

2021 Annual Conference
Texas Aquatic Plant Management Society



Bryan, TX
November 15-17, 2021

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 2021 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.

Special thanks to our sponsors for making
Texas Aquatic Plant Management Society
2021 Annual Meeting possible!



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Conference
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DAILY EVENTS-AT-A-GLANCE

See Agenda on the following pages for event times.

MONDAY - NOVEMBER 15, 2021

TAPMS Pre-Conference Board of Directors Meeting & Work Session
Exhibits Setup
Conference Check-In and Onsite Registration (Luna; 4:00 – 6:00 p.m.)

Presidents' Reception Sponsored by: Outdoor Water Solutions (Platinum Sponsor)

TUESDAY - NOVEMBER 16, 2021

Morning

Conference Check-In and Onsite Registration
Continental Breakfast
Meeting Opens – President's Welcome – APMS Update - General Session

Luncheon Sponsored by: Outdoor Water Solutions (Platinum Sponsor), Syngenta (Gold Sponsor), UPL (Gold Sponsor)

Afternoon

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

WEDNESDAY - NOVEMBER 17, 2021

Conference Check-In and Onsite Registration
Continental Breakfast
General Session (Adjourns – 11:55 a.m.)
Post-Conference Board Meeting

Breaks sponsored by: Outdoor Water Solutions (Platinum Sponsor), Syngenta (Gold Sponsor), UPL (Gold Sponsor), SePRO (Silver Sponsor), and BioSafe Systems (Silver Sponsor)

AGENDA-AT-A-GLANCE

MONDAY - NOVEMBER 15, 2021

- 12:00 PM - 3:00 PM Pre-Conference Board Meeting/Work Session (*Orion*)
4:00 PM - 6:00 PM Conference Early Check-In and Onsite Registration (*Luna*)
4:00 PM - 6:00 PM Exhibits Set-up (*Prefunction B*)
6:30 PM - 8:30 PM President's Reception (*The Pavilion*)

TUESDAY - NOVEMBER 16, 2021

- 7:00 AM - 8:00 AM Conference Check-In and Onsite Registration (*Luna*)
7:00 AM - 8:00 AM Continental Breakfast (*Prefunction B*)
8:00 AM - 10:30 AM President's Welcome & Session 1 (*Celeste A*)
10:30 AM - 10:45 AM Morning Refreshment Break and Raffle (*Prefunction B*)
10:45 AM - 11:55 AM Session 1 Continued (*Celeste A*)
11:55 PM - 1:00 PM Luncheon (*Celeste B&C*)
1:00 PM - 3:05 PM Session 2 (*Celeste A*)
3:05 PM - 3:35 PM Afternoon Refreshment Break and Raffle (*Prefunction B*)
CEU applicators must complete TDA sign in (*Orion*)
3:35 PM - 4:10 PM Session 2 Continued (*Celeste A*)
4:30 PM - 4:45 PM Closing remarks (*Celeste A*)
4:45 PM - 5:15 PM Pesticide Applicators Receive CEU Certificates (*Orion*)
5:30 PM - 6:15 PM Annual TAPMS Business Meeting (*Celeste B&C*)
6:30 PM - 8:00 PM Banquet Dinner & Awards (*Celeste B&C*)
8:00 PM - 9:00 PM Cocktail Hour (*Celeste B&C*)

WEDNESDAY - NOVEMBER 17, 2021

- 7:00 AM - 8:00 AM Conference Check-In and Onsite Registration (*Luna*)
7:00 AM - 8:00 AM Continental Breakfast (*Prefunction B*)
8:00 AM - 9:55 AM President's Announcements and Session 3 (*Celeste A*)
9:55 AM - 10:25 AM Morning Refreshment Break and Raffle (*Prefunction B*)
10:25 AM - 11:55 AM Session 3 (*Celeste A*)
1:00 PM - 2:30 PM Post-Conference Board Meeting (*Orion*)

