



Photo Credit: John Bunker Sands
Wetland Center

2023

ANNUAL MEETING

Mesquite, Texas

November 15-17, 2023



ABOUT THE TEXAS AQUATIC PLANT MANAGEMENT SOCIETY (TAPMS)

The TAPMS is a regional chapter of the Aquatic Plant Management Society—an international organization of scientists, educators, students, aquatic herbicide 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 2023 Texas Aquatic Plant Management Society Annual Conference would not have been possible without the efforts of Carlton Layne / Aquatic Ecosystem Restoration Foundation for 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.

TAPMS would like to give a special thanks to our sponsors for making the 2023 Annual Meeting Possible!

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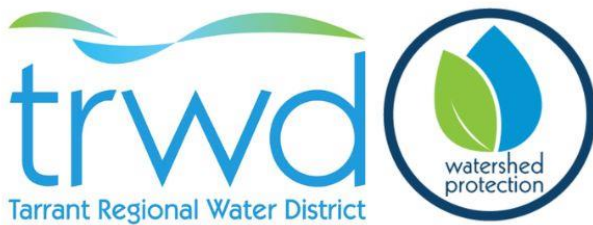


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DAILY EVENTS-AT-A-GLANCE

See Agenda on the following pages for event times.

WEDNESDAY - NOVEMBER 15, 2023

Tour of John Bunker Sands Wetland Center
Exhibits Setup
TAPMS Pre-Conference Board of Directors Meeting & Work Session
Conference Check-In and Onsite Registration
President's Reception

Presidents' Reception Sponsored by: *Edwards Aquifer Habitat Conservation Plan (Diamond Sponsor)*

THURSDAY - NOVEMBER 16, 2023

Morning

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

Luncheon Sponsored by: Edwards Aquifer Habitat Conservation Plan (Diamond Sponsor), Nufarm (Gold Sponsor)

Afternoon

General Session
Business Meeting
Pesticide Applicators Receive CEU Certificates
Awards Banquet - TAPMS Awards Presentations & Election Results
Closing Cocktail Hour

FRIDAY - NOVEMBER 17, 2023

Conference Check-In and Onsite Registration
Continental Breakfast
General Session
Post-Conference Board Meeting

Breaks sponsored by: Edwards Aquifer Habitat Conservation Plan (Diamond Sponsor), Nufarm (Gold Sponsor), Syngenta (Silver Sponsor), BioSafe Systems (Silver Sponsor), SePRO (Silver Sponsor), UPL Environmental Solutions (Silver Sponsor)

AGENDA-AT-A-GLANCE

WEDNESDAY - NOVEMBER 15, 2023

- 1:00 PM - 3:00 PM Tour of John Bunker Sands Wetland Center
- 3:30 PM – 4:00 PM Pre-Conference Board Meeting/Work Session (*Registration Desk, near Ballroom B*)
- 2:00 PM - 6:00 PM Conference Early Check-In and Onsite Registration (*Ballroom B Hallway*)
- 4:00 PM - 6:00 PM Exhibits Set-up (*Ballroom B*)
- 6:30 PM - 9:00 PM President's Reception (*Ballroom B*)

THURSDAY - NOVEMBER 16, 2023

- 6:00 AM - 8:00 AM Continental Breakfast (*Hotel Lobby*)
- 7:00 AM - 8:00 AM Conference Check-In and Onsite Registration (*Ballroom B Hallway*)
Raffle-Drawing #1
- 8:00 AM - 10:20 AM President's Welcome & CEU Session (*Ballroom CDE*)
- 10:20 AM - 10:40 AM Morning Refreshment Break (*Ballroom B*)
- 10:40 AM - 11:30 AM CEU Session Continued (*Ballroom CDE*)
CEU applicators must complete TDA sign-in (*Ballroom CDE*)
- 11:30 PM - 12:45 PM Lunch (*Ballroom B*)
Raffle-Drawing #2
- 12:45 PM - 3:05 PM CEU Session (*Ballroom CDE*)
CEU applicators must complete TDA sign-in (*Ballroom CDE*)
- 3:05 PM - 3:25 PM Afternoon Refreshment Break (*Ballroom B*)
- 3:25 PM - 4:45 PM Student Presentations & Judging (*Ballroom CDE*)
- 4:45 PM - 5:30 PM Annual TAPMS Business Meeting (*Ballroom CDE*)
Plant ID/Exhibitor Visit Raffle Drawing (\$100)
- 5:30 PM – 5:45 PM Pesticide Applicators Receive CEU Certificates (*Ballroom CDE*)
- 6:30 PM - 8:00 PM Banquet Dinner & Awards (*Ballroom B*)
- 8:00 PM - 9:00 PM Closing Cocktail Hour (*Ballroom B*)

