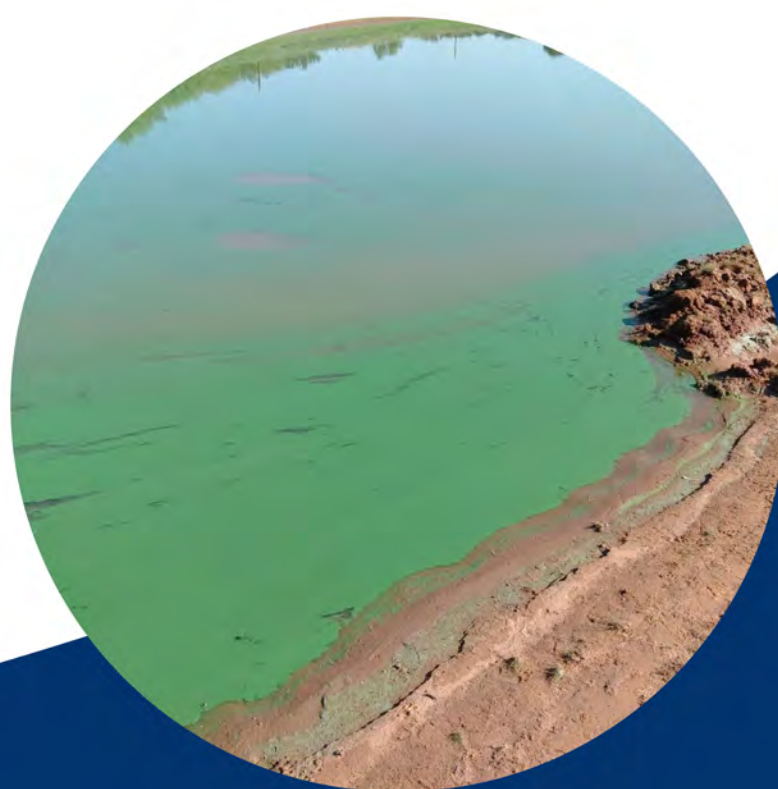




# 2022 ANNUAL CONFERENCE

Texas Aquatic Plant Management Society



San Marcos, TX  
**November 7-9, 2022**

## ABOUT THE TEXAS AQUATIC PLANT MANAGEMENT SOCIETY (TAPMS)

The TAPMS is a subunit of the Aquatic Plant Management Society—an international organization of scientists, educators, students, commercial pesticide applicators, administrators, and concerned individuals interested in the management and study of aquatic plants. The Texas Aquatic Plant Management Society consists of aquatic vegetation management professionals, companies, researchers, students, and Extension specialists dedicated to aquatic vegetation management issues in Texas. Our focus is informing youth and adults about aquatic vegetation management and preservation of natural aquatic environments, including control of invasive aquatic plant species and conservation and propagation of native aquatic plant species including rare or threatened species.

Webpage: <http://www.tapms.org>

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**Special Acknowledgments:** The 2022 Texas Aquatic Plant Management Society Annual Conference would not have been possible without the efforts of Bill Torres (TAPMS Executive Director), Carlton Layne / AERF (student presenter travel support), the TAPMS Board of Directors, and the many presenters and exhibitors who helped to make this conference an outstanding event. We are especially grateful for the support of our conference sponsors, which are acknowledged in this program.

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2022 Annual Meeting possible!



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## DAILY EVENTS-AT-A-GLANCE

See Agenda on the following pages for event times.

### MONDAY - NOVEMBER 7, 2022

TAPMS Pre-Conference Board of Directors Meeting & Work Session  
Exhibits Setup  
Conference Check-In and Onsite Registration  
Women of Aquatics Happy Hour  
President's Reception

### TUESDAY - NOVEMBER 8, 2022

#### *Morning*

Conference Check-In and Onsite Registration  
Meeting Opens – President's Welcome – General Session  
Lunch: Explore San Marcos or stay at the Conference Center

*LUNCH SPONSORED BY: Syngenta (Gold Sponsor), Alligare (Gold Sponsor), and EAHCP (Gold Sponsor).*

#### *Afternoon*

General Session (Adjourns – 4:45 p.m.)  
Pesticide Applicators Receive CEU Certificates (Veramendi G & H Hallway; 4:45 – 5:15 p.m.)  
Awards Banquet - TAPMS Awards Presentations & Election Results

### WEDNESDAY - NOVEMBER 9, 2022

Conference Check-In and Onsite Registration  
General Session (Adjourns – 11:55 a.m.)  
Post-Conference Board Meeting  
Glass Bottom Boat Tours

*BREAKS SPONSORED BY: Syngenta (Gold Sponsor), Alligare (Gold Sponsor), EAHCP (Gold Sponsor), BioSafe Systems (Silver Sponsor), SePRO (Silver Sponsor), UPL Environmental Solutions (Silver Sponsor), and WinField United (Silver Sponsor).*

## AGENDA-AT-A-GLANCE

### MONDAY - NOVEMBER 7, 2022

- 1:00 PM - 2:00 PM Pre-Conference Board Meeting/Work Session (*Placido Boardroom*)
- 2:00 PM - 6:00 PM Conference Early Check-In and Onsite Registration (*Veramendi Pre-Function G & H*)
- 4:00 PM - 6:00 PM Exhibits Set-up (*Veramendi Pre-Function G & H*)
- 5:30 PM – 6:15 PM Women of Aquatics Happy Hour (*Spring Lake Salon A*)
- 6:30 PM - 8:30 PM President's Reception (*Spring Lake Salon A*)

### TUESDAY - NOVEMBER 8, 2022

- 7:00 AM - 8:00 AM Conference Check-In and Onsite Registration (*Veramendi Pre-Function G & H*)
- 7:00 AM - 8:30 AM Breakfast on your own (*Complimentary breakfast in lobby for hotel guests*)
- 8:30 AM - 10:20 AM President's Welcome & CEU Session (*Veramendi Salons G & H*)
- 10:20 AM - 10:40 AM Morning Refreshment Break (*Spring Lake Pre-Function C*)
- 10:40 AM - 11:30 AM CEU Session Continued (*Veramendi Salons G & H*)
- 11:30 AM - 1:30 PM Boxed Lunch (*Explore San Marcos or eat in Spring Lake Salon C*)
- 1:30 PM - 3:30 PM CEU Session (*Veramendi Salons G & H*)
- 3:30 PM - 3:50 PM Afternoon Refreshment Break (*Spring Lake Pre-Function C*)
- CEU applicators must complete TDA sign-in (*Veramendi Pre-Function G & H*)
- 3:50 PM - 4:20 PM Student Presentations & Judging (*Veramendi Salons G & H*)
- 4:20 PM - 4:45 PM General Session & Closing remarks (*Veramendi Salons G & H*)
- 5:00 PM - 5:15 PM Pesticide Applicators Receive CEU Certificates (*Spring Lake Salon C*)
- 5:15 PM - 6:00 PM Annual TAPMS Business Meeting (*Spring Lake Salon C*)
- 6:15 PM - 8:00 PM Banquet Dinner & Awards (*Spring Lake Salon C*)