SITE INFORMATION & MAP

Stella Hotel
4100 Lake Atlas Dr., Bryan, TX
Phone: (979) 421-4000

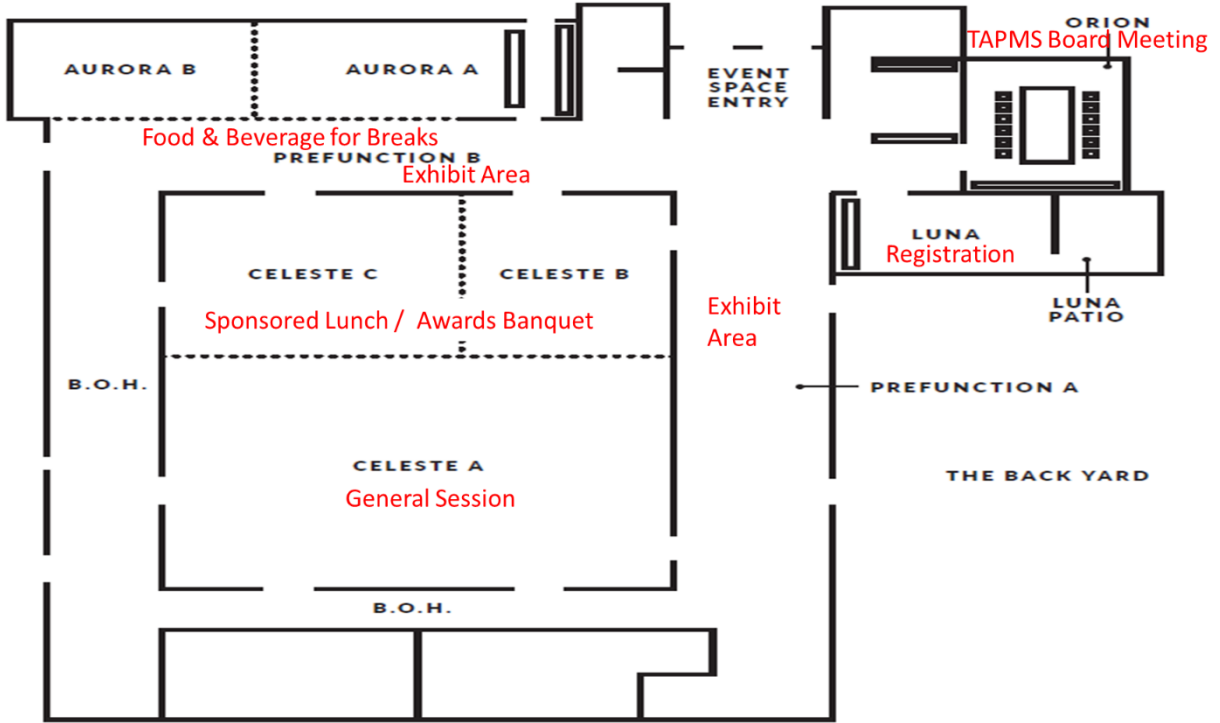


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SOCIAL EVENTS INFORMATION

PRESIDENT'S RECEPTION: *Monday, November 15, 6:30 pm to 8:30 pm, The Pavilion*

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.

Sponsored by: Outdoor Water Solutions (Platinum Sponsor)

ANNUAL BUSINESS MEETING: *Tuesday, November 16, 5:30 pm to 6:15 pm, Celeste B&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 16, 6:30 pm to 8:00 pm, Celeste B&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.

COCKTAIL HOUR: *Tuesday, November 16, 8:00 pm to 9:00 pm, Celeste B&C*

Enjoy socializing with your TAPMS friends and colleagues at the cocktail hour while enjoying beverages.

BREAKS SPONSORED BY: *Outdoor Water Solutions (Platinum Sponsor), Syngenta (Gold Sponsor), UPL (Gold Sponsor), and SePRO (Silver Sponsor)*

DETAILED AGENDA

* Indicates student presentation.
CEU indicates attendance credit of 1.0 CEU

MONDAY - NOVEMBER 15, 2021

- 12:00 PM - 3:00 PM Pre-conference board meeting/work session (*Board Members; Orion*)
- 4:00 PM - 6:00 PM Conference early check-in and onsite registration (*Luna*)
- 4:00 PM - 6:00 PM Exhibitor set up (*Prefunction B*)
- 6:30 PM - 8:30 PM President's reception (*The Pavilion*)
Sponsored by: Outdoor Water Solutions (Platinum Sponsor)

TUESDAY - NOVEMBER 16, 2021

- 7:00 AM - 8:00 AM Conference check-in and onsite registration (*Luna*)
- 7:00 AM - 8:00 AM Continental breakfast (*Prefunction B*)

Opening Remarks

- 8:00 AM - 8:15 AM Welcome & announcements
(*Jason Chapman; TAPMS President*)

Session 1 (Celeste A, Moderator: Jason Chapman)

- 8:15 AM - 8:25 AM Aquatic Plant Management Society Update
(*Ryan Thum; APMS President*)
- 8:25 AM - 9:20 AM *CEU* Statewide Integrated Pest Management of Aquatic and Riparian Invasive Species
(*John Findeisen and Monica McGarrity; Texas Parks & Wildlife Department*)
- 9:20 AM - 9:35 AM RISE Legislative Update
(*Megan Striegel; RISE*)
- 9:35 AM - 10:30 AM *CEU* Drift Minimization: Maximizing Your Chemical Investment
(*Chris Smith; Winfield United*)
- 10:30 AM - 10:45 AM Morning Refreshment Break (*Prefunction B*); Raffle
- 10:45 AM - 11:00 AM 2021 Update on the Aquatic Vegetation Management Extension Program in Texas
(*Brittany Chesser.; Texas A&M AgriLife Extension Service*)
- 11:00 AM - 11:55 AM *CEU* Laws and Regulation Updates and Requirements
(*Perry Cervantes; Texas Department of Agriculture*)
- 11:55 AM - 1:00 APM Luncheon (*Celeste B&C*)
Sponsored by: Outdoor Water Solutions (Platinum Sponsor), Syngenta (Gold Sponsor), UPL (Gold Sponsor)

TUESDAY - NOVEMBER 16, 2021

Session 2 (Celeste A, Moderator: Kristy Kollauss)

- 1:00 PM - 1:55 PM *CEU* Herbicide Safety for Applicators and the Environment
(Jeffrey Hutchinson, Ph.D; University of Texas-San Antonio)
- 1:55 PM - 2:10 PM Making Invasive Species Reporting Easy
(Chuck Bargeron; Center for Invasive Species and Ecosystem Health)
- 2:10 PM – 3:05 PM *CEU* Ahead of the curve: Proactive, comprehensive strategies to restore and maintain
aquatic ecosystems
(Mark Heilman, Ph.D; SePRO)
- 3:05 PM - 3:35 PM Afternoon Refreshment Break (*Prefunction B*); Raffle
CEU applicators must complete TDA sign in (*Orion*)
- 3:35 PM - 3:50 PM *An Analysis of Aquatic Vegetation in the San Marcos River Using sUAS
(Alexa Lopez; Texas State University)
- 3:50 PM - 4:10 PM *Evaluating the Suppression of *Hydrilla verticillata* by Manual Removal and Planting
Native Aquatic Plants
(Angela Maroti; University of Texas at San Antonio)
- 4:10 PM - 4:25 PM Utilizing Texasinvasives.org for Invasive Aquatic Species Management and Prevention
(Ashley Morgan-Olvera; Sam Houston State University)
- 4:30 PM - 4:45 PM Closing remarks for the day
(Jason Chapman, TAPMS President)
- 4:45 PM - 5:15 PM Applicators receive CEU certificates (*Orion*)

