conclude with the most important applications of the products in the Pond and Lake Management Industries, including recreational and potable waters.

### **SePRO Update – Wendi Nance**

This presentation will focus on the newest research and field results from the SePRO portfolio. Label changes, newest products, and possible new uses will be discussed.

### **Syngenta Product, Research, and Label Update – Scott Jackson**

This presentation will provide updates on the most current labels, new use patterns, and a discussion about the newest literature regarding AVM and bromide related to diquat.

### **De-escalating Conflict for Aquatic Plant Managers – Megan Cantrell**

In this session, participants will be instructed on the model of values development which is the root of interpersonal conflict. The block-and-bridge communication technique for conflict resolution will be taught as a tool for in-person conflict. Participants will apply the block-and-bridging technique in real-world scenarios applicable to aquatic plant managers. As a result of attending this session, participants will be able to: Identify sources of conflict, Demonstrate conflict resolution techniques in real-world situations.

### **Integrated Management: Biological Controls – Lee Martin**

IPM stands for "Integrated Pest Management." It's an approach to manage insects, diseases, weeds, animals and other "pests" that cause damage by combining biological, cultural, mechanical and chemical practices. Lee County Hyacinth Control District has utilized multiple species of biological controls including triploid grass carp (*Ctenopharyngodon idella*), alligatorweed flea beetle (*Agasicles hygrophila*), water hyacinth plant hopper (*Megamelus scutellaris*), and eastern mosquitofish (*Gambusia holbrooki*). We are always looking for better ways to manage invasive aquatic vegetation and one effective method is the use of biological species. LCHCD continues to explore the value of biological control agents, as these have been very effective and are often referred to as an "essential management tool in the aquatic tool belt."

### **Update: Utilizing Drone Technology in Aquatic Plant Management – Jason Cull**

Lee County Hyacinth Control District has been utilizing drones in the aquatic weed management for over 2 years. The presentation will focus on the past/present/future of our drone program and also lessons we've learned along the way. We are excited to share our experiences with this new technology to hopefully expand and develop its future potential in the aquatic plant management industry.

## **Abstracts: Thursday, October 14, 2021**

### **Lake Volume Dynamics: APM in the 3<sup>rd</sup> Dimension – James Leary, Kelli Gladding, Alex Dew, Jake Thayer**

In-water herbicide applications are critical to effective management of submersed aquatic vegetation and it is the dominant use pattern for aquatic plant management in Florida. We've learned from decades of elegant research that target concentration and exposure time will dictate treatment efficacy. Calculating target concentration starts with an accurate volume estimate of the treatment area. Here we will review the accuracy of standard methods including pole depths, acoustic surveys and also how to calculate volume with lake bathymetry in GIS. We will also demonstrate how bathymetric maps are only as good as the date they were produced. Florida lakes are very dynamic systems and highly regulated to account for seasonal changes (e.g., monsoon summers and dry winters). Lake levels are constantly changing and constantly being monitored. By the good work of many, there is close-to-real-time data on lake elevation and flow for many of Florida's lakes, which is critical information for adjusting volume and dose calculations up until the treatment date. In public waters there are small windows of opportunity to effectively manage hydrilla without interfering with the plethora of other activities. Traditionally, a third of in-water hydrilla treatments have been administered in February and March. This coincides with peak elevation before water levels are reduced going into the monsoon season (i.e., May). In many cases the elevation can drop by over a foot between February and May, translating into huge cost differences in herbicide inventory to achieve the same target concentration. There are a multitude of logistical factors that go into planning and implementation of an in-water treatment. Adding diligence to lake volume calculations and awareness of lake conditions leading up to the treatment can improve efficiency and potential cost savings of an in-water treatment.

### **Early Detection and Rapid Response for *Nymphoides cristata* on St Johns River: Is it gone? – Tim Harris and Kelli Gladding**

In 2012 a population of *Nymphoides cristata* was detected in the central St. Johns River in the Deland area. In 2012 and 2013 the Central Florida CISMA under guidance of Kelli Gladding conducted a hand removal of plants. This was effective and the plants were confined to a boat basin. The basin was treated by USACE and follow up surveys were conducted which determined the population had escaped the basin and established several small populations. Continuous treatments and monitoring was conducted to contain the populations. In 2017 hurricane Irma hit and no locations of *Nymphoides cristata* have been detected since.

### **Herbicide Uptake from Sediments in Submersed Aquatic Vegetation – William Haller**

This presentation will present the latest results on the uptake of aquatic herbicides from the roots via aqueous sediments. The impacts on drawdown treatments, tuber viability, and dealing with tuber sprouting will all be discussed. These results are a combination of lab, mesocosm, and small scale field trials.