### WEDNESDAY - NOVEMBER 9, 2022

- 7:00 AM - 8:00 AM Conference Check-In and Onsite Registration (*Veramendi G&H Hallway*)
- 7:00 AM - 8:30 AM Breakfast on your own (*Complimentary breakfast in lobby for hotel guests*)
- 8:30 AM - 10:05 AM President's Announcements and General Session (*Veramendi Salons G & H*)
- 10:05 AM - 10:30 AM Morning Refreshment Break (*Veramendi Pre-Function G & H*)
- 10:30 AM - 11:45 AM General Session Continued (*Veramendi Salons G & H*)
- 11:45 AM - 12:00 PM Closing remarks (*Veramendi Salons G & H*)
- 11:00 AM - 12:30 PM Exhibitor Break Down (*Veramendi Pre-Function G & H*)
- 11:00 AM - 2:30 PM Post-Conference Board Meeting (*Placidio Boardroom*)
- 2:00 PM - 3:00 PM Spring Lake Glass bottom Boat Tours at The Meadows Center  
*Session A 2:00-2:30 PM; Session B 2:30 PM-3:00 PM*  
Sponsor: Edwards Aquifer Habitat Conservation Plan

**SITE INFORMATION & MAP**

Embassy Suites  
 1001 E McCarty Ln.,  
 San Marcos, TX 78666  
 Phone: (512) 392-6450



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## **SOCIAL EVENTS INFORMATION**

**WOMEN OF AQUATICS HAPPY HOUR :** *November 7, 5:30 pm to 6:15 pm, Spring Lake Salon A*

Join the Women of Aquatics (WOA) for a short happy hour before the President's Reception to discuss the mission, current status, and future goals of WOA. All genders are welcome to join and socialize.

**PRESIDENT'S RECEPTION:** *Monday, November 7, 6:30 pm to 8:30 pm, Spring Lake Salon A*

Join your TAPMS friends and colleagues at the Presidents' Reception to network and socialize while enjoying food and beverages. The President's Reception is open to all registered attendees. Non-registered guests may purchase tickets at the meeting registration desk.

**LUNCHEON:** *Tuesday, November 8, 11:30 am to 1:30 pm, Spring Lake Salon C*

Grab your boxed lunch and go explore San Marcos or feel free to stay and chat at the Conference Center. Find San Marcos suggestions on the next page.

**LUNCH SPONSORED BY:** *Syngenta (Gold Sponsor), Alligare (Gold Sponsor), and EAHCP (Gold Sponsor).*

**ANNUAL BUSINESS MEETING:** *Tuesday, November 8, 5:30 pm to 6:15 pm, Spring Lake Salon C*

All TAPMS members are encouraged to attend the TAPMS Annual Business Meeting for Society updates. It will be held prior to the Banquet Dinner.

**BANQUET DINNER & AWARDS:** *Tuesday, November 8, 6:30 pm to 8:00 pm, Spring Lake Salon C*

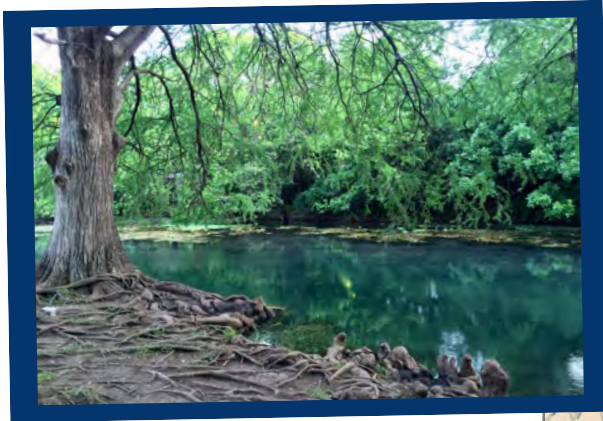
Registered attendees are invited to attend the Awards Banquet. Non-registered guests may purchase tickets at the meeting registration desk. During/after dinner, we will recognize those who have served TAPMS, welcome new officers and directors, and present this year's student presentation award and scholarship recipients.

**BREAKS SPONSORED BY:** *Syngenta (Gold Sponsor), Alligare (Gold Sponsor), EAHCP (Gold Sponsor), BioSafe Systems (Silver Sponsor), SePRO (Silver Sponsor), UPL Environmental Solutions (Silver Sponsor), and WinField United (Silver Sponsor).*



# EXPLORE *San Marcos*

2022 TAPMS Annual Meeting  
November 7-9, 2022  
San Marcos, TX



## *San Marcos River Parks*

Visit any of the San Marcos River Parks to access or view the river.

To name a few:

- Sewell
- City Park
- Bicentennial
- Rio Vista
- Ramon Lucio



Boxed lunches during exploration are sponsored by our gold sponsors:



EDWARDS AQUIFER  
HABITAT CONSERVATION PLAN



## DETAILED AGENDA

*\* Indicates student presentation.*

*CEU indicates attendance credit from TDA*

### MONDAY - NOVEMBER 7, 2022

- 1:00 PM - 2:00 PM Pre-conference board meeting/work session (*Board Members; Placidio Boardroom*)
- 4:00 PM - 6:00 PM Conference early check-in and onsite registration (*Veramendi G & H Hallway*)
- 4:00 PM - 6:00 PM Exhibitor set up (*Veramendi G & H Hallway*)
- 5:30 PM – 6:15 PM Women of Aquatics Happy Hour (*Spring Lake Salon A*)
- 6:30 PM - 8:30 PM President's reception (*Spring Lake Salon A*)

### TUESDAY - NOVEMBER 8, 2022

- 7:00 AM - 8:00 AM Conference check-in and onsite registration (*Veramendi G & H Hallway*)
- 7:00 AM - 8:30 AM Breakfast on your own (*Complimentary breakfast in lobby for hotel guests*)

#### *Opening Remarks*

- 8:30 AM - 8:40 AM Welcome & Announcements  
(*Brittany Chesser; TAPMS President*)

#### *Session 1 (Veramendi G & H, Moderator: Jason Chapman)*

- 8:40 AM - 9:30 AM <sup>CEU</sup> Overview and Updates and State & Federal Laws and Regulations  
(*Carlton Layne; Aquatic Ecosystem Restoration Foundation*)
- 9:30 AM - 10:20 AM <sup>CEU</sup> Drift Minimization: Maximizing Your Chemical Investment  
(*Chris Smith; Winfield United*)
- 10:20 AM - 10:40 AM Morning Refreshment Break (*Veramendi G & H Hallway*)
- 10:40 AM - 11:30 AM <sup>CEU</sup> Statewide Integrated Pest Management of Aquatic and Riparian Invasive Species  
(*John Findeisen and Monica McGarrity; Texas Parks and Wildlife Department*)
- 11:30 AM - 1:30 PM Boxed Lunches (*Explore San Marcos or eat in Spring Lake Salon C*)

#### *Session 2 (Veramendi G & H, Moderator: Kelly Duffie)*

- 1:30 PM - 1:45 AM <sup>0.25 CEU</sup> Field Evaluation of Intermittent Pulse Endothall Treatment for Dioecious Hydrilla Control in Spring Creek, Lake Seminole, GA  
(*Dean Jones; UPL NA OpenAg Environmental Solutions*)