Tuesday Post-Session Events

- 5:30 PM - 6:15 PM Annual TAPMS Business Meeting (*Celeste B&C*)
- 6:30 PM – 8:00 PM Banquet Dinner & Awards (*Celeste B&C*)
- 8:00 PM – 9:00 PM Cocktail Hour (*Celeste B&C*)

WEDNESDAY- NOVEMBER 17, 2021

- 7:00 AM - 8:00 AM Conference check-in and onsite registration (*Luna*)
- 7:00 AM - 8:00 AM Continental breakfast (*Prefunction B*)

Opening Remarks

- 8:00 AM - 8:05 AM Welcome & announcements
(Jason Chapman; TAPMS President)
- 8:05 AM - 8:15 AM Welcome from Platinum Sponsor, Outdoor Water Solutions, and update on research and operations related to aquatic plant management
(Joe Forman; Outdoor Water Solutions President)

Session 3 (Celeste A, Moderator: Jeffrey Hutchinson)

- 8:15 AM – 8:30 AM Use of Peroxyacetic Acid (PAA)/ Hydrogen Peroxide in Freshwater Cyanobacterial Control– Case Study of Lab Scale Trials and Treatments in Relation to Treatment Sites
(Tom Warmuth; BioSafe Systems)
- 8:30 AM – 8:45 AM A Case Study Directed by Using the Holes in Scientific Knowledge to Inform Surface Water Management Practices
(Sonja Wixom; Pond Medics)
- 8:45 AM – 9:00 AM The Potential Use of Giant Reed-derived Products to Control Harmful Algae
(Reynaldo Patino; Texas Tech University)
- 9:00 AM - 9:15 AM Management Strategies for Floating Heart (*Nymphoides spp.*)
(Mark Heilman, Ph.D.; SePRO)
- 9:15 AM - 9:30 AM Plant Selections and Successes in the Redesigned Stormwater Wetland of the TRWD Rainscapes
(Michelle Wood-Ramirez; Tarrant Regional Water District)
- 9:30 AM - 9:45 AM Distracted Driving ,DWI and Securing Your Load
(Sergeant Justin Ruiz; Texas Department of Public Safety)
- 9:45 AM - 10:10 AM Morning Refreshment Break; Raffle
- 10:10 AM - 10:25 AM Exploring Metagenomic Changes within the Sediment after MuckBiotic Treatments
(Michael Frett; Naturalake Biosciences)
- 10:25 AM - 10:40 AM Operations of an Aquatic Nursery
(Ryan O’Hanlon; Stonefly Aquatic Nursery)
- 10:40 AM - 10:55 AM Spring Lake: A Case Study for Longterm Monitoring of an Aquatic Plant Community
(Casey Williams; Bio-West Inc.)
- 10:55 AM - 11:10 AM Bois d’Arc Lake Mitigation Project Large Scale Aquatic Habitat Restoration
(Matthew Stahman; Resource Environmental Solutions)
- 11:10 AM - 11:15 AM Progression of Native Aquatic Vegetation Planted in Unfavorable Conditions
(Haley Kokel; Fish On Aquatic Plants)
- 11:15 AM - 11:30 AM Pull Kill Plant, Riparian Restoration in the Nueces Basin
(Monica McGarrity for Sky Lewey; Nueces River Authority)

11:30 AM - 11:45 AM Genetic Diversity and Geographic Origins of Invasive Yellow Floating Heart in the United States
(Ashley Wolfe, Montana State University)

11:45 AM - 11:55 AM Conference Final Address and looking forward to the 2022 meeting
(Jason Chapman, TAPMS president)

Post-Conference Events

1:00 PM - 2:30 PM Post-Conference Board Meeting *(Orion)*

PRESENTATION ABSTRACTS

Abstracts are listed alphabetically by presenting author last name.

** Indicates student presenter*

^{CEU} indicates attendance credit of 1.0 CEU

Making Invasive Species Reporting Easy

Bargeron, Chuck

University of Georgia- Center for Invasive Species and Ecosystem Health

EDDMapS, North America's leading resource for reporting occurrences of invasive species, has gotten its biggest update in over a decade. Whereas previous iterations of the EDDMapS website and smartphone applications focused on regional needs (and, thus, regional versions of each existed), the new EDDMapS unifies regions into one collective website and app. EDDMapS has been a resource for invasive species occurrence data since 2005. In this time, EDDMapS has grown from a citizen science database focused on invasive plant data in the southeast to an aggregate database soliciting data on all invasive species taxa and biological control agents across the US and into Canada. As technology has advanced, it has allowed for more features and tools to be developed and made available to EDDMapS' partners.

^{CEU} Laws and Regulations Updates and Requirements

Cervantes, Perry

Texas Department of Agriculture

Will discuss TDA updates pesticide record keeping requirements and 2021 pesticide complaints.

2021 Update on the Aquatic Vegetation Management Extension Program in Texas

Chesser, Brittany

Texas A&M AgriLife Extension Service

An update on the aquatic vegetation management tools and resources of the Texas A&M AgriLife Extension Service Rangeland, Wildlife, and Fisheries Management Extension Unit will be given. Updates will include the status of existing resources like AquaPlant, new digital and print publications, trends in clientele FAQs and outreach opportunities, including aquatic vegetation management programming delivered over the last year.

^{CEU} Statewide Integrated Pest Management of Aquatic and Riparian Invasive Species

Findeisen, John 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 2021 (Sept. 2020 – Aug. 2021), 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.