CEU Course Sign-in



FRIDAY - NOVEMBER 17, 2023

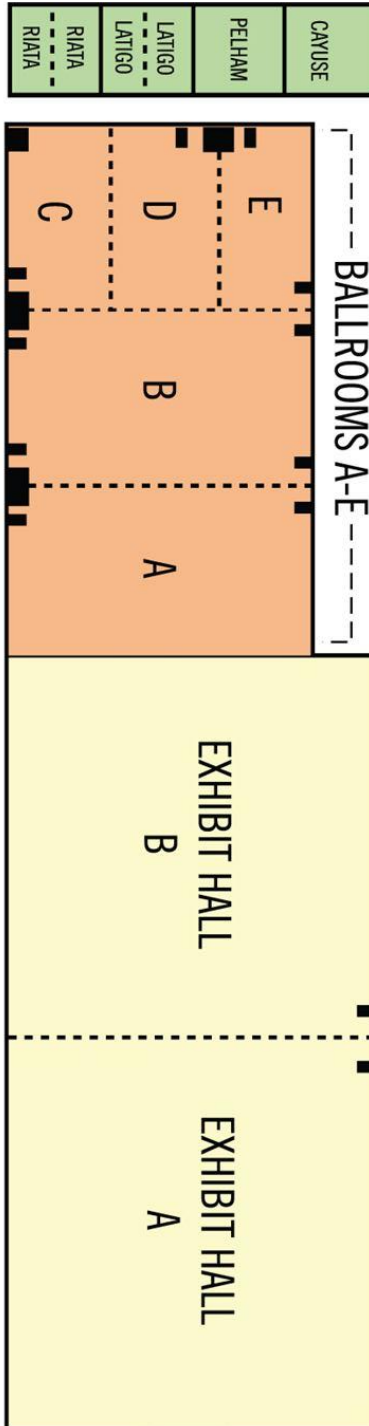
- 6:00 AM - 8:30 AM Continental Breakfast (*Hotel Lobby*)
- 7:00 AM - 8:30 AM Conference Check-In and Onsite Registration (*Ballroom B Hallway*)
Raffle-Drawing #3
- 8:30 AM - 10:05 AM President's Announcements and General Session (*Ballroom CDE*)
- 10:05 AM - 10:30 AM Morning Refreshment Break (*Ballroom B*)
Plant ID/Exhibitor Visit Raffle Drawing (\$100)
- 10:30 AM - 11:45 AM General Session Continued (*Ballroom CDE*)
- 11:45 AM - 12:00 PM Closing remarks (*Ballroom CDE*)
Raffle-Drawing #4
- 11:00 AM - 12:30 PM Exhibitor Break Down (*Ballroom B*)
- 11:00 AM - 2:00 PM Post-Conference Board Meeting (*Registration Desk*)

SITE INFORMATION & MAP

Mesquite Hotel and Conference Center

1750 Rodeo Dr., Mesquite, TX 75149

Phone: (972) 329-3100



SOCIAL EVENTS INFORMATION

President's Reception: *Wednesday, November 15, 6:30 pm to 9:00 pm, Ballroom B*

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: Edwards Aquifer Habitat Conservation Plan (Diamond Sponsor)

Plant ID/Exhibitor Visit Raffle: *Thursday, November 16, 8:00 am to 5:00 pm, Ballroom B*

Meeting attendees will have the chance to win a raffle drawing if they visit each vendor booth, writing down the name of the vendor and plant pictured at each booth. One drawing will be held at the end of Thursday's general session and one following the Friday morning break.

Annual Business Meeting: *Thursday, November 16, 4:45 pm to 5:30 pm, Ballroom CDE*

All TAPMS members are encouraged to attend the TAPMS Annual Business Meeting for Society updates. It will be held following the conclusion of the Thursday General Session.

Banquet Dinner & Awards: *Thursday, November 16, 6:30 pm to 8:00 pm, Ballroom B*

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.

Closing Cocktail Hour: *Thursday, November 16, 8:00 pm to 9:00 pm, Ballroom B*

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

BREAKS SPONSORED BY: *Edwards Aquifer Habitat Conservation Plan (Diamond Sponsor), Nufarm (Gold Sponsor), Syngenta (Silver Sponsor), BioSafe Systems (Silver Sponsor), SePRO (Silver Sponsor), UPL Environmental Solutions (Silver Sponsor)*

DETAILED AGENDA

* Indicates student presentation.