**TUESDAY - NOVEMBER 8, 2022**

- 1:45 PM - 2:00 PM     0.25 CEU Algae vs. Cyanobacteria Morphology and the Use of Peroxyacetic Acid (PAA)/Hydrogen Peroxide in Selective Freshwater Cyanobacterial Control  
(Tom Warmuth; BioSafe Systems)
- 2:00 PM - 2:30 PM     0.5 CEU TPDES Pesticides General Permit TXG870000  
(Bobby Chavez, P.E.; Texas Commission on Environmental Quality)
- 2:30 PM – 3:30 PM     CEU Aquatic Herbicide Mode of Action  
(Todd Sink, Ph.D; Texas A&M Agrilife Extension Service)
- 3:30 PM - 3:50 PM     Afternoon Refreshment Break (Veramendi G &H Hallway)  
CEU applicators must complete TDA sign-in (Veramendi G &H Hallway)
- 3:50 PM - 4:05 PM     \*Seasonal Resource Allocation and Comparative Analysis of Accumulated Degree-Day Models for the Invasive Aquatic Plant Cuban Bulrush (*Oxycaryum cubense*)  
(Allison Squires; Minnesota State University)
- 4:05 PM - 4:20 PM     \*Remote Sensing of the Invasive *Arundo donax* in Native Fish Conservation Areas of Central Texas  
(Jenna DeMent, Texas State University)
- 4:20 PM - 4:35 PM     \*Water Activity of Glyphosate, 2,4-D, and Diquat on Water hyacinth (*Eichhornia Crassipes*)  
(Hannah Brown; University of Florida)
- 4:35 PM - 4:50 PM     Drone Application with Organic Sticker on Aquatic Weeds  
(Lucy Marshall, PhD; BioSorb Inc.)
- 4:50 PM - 5:00 PM     Closing remarks for the day  
(Brittany Chesser, TAPMS President)

***Tuesday Post-Session Events***

- 5:00 PM - 5:15 PM     Applicators receive CEU certificates (Veramendi G & H Hallway)
- 5:30 PM - 6:15 PM     Annual TAPMS Business Meeting (Spring Lake Salon C)
- 6:30 PM – 9:00 PM     Banquet Dinner & Awards (Spring Lake Salon C)

**WEDNESDAY- NOVEMBER 8, 2022**

- 7:00 AM - 8:30 AM     Conference check-in and onsite registration (Veramendi G & H Hallway)
- 7:30 AM - 8:30 AM     Breakfast on your own (Complimentary breakfast in lobby for hotel guests)

### ***Opening Remarks***

8:30 AM - 8:40 AM Welcome & announcements  
(*Brittany Chesser; TAPMS President*)

### ***Session 3 (Veramendi G & H, Moderator: Brittany Chesser)***

8:40 AM – 8:55 AM Utilizing biological monitoring to guide the implementation of an aquatic plant restoration project for the fountain darter (*Etheostoma fonticola*)  
(*Casey Williams; BIO-WEST*)

8:55 AM – 9:05 AM Texasinvasives.org for Invasive Aquatic Species Management and Preventions  
(*Ashley Morgan-Olvera; Sam Houston State University*)

9:05 AM – 9:20 AM A Regional Example of Triploid Grass Carp Demand and Practices in Private Waters  
(*Robert McCartney; Johnson Lake Management*)

9:20 AM - 9:35 AM Seven Years in the Reeds: The Healthy Creeks Initiative to Control Arundo, 2016-2022  
(*Angela England, PhD; Texas Parks & Wildlife Department*)

9:35 AM - 9:50 AM Density Effects on Growth of *Ex Situ* Texas Wild-Rice  
(*Chris Hathcock, PhD; U.S. Fish and Wildlife Service, San Marcos Aquatic Resources Center*)

9:50 AM – 10:05 AM Women of Aquatics Update  
(*Amy Kay; Clarke Aquatic Services*)

10:05 AM - 10:30 AM Morning Refreshment Break (*Veramendi G & H Hallway*)

### ***Session 4 (Veramendi G & H, Moderator: Kristina Tolman)***

10:30 AM - 10:45 AM Plant Selections and Successes in the Redesigned Stormwater Wetland of the TRWD Rainscapes  
(*Michelle Wood-Ramirez; Tarrant Regional Water District*)

10:45 AM - 11:00 AM Vegetation Management on a Large Scale Constructed Wetland for Water Reuse  
(*T. Wells Shartle; Tarrant Regional Water District*)

11:00 AM - 11:15 AM Propagation Techniques for Beneficial Native Aquatic Plants  
(*Haley Kokel; Fish On Aquatic Plants*)

11:15 AM - 11:30 AM Amphibious Harvesters and Tool Carriers: An Industry Update  
(*Trent Lewis; Pond Medics*)

11:45 AM - 12:00 PM Conference Final Address and looking forward to the 2023 meeting  
(*Brittany Chesser; TAPMS president*)

***Post-Conference Events***

12:30 PM - 2:00 PM Post-Conference Board Meeting (*Kerby Lane*)

2:00 PM - 3:00 PM Spring Lake Glass Bottom Boat Tours  
*Session A:* Boat Tour (2:00 – 2:30 PM); Discovery Hall and Wetland Boardwalk  
*Session B:* Discovery Hall and Wetland Boardwalk; Boat Tour (2:30 – 3:00 PM)

## PRESENTATION ABSTRACTS

*Abstracts are listed alphabetically by presenting author last name.*

*\* Indicates student presenter*

*<sup>CEU</sup> Indicates attendance credit of 1.0 CEU*

### <sup>CEU</sup> **Overview and Updates on State & Federal Laws and Regulations**

***Carlton Layne***

*Aquatic Ecosystem Restoration Foundation*

Overview of current laws and regulations governing our industry, including pesticide use/misuse, the safe use of pesticides, Federal Government standards, NPDES/WOTUS updates, and label changes and warnings.

### <sup>CEU</sup> **Drift Minimization: Maximizing Your Chemical Investment**

***Chris Smith***

*Winfield United*

There is a need to make sure spray applications reach their target. Maximum coverage is needed for optimal pesticide performance. Maximum coverage is needed to reduce the movement of pesticides to non-target areas. There are many factors that affect whether a spray application reaches its target. Actions can be taken to reduce spray movement and ensure spray applications reach their target. Topics covered in this presentation include: What is spray drift? Why is reducing drift important? What factors affect spray drift? What can be done to limit spray drift?

### <sup>CEU</sup> **Statewide Integrated Pest Management of Aquatic and Riparian Invasive Species**

***John Findeisen and Monica McGarrity***

*Texas Parks and Wildlife Department*

This presentation will provide an update on Texas Parks and Wildlife Department's aquatic vegetation and invasive species management efforts in Fiscal Year 2022 (Sept. 2021 – Aug. 2022), with a focus on implementation of an Integrated Pest Management (IPM) strategy. Texas' IPM strategy employs a combination of prevention, herbicide treatments, biological control efforts, and outreach for not only prevention but also to promote environmental stewardship (e.g., enhancing creek health) and involvement in citizen science monitoring efforts. Early Detection and Rapid Response (EDRR) capacity is vital to efforts to monitor for new infestations of the most problematic species such as giant salvinia (*Salvinia molesta*) and zebra mussels (*Dreissena polymorpha*) and mount a rapid response when feasible. Management efforts continue to focus on floating, aquatic invasive plants and riparian invasive plants that crowd or shade out native plants, degrade habitat for fish and wildlife, and inhibit boater access. Management of aquatic and riparian invasive species using an IPM approach plays a key role in conserving Species of Greatest Conservation Need (SGCN) and providing hunting, fishing and outdoor recreation opportunities for the use and enjoyment of present and future generations

**<sup>CEU</sup> Field Evaluation of Intermittent Pulse Endothall Treatment for Dioecious Hydrilla Control in Spring Creek, Lake Seminole, GA**