Exploring Metagenomic Changes within the Sediment after MuckBiotic Treatments

Frett, Michael

Naturalake Biosciences

Over time, many ponds and lakes will experience a build-up of soft organic sediments (muck). The accumulation of soft sediment depth leads to problems such as the buildup and release of nutrients, high algal or plant growth, and decreased water volume. The soft sediment layer also provides habitat for a diverse ecosystem of microorganisms such as aerobic and anaerobic bacteria, cyanobacteria, algae, and archaea. Microorganisms within the sediment can have significant impacts throughout a pond including the breakdown of organic matter in the sediment as well as the growth of algae within the water column. Sediment characteristics and overall lake conditions are fundamental in shaping the diversity and concentration of microbes present in the sediment layer. Naturalake Biosciences has developed an experimental laboratory setup and method to analyze metagenomic changes within the sediment in response to the application of Naturalake Biosciences' MuckBiotics. The experimental laboratory setup was intended to act as a pond mesocosm and included fifteen-gallon standard aquarium tanks with added pond muck, washed sand and clay layers, and pond water. Soft sediment samples were collected before and after the application of MuckBiotics and metagenomic analysis utilizing NovaSeq 6000 sequencing was conducted by the University of Wisconsin-Madison Biotechnology Center. Next-gen sequencing confirmed differences in the soft sediment microbial communities between the control and MuckBiotics tanks after 12 weeks of testing. Differences in bacterial diversity indicated higher levels of organic breakdown and lower levels of cyanobacteria were present within the soft sediment of MuckBiotics treated tanks. Metagenomic analysis appears to be an essential tool for monitoring biological changes within the soft sediment of a pond when assessing environmental conditions and responses to treatments.

^{CEU} *Ahead of the Curve: Proactive, comprehensive strategies to restore and maintain aquatic ecosystems*

Heilman, Mark, Ph.D.

SePRO

Amidst the challenges of past watershed disturbance, eutrophication, littoral zone degradation, invasive species introductions, and broader environmental signals such as climate change, scientists and managers have the daunting task to work together to restore and maintain favorable ecology and water uses. Whether addressing an aquatic weed infestation, harmful algal blooms, protecting drinking water from taste/odor problems or a myriad of other potential water resource impairments, common principles exist for proactive management that can help keep managed systems ‘ahead of the curve’ and trending towards improved water quality or selective reductions of problem species. These strategies seek to address the key driving factors for poor water quality or invasive species success in a manner that improves conditions in the short term while complementing techniques for longer term, sustained improvement. For water quality, reducing both external and internal loading of excess nutrients such as phosphorus into collecting systems such as ponds or reservoirs can rapidly restore good conditions while reducing future inputs and out-of-control productivity. For aquatic weeds, proactive techniques that minimize nuisance growth conditions and avoid boom-bust, reactive control typically lead to better vegetation diversity, less organic loading to sediments, and other benefits. This presentation will review the rationale for proactive management of aquatic resources and give a broad overview of current strategies that fit this paradigm and future prospective methods to enhance positive outcomes.

Management Strategies for Floating Heart (Nymphoides spp.)

Heilman, Mark, Ph.D.

SePRO

Multiple varieties of invasive floating hearts (Genus: *Nymphoides*) are now found in North America. The most common in the southern US is crested floating heart (*N. cristata* – native to tropical Asia) while yellow floating heart (*N. peltata* – native to Europe/Asia) is the common type in northern sites. A variety of native floating hearts are also found in the southeastern US, and recent genetic work is documenting hybridization between exotic and native floating hearts. Invasive floating hearts have common nuisance properties of excessive biomass at the water surface and through the water column that limits navigation and reduces habitat quality for fish and wildlife. A variety of integrated management strategies have been investigated and utilized in recent years. Herbicide management is the common technique for larger infestations, and the recent development and registration of ProcellaCOR (ai. florypyrauxifen-benzyl) has greatly improved management outcomes for problem floating hearts. Past development of ProcellaCOR documented high, systemic and selective activity on multiple floating heart species. This activity has translated well to control in the field with managers throughout the US utilizing ProcellaCOR through foliar or in-water treatment techniques to achieve strong reductions in floating heart infestations. This presentation will briefly review the controlled studies supporting ProcellaCOR use patterns on floating heart species, highlight several representative field outcomes, and discuss factors to further optimize long-term management of floating heart species.

^{CEU} ***Herbicide Safety for Applicators and the Environment***

Hutchinson, Jeffrey

University of Texas - San Antonio

This talk will provide information on herbicide safety for applicators and the environment. Topics will include personal protective equipment, routes of exposure, preventing drift, herbicide storage and transport, spills, herbicide toxicity, and proper use of herbicide in aquatic environments. Best management practices will be discussed for herbicide use in freshwater ecosystems to protect non-target aquatic organisms.

Progression of Native Aquatic Vegetation Planted in Unfavorable Conditions

Kokel, Haley

Fish On Aquatic Plants

Eight species of native aquatic vegetation were planted in a pond in Fayette County, Texas in August 2020. The area was in abnormally dry conditions at the time of planting and increased to a moderate drought for one month following planting. Despite intermittent rainfall, most plants were subjected to periods of time out of the water for nine months before substantial rainfall filled the pond. Five plant species have established with vegetation expanding beyond the immediate planting area.

An Analysis of Aquatic Vegetation in the San Marcos River using sUAS

Lopez, Alexa

Recreational usage is one of the largest impacts to the endemic Texas wild-rice (TWR) on the San Marcos river (SMR). During the summer of 2020, the restricted use of public access points to the river systems allowed a unique view of how aquatic vegetation responds with little intervention from river users. This thesis utilized small unmanned aerial surveillance to capture ultra-high resolution imagery of the SMR. I then used the data to classify the vegetation composition of the river system for the months of July, August and September of 2020. The method used for classification featured an object-based image analysis using random forest, an AI algorithm to classify the data. The classified data had an accuracy assessment done which indicated an accuracy range 75.72% – 80.57% with a Kappa range of .59 – .70. The classified imagery was then used in a change detection from July to August, August to September and July to September to determine the change in vegetation composition during the summer months. During the study period, there was expansion of stands that were identified as exclusively TWR, and the expansion of mixed vegetation stands, indicating the growth of the aquatic vegetation system. This study provided a continuous coverage of aquatic vegetation from a planar view during a unique period where normally the river would have experienced its highest usage.