CEU indicates attendance credit of 1.0 CEU

WEDNESDAY - NOVEMBER 15, 2023

- 1:00 PM - 3:00 PM Tour of John Bunker Sands Wetland Center
- 3:30 PM – 4:00 PM Pre-conference board meeting/work session (*Board Members; Riata Boardroom*)
- 4:00 PM - 6:00 PM Conference early check-in and onsite registration (*Ballroom B Hallway*)
- 4:00 PM - 6:00 PM Exhibitor set up (*Ballroom B*)
- 6:30 PM - 9:00 PM President’s reception (*Ballroom B*)

THURSDAY - NOVEMBER 16, 2023

- 7:00 AM - 8:00 AM Conference check-in and onsite registration (*Ballroom B Hallway*)
- 7:00 AM - 8:30 AM Continental breakfast (*Hotel Lobby*)

Opening Remarks

- 8:00 AM - 8:15 AM Welcome & Announcements
(*Kristina Tolman; TAPMS President*)

Session 1 (Ballroom CDE, Moderator: Kristina Tolman)

- 8:15 AM - 9:15 AM ^{CEU}Vegetation Management on a Large Scale Water Reuse Constructed Wetland
(*Wells Shartle; Tarrant Regional Water District*)
- 9:15 AM - 10:15 AM ^{CEU}The Clean Water Act and Landowners: WOTUS After Sackett
(*Jim Bradbury; James D. Bradbury, PLLC*)
- 10:15 AM - 10:35 AM Morning Refreshment Break (*Ballroom B*)
- 10:35 AM - 11:35 AM ^{CEU} Statewide Integrated Pest Management of Aquatic and Riparian Invasive Species
(*John Findeisen and Monica McGarrity; Texas Parks and Wildlife Department*)
- CEU applicators must complete TDA sign-in (*Ballroom CDE*)**

- 11:35 AM - 12:45 PM Lunch (*Ballroom B*)

Session 2 (Ballroom CDE, Moderator: Olivia Ybarra)

- 12:45 PM - 1:45 PM ^{CEU} Strategies for Success With Public Interactions
(*Levi Sparks; Bandera County River Authority & Groundwater District*)

CEU Course Sign-in



THURSDAY - NOVEMBER 16, 2023

- 1:45 PM – 2:45 PM ^{CEU} Harmful Algal Proliferation Management: Trying to Further Limit a Limiting Nutrient
(*Brent Bellinger, PhD; City of Austin*)
CEU applicators must complete TDA sign-in (Ballroom CDE)
- 2:45 PM - 3:05 PM Afternoon Refreshment Break (*Ballroom B*)
- 3:05 PM - 3:25 PM State of Mechanical Harvesting in Texas
(*Trent Lewis; PondMedics*)
- 3:25 PM - 3:45 PM An Update on the Aquatic Ecosystem Restoration Foundation
(*John Madsen; Aquatic Ecosystem Restoration Foundation*)
- 3:45 PM - 4:05 PM * Using Macroinvertebrates to Assess Aquatic Macrophyte Restoration in Austin
Texas Reservoirs Post Hydrilla Invasion
(*Katie Vasquez; University of North Texas*)
- 4:05 PM - 4:25 PM * Geomorphic Response of Saltcedar Management in the Upper Brazos River
(*Tighearnan Juarez Murphy, Texas State University*)
- 4:25 PM - 4:45 PM * Examining the effects of nitrogen enrichment on growth patterns of smooth cordgrass
cultivated in various sediment regimes.
(*Kristina Hellinghausen; University of North Texas*)

Thursday Post-Session Events

- 4:45 PM - 5:30 PM Annual TAPMS Business Meeting (*Ballroom CDE*)
- 5:30 PM - 5:45 PM Applicators receive CEU certificates (*Ballroom CDE*)
- 6:30 PM – 8:00 PM Banquet Dinner & Awards (*Ballroom B*)
- 8:00 PM – 9:00 PM Closing Cocktail Hour (*Ballroom B*)

Friday- NOVEMBER 17, 2023

- 7:00 AM - 8:30 AM Conference check-in and onsite registration (*Ballroom B Hallway*)
- 7:30 AM - 8:30 AM Continental breakfast (*Hotel Lobby*)

Opening Remarks

8:30 AM - 8:40 AM Welcome & Announcements
(*Kristina Tolman; TAPMS President*)

Session 3 (Ballroom CDE, Moderator: Haley Kokel)

8:40 AM – 9:00 AM Design and Implementation of Texas’ Habitat and Angler Access Program (*Michael Homer; Texas Parks and Wildlife Department*)

9:00 AM – 9:20 AM Helicopter Application with Organic Sticker on Aquatic Weeds
(*Lucy Marshall, PhD; BioSorb Inc.*)

9:20 AM – 9:40 AM Herbicides for management of water hyacinth in the Sacramento–San Joaquin River Delta, California
(*John Madsen; Aquatic Ecosystem Restoration Foundation*)

9:40 AM - 10:00 AM Importance of Surface Aeration in Shallow Pond Management
(*Cory Richmond; Kasco Marine*)

10:00 AM - 10:20 AM A Cost-benefit Analysis of Restoration Techniques to Address Internal Nutrient Loading from Anoxic Sediments
(*Patrick Goodwin, Natural Lake*)