***K. Dean Jones<sup>1</sup>, Benjamin P. Sperry<sup>2</sup>, Michael W. Durham<sup>3</sup>, Robert J. Richardson<sup>4</sup>***

<sup>1</sup>*UPL NA OpenAg Environmental Solutions, Auburndale, FL*

<sup>2</sup>*Research Biologist, US Army Engineer Research and Development Center, Gainesville, FL.*

<sup>3</sup>*Biologist, University of Florida Center for Aquatic and Invasive Plants, Gainesville, FL.*

<sup>4</sup>*Professor, North Carolina State University, Raleigh, NC*

A field demonstration was conducted in Spring Creek on Lake Seminole near Bainbridge, GA in 2022 to evaluate an intermittent-pulse application of endothall to control dioecious hydrilla [*Hydrilla verticillata* (L.f.) Royle]. Potassium salt of endothall was dripped into spring creek at 3 mg ai L-1 for 8 hours a day for three days (24 hours total treatment). This novel application technique allows for application equipment to be manned during treatment hours and does not require overtime labor for equipment supervision outside of normal work hours. Additionally, current mesocosm research suggests that this intermittent exposure pattern can potentially increase plant control compared to constant exposure at equivalent concentrations and exposure times. Four plots, one upstream and three downstream of the injection site, were established for point intercept surveys while the entire main channel was surveyed for vegetation cover and biovolume using sonar techniques. Spring Creek consisted primarily of hydrilla prior to treatment with some small populations of coontail (*Ceratophyllum demersum*). Pretreatment (January 2022) vegetation cover and biovolume was 37 and 92%, respectively. By May of 2022 (3 months post-treatment), vegetation cover and biovolume was reduced to 22 and 79%, respectively. However, based on point-intercept data, vegetation cover and biovolume data from May mostly consisted of coontail which appears to have replaced areas previously infested with hydrilla. Further details of the demonstration will be given in the presentation as data collection is ongoing. Future work will aim to refine intermittent pulse intervals with endothall and other herbicides for optimized control of submersed aquatic plants.

**<sup>CEU</sup> Algae vs. Cyanobacteria Morphology and the Use of Peroxyacetic Acid (PAA)/Hydrogen Peroxide in Selective Freshwater Cyanobacterial Control**

**Tom Warmuth**

*BioSafe Systems*

Peroxide based algaecide have been shown effective in selective treatments for cyanobacteria. Review of the morphological differences of true algae and cyanobacteria and theories to support this algicidal selectivity. Lab scale trails of liquid Peroxyacetic acid (PAA)/hydrogen peroxide and solid SCP (sodium carbonate peroxyhydrate) on *Microcystis aeruginosa* give direction on developing effective dosing in field applications for cyanobacterial harmful algal blooms (cHAB). Monitoring prior to treatment the bloom density and distribution provide guidance for effective timing and method/technique of application adjusting for cell density at depth with algaecide concentration.

**<sup>CEU</sup> TPDES Pesticides General Permit TXG870000**

***Bobby Chavez, P.E.***



*Texas Commission on Environmental Quality*

This presentation will discuss the TPDES Pesticides General Permit TXG870000 regulated by the Texas Commission on Environmental Quality (TCEQ), which authorizes point source discharge of biological pesticides and chemical pesticides that leave a residue in water

<sup>CEU</sup> **Aquatic Herbicide Mode of Action**

**Todd Sink, Ph.D**

*Texas A&M Agrilife Extension Service*

This presentation will cover mode of action for the 15 aquatically approved herbicides in Texas and how that relates to aquatic vegetation management. Mode of action is the mechanism by which a herbicide affects a plant at the tissue level, including the sequence of events from absorption until plant death. Herbicides with the same mode of action will have similar translocation patterns and cause similar injury to plants. Target plant selectivity and behavior in water and soil are also often similar for herbicides with the same mode of action. Mode of action, therefore, has implications for how and when herbicides are applied, as well as how they affect plants, and species selectivity and efficacy. Understanding the mode of action of herbicides can make you a better aquatic vegetation management professional and deliver improved vegetation kill results.

**\*Seasonal Resource Allocation and Comparative Analysis of Accumulated Degree-Day Models for the Invasive Aquatic Plant Cuban Bulrush (*Oxycaryum cubense*)**

**Allison Squires**

*Minnesota State University*

Cuban bulrush, [*Oxycaryum cubense* (Poepp. & Kunth)] Lye is an epiphytic invasive perennial plant native to South America. It has now spread to parts of Africa, Mexico, and the Southeastern United States. Cuban bulrush is known to form large floating islands that restrict the use of lakes, reservoirs, and flowing waters. Currently, there are two types invading the United States: polycephalous (*Oxycaryum cubense forma cubense*) and monocephalous (*Oxycaryum cubense forma paraguayense*). To better understand on the potential range expansion of this species ADD (accumulated degree-day) modeling was conducted on the monocephalous type collected from Lake Columbus, Mississippi (May 2019 to April 2021). Water hyacinth (*Eichornia crassipes*) was also collected and included in the ADD modeling as the two species often grow together. Water hyacinth biomass peaked in September of 2019 and 2020, while Cuban bulrush biomass peaked in December in the year 2019-2020 and February of 2020-2021. The ADD model indicated that Cuban bulrush has a base threshold of -3 to -5°C, and thus grew earlier and longer than water hyacinth (base threshold 3-4°C). The results from the ADD modeling suggests that Cuban bulrush may have the capacity to expand as far north as Missouri, Future work will assess seasonal phenology and starch allocation of Cuban bulrush over a one-year period at Lake Columbus, MS, Lake Martin, LA, and Orange Lake, FL. The latter two field sites have the polycephalous type. The current data (2022) will expand our knowledge of the role of photoperiod and temperature (ADD) as drivers of its life history on emergent tissue.

## **\*Remote Sensing of the Invasive *Arundo donax* in Native Fish Conservation Areas of Central Texas**

***Jenna DeMent***

*Texas State University*

Invasive species management is often hindered by delays in detection or knowledge gaps of species-specific expansion rates. When community monitoring is irregular, disturbed and even protected natural areas become more vulnerable to advanced invasions. Such monitoring often requires labor intensive surveys, sometimes in remote locations, costing time and resources that could otherwise be used in the treatment stage of management. As small Unmanned Aerial Systems (sUAS) become more readily available to land managers and researchers, an avenue has been created for early detection of conspicuous invasive species. We aim to map one of these species, *Arundo donax*, an invasive giant reed that infests freshwater systems globally. *Arundo* poses a significant threat to the designated Native Fish Conservation Areas (NFCAs) of Texas. High resolution multi-spectral imagery collected around known populations of *Arundo donax* permits us to isolate the species' unique spectral response. This spectral response will then be compared to satellite imagery with greater coverage – as in the Sentinel-2 satellite – for the development of a classification map aimed to encompass the riparian zones of the targeted NFCAs. While the model is still in development, its completion will contribute to enhanced, less labor-intensive methodology for the early detection of *Arundo donax*. Mapped infestations and elucidated expansion rates of *Arundo* will both be used in a spatial analysis investigating relationships between *Arundo*'s spread within NFCAs and landscape characteristics that may contribute to its spread (e.g., developed infrastructure, nearby *Arundo* populations). These results will be used in identification of priority management locations of *Arundo donax* and may aid in streamlining ongoing management efforts. Additionally, project products will benefit land management agencies through the creation of the first remote sensing based *Arundo* inventory in NFCAs and advised methodology for continued detection.