Evaluating the Suppression of Hydrilla verticillata by Manual Removal and Planting Native Aquatic Plants

Maroti, Angela

University of Texas at San Antonio

Native aquatic plants have an important role in freshwater ecosystem functioning but are threatened by the existence of invasive aquatic plants. Hydrilla is the most nuisance species of invasive aquatic plant in the United States and is prevalent throughout the San Marcos River. There are multiple hydrilla management options however, because of the delicate biodiversity within the San Marcos River, options are limited. In these studies, two native plants (Illinois pondweed and water stargrass) and (water stargrass and Texas wild rice) were used in greenhouse and field studies, respectively, to evaluate the ability of native plants to suppress hydrilla. In the greenhouse, hydrilla, water stargrass, and Illinois pondweed were planted at varying ratios in 21 L mesocosms and the biomass of each plant within each mesocosm was taken at the end of 6 weeks. In the field study, three sites were selected in the upper section of the San Marcos River. At each site, eight plots with different percentages of hydrilla was removed and five water stargrass and Texas wild rice plants were planted randomly. The estimated coverage of each plant within the plot was measured monthly for 6 months. At six months, all plants within the plots were harvested for dry weight biomass. In the greenhouse study with different planting ratios, water stargrass and Illinois pondweed were more competitive with hydrilla during the winter study compared to the summer study and were the strongest competitors when planted in higher ratios than hydrilla. In the greenhouse study with identical ratios, it appeared that water stargrass hinders the growth of Illinois pondweed more than hydrilla. These results indicate that for these native plants to successfully suppress or out-compete hydrilla they must be planted during the winter at higher ratios than hydrilla. The results of the field study will be discussed at the conference.

Pull Kill Plant, Riparian Restoration in the Nueces Basin

McGarrity, Monica¹ presenting for Sky Lewey²

¹Texas Parks and Wildlife Department, ²Nueces River Authority

Riparian landowners band together to restore native vegetation by controlling *Arundo donax* along about 85 miles of five rivers in the upper Nueces basin. After 10 years of strategic and sustained effort almost all *Arundo* has been removed and native plants have fully colonized the once invested riparian areas.

Utilizing Texasinvasives.org for Invasive Aquatic Species Management and Prevention

Morgan-Olvera, Ashley

Texas Invasives Species Institute

The Texas Invasive Species Institute (TISI) through Texasinvasives.org helps ensure the preservation and protection of Texas' native biodiversity through early detection surveys and rapid mitigation of invasive plants and pests. We also aim to inspire environmental stewardship of Texans through education and outreach programs, because the more trained eyes watching for invasive species and managing them, the better our chances of lessening or avoiding damage to our native landscape! This presentation will cover aquatic invasive species resources and educational programs available through Texasinvasives.org and best practices for management and prevention of those species.

Operations of an Aquatic Nursery

O'Hanlon, Ryan

Stonefly Aquatic Nursery

Native aquatic plants are important aesthetic, conservation and management tools. Stonefly Aquatic Nursery grows North American native aquatic and wetland plants, designs plantings and performs plant installations. Propagation techniques utilized are fragmentation, seed germination and tubers. Identifying viable seeds and tubers and distinguishing where plants can be split is extremely important for propagation.

On the Potential Use of Giant Reed-derived Products to Control Harmful Algae

Patiño, Reynaldo

United State Geological Service

Prymnesium parvum (golden alga) is a harmful alga found in marine, coastal, or brackish inland waters worldwide. Golden alga can produce toxins that are lethal to fishes and other gilled aquatic organisms. In the USA, harmful algal blooms (HAB) of this species occur most frequently in the south and southwest, and Texas is among the most severely impacted states. Efficient bloom control methods, however, are presently unavailable for field application. Much of the current research on HAB control methods focuses on the use of plant-derived products. The premise of control methods based on natural algicides is that their environmental impacts may be of lesser magnitude than those of synthetic chemicals. Previous work has shown that extracts from giant reed (*Arundo donax*), itself a nuisance riparian plant, inhibit growth of *Microcystis aeruginosa*, a harmful cyanobacterial species. Recent studies by our laboratory demonstrated that organic and water extracts from giant reed also have strong algicidal activity against golden alga. In addition, a screen of potential allelochemicals present in giant reed revealed one with uniquely strong activity, ellipticine. The potency of ellipticine ranked among the highest reported for plant-derived algicides against golden alga or any other HAB species. These observations suggest that giant reed or products derived from it have potential application in the development of environmentally friendly HAB control methods. The spectrum of activity for giant reed products against selected aquatic organisms is currently under investigation.

Distracted Driving, DWI, and Securing Your Load

Ruiz, Justin, Sgt.

Texas Department of Public Safety

Frequent travel is often required for those in the aquatics industry whether you are a government entity conducting monitoring and research or a private company managing properties. The distance between these worksites means lots of driving which is often the most dangerous thing you will do in the course of your day. This presentation will cover distracted driving, DWI, and securing your load before travel.

CEU Maximizing Your Chemical Investment: When bad things happen to good droplets

Smith, Chris

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?