10:20 AM - 10:40 AM Morning Refreshment Break (*Ballroom B*)

Session 4 (Ballroom CDE, Moderator: Kelly Duffie)

10:40 AM – 11:00 AM Effects of Draw-Down on Growth of Ex Situ Texas Wild-Rice
(*Chris Hathcock; US Fish and Wildlife Service*)

11:00 AM - 11:20 AM Assessing 10 years of Aquatic Restoration in Comal River and San Marcos River
(*Kristina Tolman; Edwards Aquifer Authority*)

11:20 AM - 11:40 AM The Pondweeds of Texas: Their Ecology and Identification
(*Casey Williams; BIO-WEST Inc.*)

11:40 AM - 11:45 PM Conference Final Address and looking forward to the 2024 Meeting
(*Kristina Tolman; TAPMS president*)

Post-Conference Events

12:00 PM - 2:00 PM Post-Conference Board Meeting (*Registration Desk*)

PRESENTATION ABSTRACTS

Abstracts are listed by order of presentation

** Indicates student presenter*

^{CEU} Indicates attendance credit of 1.0 CEU

^{CEU} [Vegetation Management on a Large Scale Water Reuse Constructed Wetland](#)

Wells Shartle

Tarrant Regional Water District

This presentation will discuss aquatic vegetation management successes and failures on an 1,880-acre wetland designed for water supply and public recreation. We will discuss a variety of techniques to eliminate nuisance vegetation and promote desirable diversity including moist soil drawdowns, biological, mechanical, and chemical treatment. Since 2013, Tarrant Regional Water District (TRWD) has operated the George Shannon wetlands as a water supply project for Richland Chambers Reservoir. This water supply project is designed to naturally reduce nutrient and sediment loading from water pumped from the Trinity River. The wetland system can deliver nearly 100 million gallons a day to Richland-Chamber Reservoir. The wetland is located on Texas Parks and Wildlife Department's (TPWD) Richland Creek WMA – Carl Frentress unit. The partnership between TRWD with TPWD led to an agreement on vegetation management to promote vegetation beneficial to waterfowl and achieving water quality goals.

^{CEU} [The Clean Water Act and Landowners: WOTUS After Sackett](#)

Jim Bradbury

James D. Bradbury, PLLC

"The scope and definition of "Waters of the United States" (WOTUS) are at the heart of Clean Water Act regulation and have been hotly debated and litigated for decades. The ever-shifting definition of WOTUS creates uncertainty for landowners, agricultural producers, and other industries that engage in use of lands. Following rules implemented by the Obama and Trump Administrations, the Biden Administration issued its revisions to WOTUS in 2022, which included multiple tests for determining jurisdiction, including the significant nexus test, relatively permanent test, and material influence test. Many suggested the administration should have waited for a ruling from SCOTUS in the Sackett v. Environmental Protection Agency case. However, in Sackett, the Supreme Court considered WOTUS in the context of wetlands and held that a continuous surface connection is required for wetlands to be WOTUS, overturning the significant nexus test. Just recently, the Biden Administration issued a revised WOTUS rule on August 29, 2023 to comply with the Sackett ruling. The revised rule removes the significant nexus test from WOTUS determinations. This presentation will look at the evolution of WOTUS in recent years, focusing on the Sackett decision as well as the latest Biden Administration WOTUS rule and what this means for Clean Water Act regulation in the future.

^{CEU} 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 2023 (Sept. 2022 – Aug. 2023), 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.

^{CEU} Strategies for Success With Public Interactions

Levi Sparks

Bandera County River Authority and Groundwater District

This presentation emphasizes the importance of effective communication, transparency, and preparation when dealing with interactions between the public and individuals involved in aquatic plant management programs. It underscores the potential positive impact that well-handled interactions can have on public support and program success.

Interactions between the general public and aquatic plant program managers or herbicide applicators are happening at greater rates than ever before - every such interaction should not be taken lightly. How these interactions are handled and the outcome of them could either be a huge asset or hindrance to the future of these programs. Questions such as what is being sprayed, what chemicals are being used, why are you doing this, and is this safe or any variations of these questions could come while out in the field or through phone calls. Preparation is key. For managers, having materials specific to your program is extremely important to hand out as well as a working knowledge of what chemical is being applied, how it is being applied, and at what concentrations. For applicators, those same preparations added with a more in depth knowledge of the chemical will be beneficial. It is important to note that most of these interactions are not with people intent to do the program harm. These are people concerned with their own safety, their pets or children's safety, the health of the environment, or any combination of those concerns. Alleviating these concerns can not only sway the individual questioning the immediate issues, but can generate public support and approval for the projects.

Effectively addressing public concerns can not only ease the worries of the individuals involved but also generates public support and approval for the projects. This support can be valuable for the success and continuation of these programs.