## **\*Water Activity of Glyphosate, 2,4-D, and Diquat on Water hyacinth (*Eichhornia Crassipes*)**

***Hannah Brown***

*University of Florida*

Water hyacinth is an aggressive floating macrophyte that has been traditionally managed using foliar applications of 2,4-D and diquat. Recent research suggests that 20-25% of herbicide is lost to the water column. Here, we evaluated the relative efficacy of subsurface applications of 2,4-D, diquat, and glyphosate to determine if spray loss from foliar applications provides additional efficacy through absorption from roots and submersed leaves. Plants were established in mesocosms and treated with diquat at rates of 100, 200, 400, 800, 1600, or 3200 ppb. Both 2,4-D and glyphosate were applied at rates of 125, 250, 500, 1000, 2000, 4000, or 8000 ppb. Total plant biomass was harvested after 28 days of static exposure. Results suggest that subsurface diquat applications are effective at water hyacinth control, with total plant death observed at 3200 mg L<sup>-1</sup> and biomass reductions of 92% at 1600 ppb. Neither 2,4-D or glyphosate were effective at reducing water hyacinth biomass regardless of application rate. Results suggest that spray loss from glyphosate and 2,4-D applications represents wasted product and cost, while spray loss from diquat may provide additional efficacy on water hyacinth.

## **Drone Application with Organic Sticker on Aquatic Weeds**

***Lucy Marshall, PhD***

*BioSorb Inc.*

Drone applications with natural-based organic sticker, Biosorb® TopFilm™ is being used by major aquatic applicators to reduce drift and chemical run-off on waterways. TopFilm™ is made from cereal-grain microsponges called Biocar® (biological carrier) which absorb, spread, and coat uniformly reducing the wash-off of applied materials on vegetation. Recent studies in Lake Okeechobee, Florida, by county biologists, have shown not only that you get good coverage from drone spraying at an altitude of 10 to 15 feet, but also, great control of water lettuce and cattails. Droplet size and spray pattern when using TopFilm™ helps reduce drift, keeping the spray pattern from exceeding its target. Further spray drone studies in hilly, mountainous terrain, with TopFilm™ have shown reduced drift in cross winds. Biosorb® Products promote sustainability and conservation of our waterways by keeping the aquatic weed and algae control products on target, reducing drift and wash-off. Our Biosorb® products are certified organic under the USDA NOP Rule § 205.601(m)(1). For more information, contact us: <http://www.Biosorb-Inc.com> or Biosorb YouTube Channel.

### **Utilizing biological monitoring to guide the implementation of an aquatic plant restoration project for the fountain darter (*Etheostoma fonticola*)**

*Casey Williams*

*BIO-WEST*

Many restoration projects are implemented with little or no information to provide guidance as to how the project should be carried out. Rarely are historical or baseline data available to provide insight on the structure and function of the site before impairment. This greatly decreases the chance of success especially at the ecosystem scale of restoration. Additionally few restoration projects are provided the opportunity and structure to conduct simultaneous monitoring in order to answer questions regarding the long-term success of the project. In 2013 a large scale aquatic plant restoration project was begun in selected locations of the Comal River to help improve and increase habitat for the federally endangered fountain darter (*Etheostoma fonticola*). The ongoing project involves removing an invasive aquatic plant (*Hygrophila polysperma*) by mechanical means and re-introducing native aquatic plants believed to be more favorable to the fountain darter. Routine biological sampling and monitoring including vegetation mapping, timed dip netting and drop net methods spanned 13 years followed by 8 years of monitoring while restoration was being conducted. This robust data set helps gauge habitat use and population changes in the fountain darter population at restored sites over the long-term. Utilizing biological monitoring should greatly enhance the future success and management of this restoration project and should be considered for other restoration projects to enhance success.

### **Texasinvasives.org for Invasive Aquatic Species Management and Preventions**

*Ashley Morgan-Olvera*

*Sam Houston State University*

Texasinvasives.org now housed at The Texas Invasive Species Institute (TISI) in Huntsville, TX, helps ensure the preservation and protection of Texas' native biodiversity through early detection surveys and rapid mitigation of invasive plants and pests. To better our chances of protecting our native landscapes we also strive to inspire environmental stewardship of Texans through education and outreach programs. This presentation will cover aquatic invasive species resources and educational programs available through Texasinvasives.org, how to report these species through our website and Report It! application, and best practices for management and prevention of those species.

## **A Regional Example of Triploid Grass Carp Demand and Practices in Private Waters**

***Robert McCartney***

*Johnson Lake Management*

Biological controls are often used to control nuisance aquatic vegetation, but long-term assessments on their use are lacking. Purpose of this study was to contribute to long-term assessments of triploid Grass Carp *Ctenopharyngodon idella* as a biological control by providing a regional example on the demand and practice of stocking triploid Grass Carp by private landowners between 1992 and 2020. Using a database derived from permit applications (N = 30,387), 793,609 triploid Grass Carp were permitted for stocking in private waters of Texas. Mean number of permitted triploid Grass Carp per year was 27,365 ( $\pm$  7,346; range: 13,897 – 43,226) for stocking into water bodies with a mean surface area ( $\pm$  1 SD) of 2.0 ha ( $\pm$  6.4; range: 0.004 to 158). Numbers of applications and permitted triploid Grass Carp per year remained consistent through time. The typical application, based on distributional medians, was for an introductory stocking of eight triploid Grass Carp into a small water body (median: 0.6 ha) with submergent and emergent vegetation covering >50% of the surface area. Estimated 2020-prorated costs were US\$208 per ha for a water body with <50% vegetative coverage and \$416 per ha for a water body with >50% coverage. Results of this study are a step towards documenting long-term use of triploid Grass Carp as a biological control of nuisance aquatic vegetation but also highlighted gaps in information that will be beneficial for additional long-term assessments.

## **Seven Years in the Reeds: The Healthy Creeks Initiative to Control Arundo, 2016-2022**

***Angela England, PhD***

*Texas Parks & Wildlife Department*

*Arundo donax* (giant reed) is a 20' + tall Asian grass that has invaded riparian habitats across northern Mexico and much of the southern United States. *Arundo* forms dense, 20- to 30-foot-tall monocultures that can crowd out native vegetation, reduce and alter patterns of stream flow, increase streambank erosion, degrade fish and wildlife habitat quality, and increase wildfire risk. Since 2016, the Healthy Creeks Initiative has provided management of invasive *Arundo* at no cost to hundreds of participating landowners within the Texas Hill Country in order to maintain quality habitat for Guadalupe Bass and other native fishes. This presentation will discuss the project's progress to date.