Bois d'Arc Lake Mitigation Project Large Scale Aquatic Habitat Restoration

Stahman, Matthew

RES

The North Texas Municipal Water District (NTMWD) is currently constructing a surface water reservoir in Fannin County, Texas to supply the needs of a growing regional population; the first of its kind in Texas in 30 years. The resulting Bois d'Arc Lake will be mitigated by restoring, enhancing and preserving approximately 15,000 acres of wetland and upland habitats and nearly 70 miles of ephemeral, intermittent and perennial streams within the same watershed. The scale of this mitigation project is significant: approximately 8,500 acres of forested, emergent and scrub shrub wetland; 2,700 acres of upland forest; and 3,300 acres of native grassland restoration and enhancement; and over 392,000 linear feet of stream restoration, enhancement and establishment. Restoration and perpetual protection of these habitats will decrease erosion, sedimentation, and nutrient loads in a significant portion of the Bois d'Arc Creek watershed that drains into the Red River between Texas and Oklahoma. This presentation will provide background on development of the Bois d'Arc Lake Mitigation Project as well as its current status three years into construction. We will discuss the variety of habitats, geology, technical challenges and lessons learned to date on ecological restoration at this scale, including challenges with large scale aquatic habitat planting and maintenance. We will also discuss how NTMWD used a novel Full-Service Provider contracting mechanism to reduce project cost and transfer long-term risk.

RISE: Legislative Update

Striegel, Megan

Responsible Industry for a Sound Environment

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.

Effects of Aquatic Habitats on Fish and Wildlife, Chemical Control of Aquatic Plants, Management of Aquatic Plants and Ecosystems

Warmuth, Tom

BioSafe Systems

Peroxide based algaecide have been shown effective in selective treatments for cyanobacteria. 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.

Spring Lake: A case study for longterm monitoring of an aquatic plant community

Williams, Casey

BIO-WEST

Spring Lake in San Marcos, Texas is an artificial water body created by the impoundment of San Marcos Springs. Created in 1849, Spring Lake is home to a host of endemic, native and modern introduced aquatic species making a “hot spot” for aquatic fauna and flora diversity in Texas. Spring Lake also has a long record of studies regarding the aquatic plant diversity over the time of its existence with the earliest such description and mapping occurring in 1930 and the most recent occurring in 2020. Between that time multiple other mapping or descriptive studies have investigated changes in Spring Lake’s vegetation community making it a unique case study for Texas. These studies have shown the remarkably early infestation of nonnative plants, slight decrease in plant diversity, significant changes in dominance of individual species and several successful instances of invasive species removal. I will highlight these instances in the historical timeline of this Texas treasure.

A Case Study Directed by Using the Holes in Scientific Knowledge to Inform Surface Water Management Practices

Wixom, Sonja

PondMedics

The use of Nanobubbles in agricultural settings has been widely studied and used to create favorable results such as increased germination rates (Ahmed et al. 2018), controlling biofouling in irrigation settings (Xiao et al. 2020), and improved soil aeration (Baram, Evans, Berezkin, and Ben-Hur, 2021). Developments in the applications of use for Nanobubbles has been so rapid that Forbes has featured it in a few articles such as ‘On Tap For 2021: Nanobubbles, Thermal Batteries, And More’ (Kobayashi-Solomon 2021) where it is boasted as new technology to watch in 2021. However, the implementation, successes, and failures of Nanobubbles in surface water management are still relatively unknown. This case-study features a 30-day study of nanobubbles' effect on dissolved oxygen, pH, and oxidation-reduction potential of multiple ponds in the North Central region of Texas.

This case-study is designed to help confirm some management practices claims to be used in the present, identify further unknowns, and to illuminate where continuing research should be directed.

Genetic Diversity and Geographic Origins of Invasive Yellow Floating Heart in the United States

Wolfe, Ashley

Montana State University

Yellow floating heart (*Nymphoides peltata*) is an introduced floating-leaved aquatic plant native to Europe and Asia. The USDA-APHIS Weed Risk Assessment found a high likelihood that yellow floating heart could become a serious invader, and it is now distributed across much of the US. Little is known about the relative importance of vegetative versus sexual reproduction in its local persistence and spread across the US. In addition, although an assessment concluded that it would be a good candidate for biological control, it is currently unclear where searches for potential control agents should be conducted in the native range. Here, we collected data from ten microsatellite markers on over 200 yellow floating heart plants collected from the US and the Eurasian native range in order to determine clonal versus sexual reproduction, and to identify the geographic origins of US infestations. Plants in the US were most similar genetically to collections from Europe, which suggests that biological control surveys should focus efforts there. Further, we found evidence for both vegetative and sexual reproduction in the US. One multilocus microsatellite genotype (clone) was widely distributed across the US, and two other clones were found in multiple southern and eastern US states. The wide geographic distributions of these clones indicate dispersal of vegetative fragments among water bodies and/or multiple introductions from the same source or stock (e.g., water garden trade). We found a single clone in our samples for the majority of US populations (66%), indicating a preponderance of local asexual reproduction. However, several local populations had multiple clones, which provides some evidence for localized sexual reproduction. Aquatic plant scientists and managers should consider this genetic diversity when developing control methods to determine whether efficacy of specific tactics differ among distinct genotypes.

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

Wood-Ramirez, Michelle

Tarrant Regional Water District

The Tarrant Regional Water District (TRWD) has implemented low impact development strategies with its continued landscaping retrofits at its Fort Worth Campus. Applying green stormwater infrastructure (GSI) 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 extended dry-detention basin with micro-pools in North Texas. This feature has incorporated a variety of wetland plants, with 58 documented species present in the wetland last year. The area attracts wildlife such as waterfowl, insects, 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 also has incorporated a meandering rock channel, which connects the roofs of nearby buildings to the wetland, helping to further decrease the velocity of runoff. This also increases infiltration into the surrounding area and further cleans the water before it enters the local water supply. Present too are rainwater cisterns that not only help slow down the rate of runoff from a nearby building, but help to re-use water for irrigation purposes, irrigating native and adapted plants that are on campus. The campus has 170 documented vegetation species on its premises, most of which are native to the state. Permeable surfaces, such as rock channels, gravel pavers, and permeable concrete are demonstrated on site. Five species of water efficient turf

grasses are also part of the TRWD Rainscapes. Curb cuts are utilized as well and help direct water to a raingarden that captures and treats runoff, allowing it to infiltrate or be utilized via evapotranspiration.