Brent J. Bellinger, PhD

City of Austin

Toxicity associated with benthic cyanobacterial mats (aka harmful algal proliferations [HAP]) is a global phenomenon increasing in extent and occurrence frequency. In the summer of 2019 five dogs died within a few weeks of each other after ingestion of cyanobacteria mat material that contained dihydroanatoxin-a (dhATX), a potent congener of anatoxin-a, after swimming in Lady Bird Lake, an urban Central Texas, USA, reservoir. In response, the City of Austin with the University of Texas established a monitoring program to track HAP development, variability in toxin contents, mat species composition, and water quality parameters to understand the timing, duration, intensity, and possible drivers of the toxin events. In 2021, the City began a 5-year pilot project applying lanthanum-modified bentonite (LMB) at an upriver location where the highest toxin contents and greatest abundance of floating mat biomass had been observed. In 2022, a second location downriver was added to the LMB treatment plan. The objective of the pilot project was to determine if LMB could effectively alter sediment phosphorus (P) chemistry, an ecosystem limiting nutrient, and subsequently reduce the extent and/or toxicity of the mats present. Results have been mixed between the sites, with effective alterations in sediment P characteristics observed at the most upriver site, but smaller changes have been noted downriver. In the absence of large depositional events, annual changes are minimal. However, we believe that the abundance of urban inputs to the downriver site is negatively impacting LMB efficacy.

[State of Mechanical Harvesting in Texas](#)

Trent Lewis

PondMedics

When it comes to integrated pest management practices, mechanical harvest is an important tool in the toolbox. With a rise of pesticide regulation, and the future of the political climate, mechanical harvest is going to be a necessary consideration in the future of aquatic plant management. Additionally, mechanical harvest, can increase the efficacy of aquatic herbicides, as well as deliver better results to the stakeholders. In this session, Mr. Lewis will give a state of the industry update as well as introduce some of the newest tools on the market.

[An Update on the Aquatic Ecosystem Restoration Foundation](#)

John Madsen

Aquatic Ecosystem Restoration Foundation

The Aquatic Ecosystem Restoration Foundation is committed to sustainable water resources through the science of aquatic ecosystem management in collaboration with industry, academia, government and other stakeholders. The Aquatic Ecosystem Restoration Foundation accomplishes this mission through support of research and development of aquatic ecosystem management strategies, advocating for environmentally sound conservation and restoration of aquatic ecosystems, providing information to the public regarding aquatic plant management, and serving as an unbiased voice for ecosystem management activities.

Using Macroinvertebrates to Assess Aquatic Macrophyte Restoration in Austin Texas Reservoirs Post Hydrilla Invasion

***Katie Vasquez**

University of North Texas

Lady Bird Lake and Lake Austin are adjacent reservoirs in Austin, Texas with the primary functions of electrical power generation, flood control, and recreation. In 1999, the invasive submerged aquatic macrophyte (SAV), *Hydrilla verticillata* was observed in Lake Austin where it established over the span of the lake, though never establishing in Lady Bird Lake. Management strategies to eradicate Hydrilla included the stocking of sterile Asian grass carp, *Ctenopharyngodon idella*. This practice nearly eliminated Hydrilla and resulted in the decline of native aquatic vegetation and increased shoreline erosion. Conservation efforts to reestablish the vegetation are underway. SAV, in addition to facilitating nutrient uptake and retention, enhancing water clarity, stabilizing substrate, and attenuating wave energy, provides food and refugia for aquatic fauna. My research aims to understand the biological implications of the restoration of various SAV assemblages by analyzing the macroinvertebrate communities present within bare, mixed, and monocultured habitat regimes. The data suggests that mixed-cultured SAV, site disturbance, and macroinvertebrate taxonomic resolution are the primary determinants of macroinvertebrate richness, abundance, and diversity.

Geomorphic Response of Saltcedar Management in the Upper Brazos River

***Tighearnan Juarez Murphy**

Texas State University

Saltcedar (*Tamarix spp.*) is an invasive phreatophyte originating from the Mediterranean, North Africa, and Asia. Brought to the United States for ornamental plantings and erosion control in the 19th century, it has since become invasive, particularly in the southwest. Within the upper Brazos River (UBR) watershed, this invasive species has altered instream sedimentation dynamics along with channel and floodplain morphologies. The armoring of stream banks by saltcedar has reduced stream width, deepened channels, and increased velocities. Saltcedar is also suspected of using greater quantities of groundwater than native vegetation, furthering the need for management. The UBR is also the critical habitat of two endangered fish species: the Sharpnose Shiner (*Notropis oxyrhynchus*) and Smalleye Shiner (*Notropis buccula*). These fish require wide, shallow and sandy instream conditions that saltcedar is threatening. Since 2016, Texas Parks and Wildlife Department (TPWD) has treated saltcedar along the UBR with the herbicide imazapyr via helicopter application. Studies have shown that there has been an overall decrease in saltcedar in managed areas, although it remains an ongoing issue within the UBR. This presentation will explore the differences in grain sizes from sediment samples taken in 2017 and 2022 to understand the geomorphic responses of the UBR to the management of saltcedar. The results of the comparative analysis will be discussed at the conference.