## **Density Effects on Growth of *Ex Situ* Texas Wild-Rice**

***Chris Hathcock, PhD***

*U.S. Fish and Wildlife Service, San Marcos Aquatic Resources Center*

*Zizania texana* (Texas wild-rice) is a federally endangered aquatic grass restricted to the first 4.3 km of the spring-fed, thermally constant San Marcos River in San Marcos, TX, USA. As a partner in the Edwards Aquifer Habitat Conservation Plan, the San Marcos Aquatic Resources Center (SMARC; managed by the U.S. Fish and Wildlife Service) works with Texas State University's Meadows Center for Water and the Environment to propagate *Z. texana* and transplant seedlings to areas within the species' historical range. SMARC also maintains a "species-assurance colony" on station to prevent the species extinction if the natural population succumbs to a

catastrophic event in the river. Texas wild-rice exhibits variation in proportional allocation of biomass to reproductive and non-reproductive tissues based on environmental conditions, which are likely affected by planting density. To compare vegetative and reproductive output of the species at different planting densities, a randomized block design utilizing three experimental tanks and three density treatments was employed over approximately one year. Relative to higher density plots, low-density plots had fewer flowering, non-flowering, and total emergent stems per plot. High-density plots had fewer immature panicles, total panicles, and total emergent stems per seedling, and higher percentages of panicles fully developed and stems senescent per seedling. At the time of harvest, seedling survivorship was greater in low-density than in high-density plots. Although mean tiller biomasses per plot did not differ among densities, low-density plots had greater mean reproductive-, vegetative-, and total-tiller biomasses per seedling than did other plots. Findings suggest a direct relationship between seedling density and intraspecific competition, which negatively affects both vegetative and reproductive growth of individual seedlings. Higher seedling densities, however, likely contribute to greater overall reproductive output within a stand of the species.

## **Women of Aquatics Update**

*Amy Kay*

*Clarke Aquatic Services*

Women of Aquatics is an organization formed to encourage women to participate in and build careers relating to Aquatics. Amy Kay will give an update on the organization and how you can get involved and support Women of Aquatics.

## **Plant Selections and Successes in the Redesigned Stormwater Wetland of the TRWD Rainscapes**

*Michelle Wood-Ramirez*

*Tarrant Regional Water District*

The Tarrant Regional Water District (TRWD) has implemented low impact development strategies (LID) and green stormwater infrastructures (GSI) with its continued landscaping retrofits at its Fort Worth Campus. Applying numerous demonstrations of green stormwater infrastructure into its landscape components, it has developed campus-wide BMPs that help clean, slow, and reuse stormwater, leading to the branding of “TRWD Rainscapes.” A re-designed stormwater wetland was created from a malfunctioning detention basin, and now is the first of its kind in North Texas. This feature has incorporated a variety of wetland plants, with 58 documented species present in the wetland in 2020. The area attracts wildlife such as waterfowl, insects, meso-mammals, and amphibians, and has aided in conservation efforts of wetlands and associated biota. It has also increased in function as a stormwater management component, and introduced a host of other ecosystem services.

The campus has 170 documented vegetation species on its premises, most of which are native to the state. This presentation will highlight the plant community that was planted, and compare it to what is now established and thriving in the North Texas and Upper Trinity Basin’s first re-designed stormwater wetland ecosystem. Parts of the TRWD campus in Fort Worth are a registered pollinator waystation, as well as certified wildlife habitat. The TRWD Rainscapes components on the campus demonstrate benefits to biodiversity and water conservation, and also categories such as new, or innovative designs, retrofit and redevelopment as part of a master plan project. These benefits are applicable to residential, commercial, and industrial audiences, who tour the campus every year. The TRWD Rainscapes help to improve the local watershed and clean our stormwater

before it reaches the Trinity River. This campus serves as a demonstration for stewards of the land, both urban and rural, showcasing how LID can be applied for stormwater management.

Rainscapes Story Map: <https://storymaps.arcgis.com/stories/70cd37053e9e4f81b622376b545a65e5>

or

<https://arcg.is/09ffq00>

## **Vegetation Management on a Large Scale Constructed Wetland for Water Reuse**

### ***T. Wells Shartle***

#### *Tarrant Regional Water District*

The Tarrant Regional Water District (TRWD) constructed a reuse treatment wetland as a dependable water supply project during times of drought for Richland Chambers Reservoir. The George Shannon Wetland is nearly an 1800-acre wetland system capable of treating over 100 million gallons a day (MGD) of raw water from the Trinity River by reducing sediment and nutrient concentrations. The treated wetland water is pumped into Richland Chambers Reservoir and from the reservoir, it is pumped to the customer cities where it is treated and consumed. After consumption, the water is collected at the wastewater treatment plants, treated and discharged as effluent into the Trinity River. To complete the reuse cycle, the Trinity River water is recollected at the wetland system. The wetland system is located on Texas Parks and Wildlife Department's (TPWD) Richland Creek WMA – Carl Frentress unit. The partnership of TRWD with TPWD led to an agreement on vegetation management to promote vegetation beneficial to waterfowl and achieve water quality goals. This presentation will discuss vegetation management successes and failures from a variety of techniques including moist soil drawdowns, biological, mechanical, and chemical.

## **Propagation Techniques for Beneficial Native Aquatic Plants**

### ***Haley Kokel***

#### *Fish On Aquatic Plants*

Whether it is providing habitat, erosion control or aesthetics, native aquatic plants are a key management tool to enhance aquatic ecosystems. Plant species selection can be completed using an evaluation of the existing aquatic vegetation population and the goals for the system. Growing the plants successfully in the nursery starts with using the appropriate propagation technique.

## **Amphibious Harvesters and Tool Carriers: An Industry Update**

### ***Trent Lewis***

#### *Pond Medics*

Although mechanical vegetation control is not the end-all, be-all for aquatic plant management, it can be a tool in the toolbox to help clients achieve success in meeting their management goals. Trent Lewis will provide an industry update on the newest tech available to the market for amphibious machines.

## PRESENTER BIOGRAPHIES

*Biographies are listed by order of presentation; \* Indicates student presenter.*

<sup>CEU</sup> **Carlton Layne** - Email: [layn1111@bellsouth.com](mailto:layn1111@bellsouth.com)

*Executive Director, Aquatic Ecosystem Restoration Foundation*

Carlton R. Layne received his BA Degree in Biology from Clarion State University, Clarion, PA and an MS Degree in Criminal Justice from Rollins College in Winter Park, FL. Carlton spent 5 years with the USDA, Agricultural Marketing Service, and 30 years with the US EPA in the Pesticides & Toxic Substances Branch. While with US EPA, Carlton was an Inspector, Grant Monitor, and Regional and National Training Officer (1973-1990), Chief of the Region 4 Pesticides Section (1990-1999), and a National Pesticides Expert (2000-2003). Currently, Carlton is the Executive Director of the Aquatic Ecosystem Research Foundation. Carlton is Past President of the Florida Aquatic Plant Management Society and Past Director Aquatic Plant Management Society.

<sup>CEU</sup> **Chris Smith** - Email: [CJSmith@landolakes.com](mailto:CJSmith@landolakes.com)

*Senior Professional Sales Representative-Aquatics & Vegetation Management, WinField United*

Chris Smith has been serving and providing solutions to the aquatics and vegetation management industry in Texas for 14 years. He primarily services lake management companies, industrial herbicide applicators, river and water authorities, utility companies, and various governmental agencies. In addition to this role, he has national responsibility for the Aquatics and Vegetation Management business segments for Winfield United. Chris served as the Editor for the Texas Aquatic Plant Management Society for 8 years and President following that tenure in 2019. He also served on the board of the Texas Vegetation Management Association for 6 years including a term as President in 2014-2015. Chris attended Texas A&M University earning a B.S. in Agronomy. He currently resides in Magnolia, Texas with his wife, Tammy and their three children.