Parts of the TRWD campus in Fort Worth are a registered pollinator waystation, as well as a certified wildlife habitat domain. The TRWD Rainscapes components on the campus demonstrate benefits to biodiversity and water conservation, and 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. This presentation will highlight the project and the plant community was established in the stormwater wetland.

PRESENTER BIOGRAPHIES

*Biographies are listed alphabetically by presenter last name; * Indicates student presenter.*

Bargeron, Chuck - cbarger@uga.edu

Director, University of Georgia – Center for Invasive Species and Ecosystem Health

Chuck Bargeron is the Director of the University of Georgia – Center for Invasive Species and Ecosystem Health. He has been with UGA for 22 years and his work focuses on invasive species and information technology. His programs include EDDMapS, ForestryImages.org and Invasive.org. Chuck was the Chair of the National Invasive Species Advisory Council and is the past President of the North American Invasive Species Management Association. He has been an invited speaker at over 300 regional and national conferences and co-authored over 62 journal articles and outreach publications.

Cervantes, Perry - perry.cervantes@texasagriculture.gov

Director of Environmental and Biosecurity Programs, Texas Department of Agriculture

Graduated from Southwest Texas State University with a Bachelor's degree in Animal Science. Has worked with the Texas Department of Agriculture for 24 years starting as an inspector and recently becoming Director of Environmental and Biosecurity Programs.

Chesser, Brittany - brittany.chesser@ag.tamu.edu

Aquatic Vegetation Management Program Specialist, Texas A&M AgriLife Extension Service

Brittany Chesser is the statewide Aquatic Vegetation Management Program Specialist for Texas A&M AgriLife Extension Service. Brittany received her B.S. in Natural Resources from Delaware State University and her M.S. in Wildlife, Fisheries, and Aquaculture from Mississippi State University. Currently in her role at TAMU, she provides technical expertise on aquatic vegetation management to the general public through identifying specific plant species, recommending management practices, and delivering presentations; along with serving as the Lab Specialist for the TAMU Aquatics Diagnostic Laboratory.

^{CEU} **Findeisen, John** - Email: 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.

Frett, Michael - Email: michael.f@teamaquafix.com

Aquatic Biologist, Naturalake Biosciences

Michael Frett is an Aquatic Biologist for Naturalake Biosciences in Madison, Wisconsin. He graduated with bachelor's degree in biology and biochemistry from Carleton College and has worked with Naturalake Biosciences for the past three years. His research has focused on sediment characteristics, internal nutrient cycling, and harmful algae bloom proliferation within lakes and ponds.

Heilman, Mark - Email: MarkH@sepro.com

SePro Corporation

Dr. Heilman is Senior Aquatic Technology Leader for SePro and oversees the company's research and development efforts to bring forward new technologies for managing water resources. He also directly assists many public and private natural resource managers in the US and some international colleagues with challenging projects managing aquatic invasive species with an emphasis on aquatic plants. Dr. Heilman holds a B.S. in Biology and Ph.D. in Aquatic Ecology from the University of Notre Dame. He received the Northeast Aquatic Plant Management Society's (NEAPMS) Aquatic Plant Science Award in 2011 and the national Aquatic Plant Management Society's (APMS) Outstanding Research and Technical Contributor Award in 2013. He is the current APMS President.

Hutchinson, Jeff, Ph.D. - Email: jeffrey.hutchinson@utsa.edu

Assistant Professor, University of Texas - San Antonio

Dr. Jeff Hutchinson is currently Assistant Professor at UT-San Antonio and specializes in freshwater ecology and natural resource policy and administration. Jeff holds a B.S. in Forest Resources and Conservation (University of Florida), a M.S. in Wildlife Ecology (University of Kentucky), and a Ph.D. in Agronomy (University of Florida). Prior to coming to UTSA, he conducted post-doctoral research at the University of Florida Center for Aquatic and Invasive Plants, Gainesville and worked as a botanist with the United States Fish and Wildlife Service, San Marcos Aquatic Resources Center (SMARC; San Marcos, TX). His primary research interests are focused on the species and landscape of the Edwards Aquifer, and includes topics such as nutrient uptake by aquatic plants, aquatic invertebrates as bioindicators of aquatic health, effects of runoff on aquatic organisms, phenological plasticity in plants such as the endangered aquatic macrophyte Texas wild rice, floods and droughts, and the impacts of non-native species on aquatic and riparian structure and function. The long range goal is to develop applied management techniques to improve stream and river health conditions that are applicable to real world situations in aquatic environments on a national and international level.

Kokel, Haley - Email: haley.kokel@fishonaquaticplants.com

Owner, Fish On Aquatic Plants

Haley Kokel owns and operates Fish On Aquatic Plants, a native aquatic plant nursery in Aledo, Texas. Haley earned her Master's degree from Texas A&M University through research on native aquatic vegetation establishment. Prior to opening her nursery, Haley worked for Texas Parks and Wildlife and Missouri Department of Conservation where she implemented plant propagation and planting techniques for vegetation restoration in state lakes. Outside of working in the nursery, Haley enjoys fishing, leatherworking, gardening and spending time with her family.