Examining the effects of nitrogen enrichment on growth patterns of smooth cordgrass cultivated in various sediment regimes

***Kristina Hellinghausen**

University of North Texas

A primary concern in coastal ecosystems is the increasing threat of nitrogen (N) pollution, in which salt marshes serve as buffers by retaining, transforming, and recycling nitrogen. Further, beneficial use of dredged material (BUDM) is an increasingly prevalent strategy for wetland mitigation projects. Smooth cordgrass (*Spartina alterniflora*) is a predominant interceptor of N and an essential halophyte in restoration of salt marshes, yet little is known regarding the impact of N on its allocation of biomass and photosynthetic capacity when cultivated in dredged material. This study was designed to fill this knowledge gap by determining the effect of N on stem height (cm), above and belowground biomass (DW g), and total chlorophyll (mg/L) over a 7-week period across a gradient of four N concentrations and three sediment types. The data suggests that increasing N generally promoted an increase in stem height and aboveground biomass, while growth of belowground biomass was stimulated to a lesser extent. Plants grown in all-purpose soil and dredged material tended to favor the more mid-level N concentrations for growth of both tissue types, while those in native estuarine sediment favored high N. The results of this study pose important implications for ecological restoration practitioners aiming to enhance vegetation establishment in wetlands created with the beneficial use of dredged material.

Design and Implementation of Texas' Habitat and Angler Access Program

Michael Homer

Texas Parks and Wildlife

Texas Parks and Wildlife Department (TPWD) is responsible for managing freshwater fisheries resources in over 1,100 reservoirs and small impoundments in addition to 191,000 miles of streams, creeks, and rivers in the state. Many of these systems have suffered declines in habitat quantity and quality associated with land and water use patterns; and the state's rapid population growth has led to increased pressure on currently available public access fishing locations. To address current and emerging needs for fish habitat conservation and restoration and the increasing demand for angler access in these systems, TPWD allocated funds generated from freshwater fishing license revenues and sand and gravel royalties to develop and support the Habitat and Angler Access Program (HAAP). The HAAP was established to support freshwater fish habitat restoration and enhancement efforts as well as shoreline-based angler access projects. The HAAP was conceptualized with two funding allocation mechanisms: a competitive grant program that supports projects led by external partners and an internal funding stream supporting habitat and access projects proposed by TPWD fisheries biologists. Successful development of the HAAP required establishing a framework that would a) address established fish habitat and angler access priorities, b) be supported among TPWD staff, c) follow protocols congruent with other successful TPWD grant programs to effectively allocate resources, and d) efficiently deliver outcomes (high quality habitat and access) to meet program objectives. A workgroup of TPWD fisheries biologists was tasked to develop and adaptive external grant framework that included drafting a request for proposals (RFP), solicitations of Letters of Interest to prospective partners, proposal scoring system, project selection process, and regulatory compliance documentation. The workgroup facilitated a statewide needs assessment to identify thematic funding needs and priority shovel-ready projects for the internal funding stream. This discussion highlights the development of the HAAP framework, its implementation, challenges encountered, strategic priorities, projects selected for funding, programmatic modifications, expected outcomes and future steps.

Helicopter Application with Organic Sticker on Aquatic Weeds

Lucy Marshall, PhD

BioSorb Inc.

Helicopter 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 Texas lake reservoirs by the US Army Corps of Engineers (USAE), show that ultra-low volumes (ULV) of herbicides with TopFilm™ helps control *Salvinia molesta* (Salvinia), an invasive aquatic weed. Since some of these lake reservoirs are used for potable water, the object is to control the weed with minimal chemicals. The results show good control of Salvinia five months after treatment (5 MAT).

Droplet size and spray pattern when using TopFilm™ helps reduce drift, keeping the spray pattern from exceeding its target.

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: www.Biosorb-Inc.com or www.YouTube.com/@biosorb.