### **Implementation of a Standardized Protocol for Freshwater Fish Health in Florida – Daniel Nelson and Ted Lange**

The health of Florida's aquatic ecosystems and sportfishes has catapulted into the spotlight by concerned stakeholders. Stakeholders have blamed aquatic plant management and herbicide treatments on the degradation of Florida's water quality and apparent increase in fish disease. In response, the Florida Fish and Wildlife Conservation Commission's Freshwater Fisheries Research and Management divisions implemented a field-based approach to visually assess the presence of gross abnormalities of fish. Twenty-eight

waterbodies were sampled in spring 2020 and spring 2021 to assess the presence of abnormalities in Largemouth Bass *Micropterus salmoides* populations. Observed abnormalities were coded into five categories while in the field. In spring 2021, 4.7% of sampled bass were coded with some abnormality, the most common being lesion (2.3%). We found no evidence to support any trends between the percent of abnormalities and metrics related to water quality, watershed land use, fishery community, or herbicide use. Future research efforts should focus on further improving standardization of abnormality coding, understanding the biotic and abiotic factors influencing the variability of abnormalities among waterbodies, and prompt further diagnostic work if the prevalence of abnormalities increases or a mortality event occurs. Future management efforts should focus on providing current, relevant information to stakeholders on different abnormalities and their effects on the status of Florida's waterbodies.

### **Water Chemistry, Aquatic Plants, Fish, Wildlife and Finally Hydrilla – Mark Hoyer**

The core lake management strategy for most system begins with the control of nutrients, primarily phosphorus and nitrogen, which generally limit primary production. The chain of eutrophication models (nutrient loading models, phosphorus – chlorophyll, chlorophyll – Secchi, and Secchi – maximum depth of plant colonization models) are all tools used to set targets for nutrient management strategies. The abundance of aquatic organisms is directly related to a lakes base productivity, which is determined by limiting nutrients of individual systems. Low nutrients fewer aquatic organisms and high nutrient more aquatic organisms. Along this nutrient gradient, aquatic plants provide habitat that differentially impacts the life histories of individual species of fish and wildlife within the lake system. This presentation will discuss the relations among water chemistry, aquatic plants, and fish and wildlife populations in Florida lakes. Finally, there will be a brief discussion of past and present management strategies for hydrilla using Lake Istokpoga as an example.

### **More trials to evaluate “natural” herbicides for aquatic weed management – Lyn Gettys**

The 2019 FWC “pause” in herbicidal aquatic weed control has spurred interest in evaluating the efficacy and selectivity of alternative products for invasive species management in aquatic systems. We are investigating the activity of a range of concentrations of acetic acid and d-limonene after foliar applications to selected invasive floating and native emergent plants. Year 1 of this 3-year project focused on efficacy on waterhyacinth and waterlettuce and selectivity on pickerelweed and broadleaf sagittaria; these data were presented at the 2020 FAPMS conference. In Year 2 we evaluated efficacy on feathered mosquitofern and common salvinia and selectivity on cattail and spikerush; these data are the focus of this presentation. Plants were co-cultured in 68L mesocosms until floating plant coverage was > 80%, then treated once with a single product or combination (plus surfactant). Four replicates were prepared for each treatment and all plants were maintained for 8 weeks after treatment. Plants were then evaluated for visual quality, destructively harvested and placed in a forced-air drying oven for 2 weeks to determine reduction in biomass compared to untreated control (UTC) plants. We were able to identify treatments that were efficacious on target species and selective on native species, but as with our Year 1 data, deployment of these treatments at scale would result in significant increases in costs. These data reveal that alternative products may be useful for aquatic weed management but more research – including field trials – is necessary to confirm these results.

### **Update from the Aquatic Plant Management Society – Dr. Jay Ferrell**

This presentation will provide an update on the national chapter of aquatic plant management (APMS). Invasive plant trends, the national conversation about HAB and membership updates will all be provided.



**Product, Label, and Industry Update from UPL – Dean Jones**

The UPL Industry Update will include a discussion of what’s new at UPL NA, a new use pattern for Hydrothol Granular, a new combination with Hydrothol 191, an introduction to our new imazamox formulation known as Top Deck, and an update on ADAPT (Aquatic Delivery Autonomous Precision Technology) prototype IV. ADAPT is the newest technology from UPL that is designed to aid the applicator in efficiency and accuracy.

**The Continued Refinement of Triclopyr Use Patterns for Invasive Plant Control – Stephen Enloe**

Triclopyr is a widely used herbicide for invasive plant management. However, recent changes to glyphosate use patterns have resulted in an even greater interest in triclopyr use. Additionally, recent advances in triclopyr formulations have resulted in an expansion of opportunities for use. This talk will focus on refinement of triclopyr approaches to improve invasive plant control and minimize non-target injury.

**Spray Tracker Technology for Aquatic Vegetation Control with FWC – Alex Dew**

In early 2019, the Florida Fish & Wildlife Conservation Commission (FWC) conducted a series of meetings to solicit stakeholder input about its Invasive Aquatic Plant Management Program. One of the main stakeholder desires expressed in those meetings was increased oversight of contractors. In response, FWC developed a GPS tracking system to record plant management applications (*SprayTracker*). Very early in this process, the utility of this technology in areas outside of contractor oversight was recognized. This program is still in its pilot phase but has already been used for research, contractor fleet management, and more. GPS units have also been fitted on mechanical harvesters and mechanical shredders to record treatments with those machines. FWC is also looking into the potential to expand this technology to upland plant management and electrofishing sampling. Passive collection of data on such a fine temporal and spatial scale gives researchers and managers an abundance of data and information with minimal effort required for collection.

**Notes**

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Be sure to thank our sponsors!