<sup>CEU</sup> **Findeisen, John** - Email: [john.findeisen@tpwd.texas.gov](mailto:john.findeisen@tpwd.texas.gov)

*Aquatic Habitat Enhancement Team Lead, Texas Parks & Wildlife Department*

John Findeisen is currently the Team Leader for the Texas Parks and Wildlife Department's Aquatic Habitat Enhancement (AHE) Team in Brookeland, Texas. He earned a B.S. in Wildlife and Fisheries Sciences from Texas A&M University and a M.S. in Biology (emphasis in Aquatic Biology) from Southwest Texas State University. John has been employed by the Texas Parks and Wildlife Department for 20+ years as a fisheries management biologist and transferred from the Corpus Christi District fisheries management team to the AHE team in February 2016.

**McGarrity, Monica** - [Monica.McGarrity@tpwd.texas.gov](mailto:Monica.McGarrity@tpwd.texas.gov)

*Senior Scientist, Texas Parks and Wildlife Department*

Monica McGarrity holds a Bachelor of Science in Biology from Old Dominion University in Virginia and a Master of Science in Biology from Florida Atlantic University. Monica has 16 years of experience working with invasive species in many capacities and is currently Senior Scientist for Aquatic Invasive Species at Texas Parks and Wildlife Department, where her work encompasses diverse aspects of invasive species prevention, detection, ecology, management, and research. Monica represents TPWD on several interagency working groups including the Western, Mississippi River Basin, and Gulf and South Atlantic States Regional Panels of the Aquatic Nuisance Species Task Force, and the Texas Invasive Species Coordinating Committee. Monica has served as a director on the boards of the Texas Invasive Plant and Pest Council and Texas Aquatic Plant Management

Society.

**Dean Jones - Email: [dean.jones@upl-ltd.com](mailto:dean.jones@upl-ltd.com)**

*UPL Aquatics Territory Manager, UPL NA OpenAg Environmental Solutions*

Dean Jones is an Aquatics Territory Manager for UPL NA covering the southeast United States. Dean has 26 years of experience in aquatic plant management and has served as Manager of the Polk County Aquatic Weed Control Section, Senior Biological Scientist with the University of Florida Center for Aquatic and Invasive Plants, and a contractor for the US Army Corps of Engineers. While working for UF and USACE, his focus was hydrilla control while assisting with evaluating new chemistries, developing novel management strategies for hydrilla, and utilizing new technologies for surveys and pre/post treatment evaluations.

**Tom Warmuth - Email: [twarmuth@biosafesystems.com](mailto:twarmuth@biosafesystems.com)**

*National Sales Manager of the Lake, Pond and Municipal Waters Division, BioSafe Systems*

Tom grew up in Fairport Harbor, on the northeast Ohio shores of Lake Erie. He is a graduate of East Carolina University with a degree in Biology. Starting his career in Florida, Tom's experience began while working in mosquito and public health pest control, environmental consulting and permitting, and aquatic weed management. More recently, Tom has worked in the lake management industry. He is a former director for TAPMS, the Immediate Past President of the Western Aquatic Plant Management Society and the 2020 recipient of the Aquatic Plant Management Society's Max McCowen Friendship Award. For the past 13 years, he has lived in North Carolina with his wife, Sara.

**Bobby Chavez, P.E. - Email: [robert.chavez@tceq.texas.gov](mailto:robert.chavez@tceq.texas.gov)**

*Engineer IV (Water Quality), Texas Commission on Environmental Quality*

Robert received his Bachelor of Science degree in Civil Engineering from the University of Texas at Austin in 2005. He joined the Texas Commission on Environmental Quality in 2010 as an engineer for the Dam Safety Division and later transferred to the Land Application Team in 2018. Robert is a licensed professional engineer in the state of Texas.

**Todd Sink, PhD - Email: [todd.sink@ag.tamu.edu](mailto:todd.sink@ag.tamu.edu)**

*Associate Professor and Aquaculture Extension Specialist, Texas A&M Agrilife Extension Service*

After working as a postdoctoral researcher at the University of Tennessee and the University of Arkansas, Dr. Sink began his current position as an Associate Professor in the Department of Rangeland, Wildlife, and Fisheries Management at Texas A&M University (TAMU). Dr Sink is also an Aquaculture Extension Specialist at Texas A&M AgriLife Extension Service and the Director of the TAMU Aquatic Diagnostics Laboratory, which is the only fish disease pathology and waterborne toxin testing laboratory in the state of Texas. He is currently working on a number of projects, including determining a viable method of sex reversal in female Southern flounder, which will allow the species to be bred and sustained without the need for wild-caught males. In addition Dr. Sink is evaluating the safety, gross pathology, and efficacy of a novel slow-release spawning aid, Ovaplant-L®, in marine finfish reproduction.

**\*Allison Squires - Email: [allison.squires@mnsu.edu](mailto:allison.squires@mnsu.edu)**

*Masters Student, Minnesota State University*

Allison Squires is a master's student at Minnesota State University, Mankato. She received her B.S. in May of 2022 in ecology with a 3.78 GPA. Allison recently retired from the Minnesota Army National Guard in December of 2020, ending a 6 year long career as a signal support specialist (25U). Allison also ended her 4-year



commitment as a watercraft inspector and area manager around the state of Minnesota; she checked watercraft coming in and out of the water for AIS, while also educating boaters about the dangers of spread and how to prevent it. With her combined passion of protection from the MN National Guard, and her interest in AIS, she is excited and honored to present her research regarding management strategies for Cuban bulrush; this is not only to protect ecosystems, but people as well.

**\*Jenna DeMent - Email: [mtl77@txstate.edu](mailto:mtl77@txstate.edu)**

*Masters Student, Texas State University*

Jenna earned her BS in Biology from Texas A&M University – Corpus Christi in 2018 and is now a second-year Population and Conservation Biology MS student at Texas State University in the Martina Lab. Prior to graduate school, recent work experience had her serving as the 2021 State Botanist for Texas' National Wetland Condition Assessment as well as a Forest Data Technician for The Nature Conservancy in Mississippi Headwaters of Minnesota. Her career goals focus on ecologically responsible habitat management of wetland systems. She aims to continue this through with her current thesis project on application of remote sensing for the aquatic invasive species *Arundo donax*.

**\*Hannah Brown - Email: [hbrown2@ufl.edu](mailto:hbrown2@ufl.edu)**

*Masters Student, University of Florida*

Hannah Brown is pursuing her Master's in Agronomy from the University of Florida, where she completed bachelor's degrees in chemistry and biology. She currently does research on the management of water hyacinth at the Center for Aquatic and Invasive Plants.

**Lucy Marshall, PhD - Email: [lmarshall@biosorb-inc.com](mailto:lmarshall@biosorb-inc.com)**

*Research Director, BioSorb Inc.*

Dr. Marshall received her Ph.D. in Biochemistry from Rice University, post-doc at the University of Texas Medical School, Houston, and a Research Associate position at the University of Pennsylvania. She was hired by Monsanto to establish their first Drug Delivery Laboratory collaborating with California Institute of Technology and later became Research Group Leader in Agricultural Formulations. Dr. Marshall established Trans America Product Technology, Inc. (TAPT), a consulting firm specializing in product formulations. Working with natural products, the Biosorb® Microsponge™ technology was developed and patented. The biological carrier, Biocar®, has been used with several biopesticides including a bioherbicide for managing hydrilla for the US Army Corps of Engineers. Biosorb Inc. was founded to manufacture and sell the proprietary and patented Biocar® technologies, including the liquid form, TopFilm™, for promoting environmentally friendly approaches to aquatic, horticulture and agriculture products. Biosorb® technologies in Biocar® improve rainfastness and weatherability, thus saving costs, fuel, labor, and reducing the chemical load on the environment.