Herbicides for management of waterhyacinth in the Sacramento–San Joaquin River Delta, California

John Madsen

Aquatic Ecosystem Restoration Foundation

Waterhyacinth (*Eichhornia crassipes* (Mart.) Solms) is a global aquatic weed. Although a number of herbicides such as 2,4-D and glyphosate effectively control this plant, additional herbicides need to be evaluated to address concerns for herbicide stewardship and environmental restrictions on the use of herbicides in particular areas. Waterhyacinth has become a significant nuisance in the Sacramento–San Joaquin River Delta. The predominant herbicides for management of waterhyacinth in the Delta have been 2,4-D and glyphosate. However, environmental restrictions related to irrigation water residues and *Eichhornia crassipes* (Mart.) Solms restrictions for preservation of endangered species are prompting consideration of the new reduced-risk herbicides imazamox and penoxsulam. Two trials were performed in floating quadrats in the Delta during the summer of 2016. In the first trial, two rates each of 2,4-D, glyphosate, imazamox, and penoxsulam were treated in four replicate quadrats. In this trial, the highest rates of all four herbicides provided greater than 80% control (2,4-D, 82%; glyphosate, 87%; imazamox, 93%; and penoxsulam, 94%). In the second trial, the lower rate of glyphosate (1,681 g/ha) was compared to four rates each of imazamox (187 to 1,494 g/ha) and penoxsulam (12 to 98 g/ha). In this trial, the highest rates of imazamox and penoxsulam provided 96 and 95% control, respectively, compared to the untreated reference. Imazamox and penoxsulam will provide suitable control of waterhyacinth as part of an operational program and may be used as part of an integrated pest management program with considerations of herbicide resistance management. In addition, incorporating these reduced-risk herbicides into the management program can reduce the amount of pesticides applied per acre to achieve waterhyacinth control.

Importance of Surface Aeration in Shallow Pond Management

Cory Richmond

Kasco Marine

Surface aeration improves water quality by increasing dissolved oxygen. High dissolved oxygen levels improve water clarity, decrease available nutrients, increase fish productivity and reduce nuisance insect populations. This presentation will highlight these attributes and show zones of influence of different sized systems.

A Cost-benefit Analysis of Restoration Techniques to Address Internal Nutrient Loading from Anoxic Sediments

Patrick Goodwin

Naturalake

Internal phosphorus (P) and nitrogen (N) loading from sediments can represent a major driving force behind harmful algal blooms (HABs) within many lake systems. The process of internal P and N recycling from lake sediments is complex and is influenced by many factors. These factors can include biological (e.g., bacterial activity, mineralization processes, and bioturbation), chemical (e.g., redox conditions, pH, iron, and nitrate availability), and physical factors such as resuspension and sediment mixing. There are three general approaches to addressing internal P and N loading from sediments, dredging, oxygenation and/or circulation, or inactivation. Deciding which approach will provide the best results per dollar spent and the duration of benefits will depend on many factors, such as the lake's sediment features, lake depth, external nutrient loads, hydrology, desired goals, and the restoration approach, design, and cost. The pros and cons of each restoration technique will be discussed in detail, and a simple Excel-based model that allows for a cost-benefit analysis based on sediment features will be presented.

Effects of Draw-Down on Growth of Ex Situ Texas Wild-Rice

Chris Hathcock, PhD

U.S. Fish and Wildlife Service

Zizania texana (Texas wild-rice; hereafter, TWR) 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 TWR and transplant seedlings to areas within the species' historical range. SMARC also maintains a "species-assurance colony" on station to prevent species extinction if the natural population succumbs to a catastrophic event in the river. TWR exhibits variation in proportional allocation of biomass to reproductive and non-reproductive tissues based on environmental conditions. Mature TWR plants were subjected to simulated water-lowering events in large concrete tanks by raising randomly selected plants to mid- and shallow-levels using cinder blocks. Vegetative and reproductive output among treatment and control plots were analyzed within three experimental tanks over approximately one year. Relative to shallow-level plots, control and mid-level plots had fewer flowering, non-flowering, and total emergent stems per plot. Final vegetative and root biomass was significantly greater than shallow-level plots in both mid-level and control plots. Findings suggest a greater allocation of biomass toward sexual reproduction following exposure to lowered water levels, resulting in less vegetative and root development. Although greater seed production may be triggered by a river-lowering event such as a dam break or severe drought, sustainability and vigor of parent plants is probably dramatically compromised by such events.

Assessing 10 years of Aquatic Restoration in Comal River and San Marcos River

Kristina Tolman

Edwards Aquifer Authority

The Edwards Aquifer Habitat Conservation Plan (EAHCP) is a regional, 15-year plan to protect and enhance habitat for the threatened and endangered species that rely on Edwards Aquifer springflow in the San Marcos and Comal springs systems in San Marcos and New Braunfels, Texas. Since 2013, EAHCP

contractors have removed non-native aquatic vegetation including *Hygrophila polysperma* and *Hydrilla verticillata*, and planted native vegetation to enhance habitat for the endangered fountain darter fish.

Data used for this analysis include full-system vegetation surveys from 2013 and 2023, in both the San Marcos and Comal rivers.

[The Pondweeds of Texas: Their Ecology and Identification](#)

Casey Williams

Bio-West Inc.