***Lopez, Alexa - apl23@txstate.edu**

Graduate Student, Texas State University

***Maroti, Angela - angela.maroti@my.utsa.edu**

Graduate Student, University of Texas - San Antonio

Angela Maroti grew up in Seguin, Texas and received her bachelor's degree from Texas A&M University in 2018 in Wildlife and Fisheries Sciences before pursuing a master's degree in Environmental Science at UTSA in 2020. Her professional interests include freshwater ecology, wildlife biology, natural resource management, and

sustainability. Angela's research was focused on evaluating the suppression of hydrilla using water stargrass, and the federally endangered Texas wild rice in the San Marcos River. She is expected to graduate this December.

McGarrity, Monica - 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 serves as a director on the boards of the Texas Invasive Plant and Pest Council and Texas Aquatic Plant Management Society.

Morgan-Olvera, Ashley - Email: arm001@shsu.edu

Director, Texas Invasives Species Institute and Texasinvasives.org

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 and TDA in the implementation of invasive insect, mollusk, and plant pathogen field-surveys. She also supports the mission of TISI and Texasinvasives.org that focus on public education, reporting, prevention, and management of invasive species, by providing training programs such as the Invaders of Texas and educational workshops to motivate students and citizens alike into action against invasive plants and pests.

O'Hanlon, Ryan - Email: arm001@shsu.edu

Co-owner and Lead Aquatic Horticulturist, Stonefly Aquatic Nursery

Ryan is the co-owner and lead aquatic horticulturist at Stonefly Aquatic Nursery. He has been in the industry since completing his Masters at Texas A&M's Wildlife and Fisheries Sciences department in 2016. His interest in aquatic ecology helped lead to the start of Stonefly where they grow native aquatic and wetland plants for aesthetics, conservation and management.

Patiño, Reynaldo - reynaldo.patino@ttu.edu

Leader, USGS Texas Cooperative Fish and Wildlife Research Unit

Reynaldo Patiño is Leader of the USGS Texas Cooperative Fish and Wildlife Research Unit and is also Research Professor with the departments of Natural Resources Management and Biological Sciences at Texas Tech University. His laboratory is interested in questions of water quality, harmful algae, and ecotoxicology. Their work on harmful algae focuses on *Prymnesium parvum* ("golden alga") and aims to understand environmental factors that regulate or facilitate blooms and to develop environmentally friendly methods of bloom control.

Ruiz, Justin, Sgt. - justin.ruiz@dps.texas.gov

Sergeant, Texas Department of Public Safety

Justin graduated from Stephen F. Austin State University with a Pre-Law Degree and was stationed in Caldwell as a Trooper. He is a Military Veteran (Army) and has been with the Texas Department of Public Safety for over 7 years. He conducts presentations from Pre-K kids to Corporate Companies. He enjoys speaking to people and hopes to have a positive impact on everyone he encounters.

^{CEU} **Smith, Chris - Email: 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 13 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.

Stahman, Matt - mstahman@res.us

Director, RES

Matt Stahman has over 25 years of professional experience in the environmental consulting and mitigation, and ecological restoration industries. Matt serves as Director of Regulatory for RES, an ecological restoration firm providing client-focused wetland, stream and species mitigation offsets, green stormwater infrastructure and corporate sustainability solutions nationwide. He is currently working on a ~15,000-acre ecological restoration and enhancement project for North Texas Municipal Water District's Bois d'Arc Lake, one of the largest permittee-responsible mitigation projects in the Nation. Matt previously served as an environmental consultant conducting environmental permitting for the oil & gas, electric transmission, generation, land development, water resources, and transportation sectors. Matt specializes in Clean Water Act and Endangered Species Act permitting, compliance and mitigation.

Striegel, Megan - mstriegel@pestfacts.org

Director, RES

Megan Striegel is the Grassroots Manager at RISE, where she is responsible for strengthening and increasing RISE's presence at the federal, state, and local levels in advocating for the specialty pesticide and plant health industries. She also serves as the staff liaison to the RISE Aquatics Committee. Prior to joining RISE, Megan worked in the Agriculture Advisor's Office at the U.S. Environmental Protection Agency. She earned her bachelor's degree at Iowa State University and lives in Arlington, VA.

Warmuth, Tom - Email: twarmuth@biosafesystems.com

National Manager, BioSafe Systems

Tom Warmuth is the National Manager of the Lake, Pond and Municipal Segment for 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 12 years, he has lived in North Carolina with his wife, Sara.

Williams, Casey - Email: cwilliams@bio-west.com

Aquatic Plant Ecologist and Plant Ecologist, BIO-WEST

An alumni of Southwest Texas State University and Texas State University, Casey is an aquatic plant ecologist for BIO-WEST 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.

Wixom, Sonja - sonja@pondmedics.com

Lake Manager and Limnology Educator, PondMedics

Sonja earned her BS at SUNY Environmental Science & Forestry in Conservation Biology (2016), and earned her MS at SUNY Oneonta in Lake Management (2019). She relocated from Upstate New York to North Central Texas recently to start her lake management career with PondMedics. Sonja has a passion for sharing her limnological knowledge and providing education on a variety of levels to a variety of audiences.

Wolfe, Ashley - ashley.wolfe3@montana.edu

Research Associate and Lab Manager, Montana State University

Ashley L. Wolfe is currently a Research Associate and Lab Manager at Montana State University's Plant Sciences & Plant Pathology Department. She received her BSc in Conservation Biology and Ecology from Montana State University in December 2020. Her research focuses on the ecological genetics and genomics of invasive aquatic plants.

Wood-Ramirez, Michelle - Michelle.Wood-Ramirez@trwd.com

Watershed Coordinator, Tarrant Regional Water District

Michelle Wood-Ramirez is a Watershed Coordinator at Tarrant Regional Water District. She is experienced working in and teaching about natural resources and ecological restoration, having loved connecting people to nature since she was a child. 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 urban stormwater and LID. Michelle is passionate about ecological stewardship and environmental justice in the urban realm via hands on education and mentoring.