**Casey Williams - Email: [cwilliams@bio-west.com](mailto:cwilliams@bio-west.com)**

*Aquatic Plant Ecologist and Plant Ecologist, BIO-WEST Inc.*

An alumni of Southwest Texas State University and Texas State University, Casey is an aquatic plant ecologist for BIO-WEST Inc. where he has worked for 9 years. He is heavily involved with several restoration and monitoring projects in the San Marcos and Comal Rivers as part of the Edwards Aquifer Authority's Habitat Conservation Plan. These include mapping Texas wild-rice, and habitat restoration for the fountain darter, both federally listed species. He is also involved in several other aquatic plant restoration and botanical projects around the state of Texas.

**Ashley Morgan-Olvera - Email: [arm001@shsu.edu](mailto:arm001@shsu.edu)**

*Research & Education/Outreach Director of Texas Invasive Species Institute, Sam Houston State University*

Ashley Morgan-Olvera, M.S. is the Director of both the Texas Invasive Species Institute (TISI) located at Sam Houston State University (SHSU) and Texasinvasives.org. She received her M.S. in Parasitology from SHSU in 2011 before starting at TISI, and has worked extensively with USDA-APHIS, TPWD, TDA and HGAC in the implementation of invasive insect, mollusk, and plant pathogen field-surveys, along with Clean Rivers surveys for HGAC. She also supports the mission of TISI and Texasinvasives.org that focuses on public education, reporting, prevention, and management of invasive species, by providing training and educational workshops to motivate others into action against invasive plants and pests.

**Robert McCartney - Email: [rpmccartney88@gmail.com](mailto:rpmccartney88@gmail.com)**

*Aquatic Biologist, Johnson Lake Management*

Robert McCartney is from San Marcos, TX, and attended Texas State University for his B.S. in Biology, graduating in 2011, and his M.S. in Water Resources Sustainability, graduating in 2022. He has worked as an aquatic biologist for Johnson Lake Management Service in San Marcos, TX since 2016 where he manages private, commercial, and public water bodies in the Austin/San Antonio corridor, Texas Hill Country, and the surrounding areas.

**Angela England, PhD - Email: [angela.england@tpwd.texas.gov](mailto:angela.england@tpwd.texas.gov)**

*Conservation Biologist, Texas Parks & Wildlife Department*

Angela England is a Conservation Biologist with Texas Parks and Wildlife Department's Watershed Conservation Team. She is the project manager for the Healthy Creeks Initiative to control invasive Arundo in the Texas Hill Country. Angela attended the University of Texas at Austin for her Bachelor's in Zoology, and earned a Ph.D. in Biology at the University of New Mexico. Previously, Angela worked in riparian restoration and GIS analysis with the City of Austin's Watershed Protection Department, wrangled visitors at Travis County's Hamilton Pool Preserve, taught at the University of New Mexico's Biology Department, conducted bat research with the U.S. Geological Survey, and spent eight years working for Bat Conservation International. Angela is a Texas Master Naturalist, an ISA Certified Arborist, and a licensed pesticide applicator. Her hobbies include camping, gardening, dancing, home brewing, birdwatching, and taking long walks with field guides and iNaturalist.

**Christopher Hathcock, PhD - Email: [chris\\_hathcock@fws.gov](mailto:chris_hathcock@fws.gov)**

*Supervisory Botanist, U.S. Fish and Wildlife Service, San Marcos Aquatic Resources Center*

Chris Hathcock has worked for both the Texas Parks and Wildlife Department and the U.S. Fish and Wildlife Service for nearly 20 years. His focus is on designing, implementing, and managing restoration and research projects aimed at aquatic and riparian ecosystems.

**Amy Kay - Email: [akay@clarke.com](mailto:akay@clarke.com)**

*Business Development Leader, Clarke Aquatic Services*

Amy Kay is entering her 15th year in the aquatic plant management industry. Her involvement includes AIS control and research projects in California, Florida, Idaho, Illinois, Indiana, Michigan, Minnesota, Montana, and Wisconsin. Her area of expertise is working with lake groups, consultants, industry, academia, and

government agencies developing and executing large scale management projects. Currently, Amy is the Business Development Leader for Clarke Aquatic Services, the Vice President of Midwest Aquatic Plant Management Society, special representative to the Aquatic Plant Management Society and the Founder and President of Women of Aquatics.

**Michelle Wood-Ramirez - Email: [Michelle.Wood-Ramirez@trwd.com](mailto:Michelle.Wood-Ramirez@trwd.com)**  
*Urban Programs Coordinator, Tarrant Regional Water District*

Michelle Wood-Ramirez is Urban Programs Coordinator at the Tarrant Regional Water District. She is an experienced watershed coordinator and informal educator, passionate about working in and teaching about natural resources and ecological restoration. Her background majoring in Entomology at Texas A&M University and love of wetlands and benthics led her to work towards a Master's Degree in Watershed Management and Hydrologic Science from Texas A&M University, focusing on green urban stormwater infrastructure and LID. Michelle is passionate about ecological stewardship and environmental justice in the urban realm via hands on education and mentoring, reconnecting our growing Texas population with the ecosystems that will help us thrive and become resilient.

**T. Wells Shartle - Email: [wells.shartle@trwd.com](mailto:wells.shartle@trwd.com)**  
*Environmental Tech II, Tarrant Regional Water District*

T. Wells Shartle is an Environmental Tech II at the Tarrant Regional Water District. He has 10+ years of experience managing vegetation and monitoring water quality in the George Shannon Wetland for Water Reuse for Richland Chambers Reservoir. He obtained his BBA in Management with a minor in Environmental Studies from Baylor University and followed his passion in natural resources to obtain a MS in Environmental Science from SFASU, focusing on nutrient cycling in treatment wetland soils.

**Haley Kokel - Email: [haley.kokel@fishonaquaticplants.com](mailto:haley.kokel@fishonaquaticplants.com)**  
*Owner, Fish On Aquatic Plants*

Haley Kokel owns and operates Fish On Aquatic Plants, a native aquatic plant nursery in College Station, Texas. She propagates and grows native plants for establishing aquatic ecosystems. Haley earned her M.S. in Wildlife and Fisheries Science from Texas A&M University through research on native aquatic vegetation establishment. Prior to opening her nursery, Haley worked for Texas Parks and Wildlife Department and Missouri Department of Conservation where she implemented plant propagation and planting techniques for vegetation restoration in state lakes. Haley also enjoys teaching about conservation and aquatic plants through youth organizations including Bass Brigade - Texas Brigades and Brazos County 4-H.

**Trent Lewis – Email: [trent@pondmedics.com](mailto:trent@pondmedics.com)**  
*Owner, Pond Medics*

Trent Lewis, FPC is the owner of the PondMedics Family of Brands that he and Emily Lewis, P.E. began 20 years ago. American Truxor Direct (ATD) is a sister company of the PondMedics Family of Brands which sells, rents, services and contracts the Truxor, a Swedish-made amphibious machine. ATD has 12 years of experience operating, selling and maintaining amphibious equipment for use in aquatic plant management. Of the dozens of Truxors ATD has sold over the years and the thousands of hours their team has put on amphibious machines, they know what works and what doesn't in aquatic vegetation control. Trent will present to the group an industry update on the new tech and trends the amphibious industry is experiencing going into 2023.