Pondweeds, family Potamogetonaceae, are widespread in Texas and commonly found in a variety of habitats across the state. This family is represented by three genera in Texas. Notable field characteristics of the family include entirely submersed growth, strongly and linearly veined leaves as well as stipulate leaves. Some species of pondweeds exhibit phenotypic plasticity. Plasticity may result from the varied environmental conditions in which the populations grow or from morphologic changes in individuals of a population during the growing season. Individuals in fruit have relatively consistent morphology within a species. Reproductive features are most important in separating species of Pondweeds. The water quality parameters of pH and alkalinity are important in determining where pondweeds grow. All but one recorded species of pondweed are native to Texas. While pondweeds can become a nuisance in some circumstances, they are also important for fish and waterfowl habitat. Recent literature has identified pondweeds as very good for phytoremediation and nutrient uptake. This presentation will cover aspects of Pondweed identification highlighting the variability within some species. I will also discuss the parameters in which pondweeds grow and how this is important for control or propagation for pondweeds.

PRESENTER BIOGRAPHIES

Biographies are listed by order by presenter last name.

** Indicates student presenter.*

Brent J. Bellinger, PhD

City of Austin

Brent Bellinger is an aquatic ecologist and studied and monitored ecosystem conditions and linkages as influenced by anthropogenic activities from the Great Lakes to the Florida Everglades before settling in Austin, TX. The goal of his research is to gain enough understanding of what is driving conditions to make informed active management decisions that will enhance ecosystem services being provided by the aquatic environment.

Jim Bradbury

James D. Bradbury, PLLC

Jim Bradbury's practice focuses on land, environmental, water and regulatory matters, including the imminent water policy issues facing rural Texas. His firm has offices in Fort Worth and Austin. Jim has a focus on the legal and policy issues facing Texas landowners and producers, working with statewide agricultural associations on legislative and regulatory matters, including amicus briefing to the Texas Supreme Court on issues of statewide importance. Mr. Bradbury is an adjunct Professor at Texas A&M Law School, teaching Ag Law, Natural Resources and Eminent Domain Policy. He regularly speaks on landowner rights and water issues as they affect Texas public policy and serves on the Board of the Texas Land Trust Council and the Policy Committee of Texas Ag Land Trust working to conserve working farms and ranches.

John Findeisen

Texas Parks and Wildlife Department

John Findeisen graduated with Bachelor's degree from Texas A&M University and a Master's degree from Southwest Texas State University. John has worked for TPWD as a biologist for 28 years; 20 years as a fisheries biologist and 8 years as an invasive species biologist. John is currently the Team Leader for the TPWD Aquatic Habitat Enhancement Team. Outside of work, John is an avid hunter and angler.

Patrick Goodwin

Naturalake

Patrick Goodwin holds a B.S. in Biology from the University of North Florida and an M.S. in Lake Management from SUNY Oneonta. Patrick is a certified lake manager with over ten years of experience in water resource management.

Chris Hathcock, PhD

U.S. Fish and Wildlife Service

Chris Hathcock has over 20 years of experience in designing, implementing, and managing habitat restoration projects in central and southern Texas. Much of his work has targeted riparian and floodplain plant communities, both for the Texas Parks and Wildlife Department and the U.S. Fish and Wildlife Service. He received a B.S. in Fisheries and Wildlife from the University of Missouri - Columbia (1994) and a M.S. in Biology from the University of Texas - Pan American (2000). As Lead Botanist at the San Marcos Aquatic Resources Center, his current research and restoration focus is on endangered Texas wild-rice and plant communities in and along the San Marcos River and other central Texas rivers.

***Kristina Hellinghausen**
University of North Texas

Kristina Hellinghausen is currently a master's student at the University of North Texas and a Research Assistant through the Oak Ridge Institute for Science and Education. Stationed at the US Army Engineer Research and Development Center's Lewisville Aquatic Ecosystem Research Facility in Lewisville, TX, her primary role for the last three years has been to support ecological restoration projects and research efforts investigating the ecology and management of invasive water chestnut in the U.S.

Michael Homer
Texas Parks and Wildlife

Mike Homer Jr. is the TX Parks & Wildlife Department Inland Fisheries – Abilene District Supervisor and the coordinator of the Inland Fisheries Division's Habitat and Angler Access Program (HAAP; www.tpwd.texas.gov/haap). As a fisheries biologist, Mike and his team ensure sustainable use and sound management of fisheries resources in Texas' public waters. As the HAAP coordinator, Mike helps lead efforts for the Inland Fisheries Division to fund projects to restore and enhance fish habitat and create shoreline-based angler access in Texas' inland public waters. Mike also serves as the American Fisheries Society Fish Habitat Section President-Elect, is the Texas representative on the Southern Division Reservoir Technical Committee and is a former Texas Chapter President.

Trent Lewis
PondMedics

Trent Lewis, founder of the PondMedics Family of Brands, has been serving the surface water industry for more than 20 years. He is one of the founding members of the Society of Lake Management Professionals, current president of the Society, and has been a board member since the early days of SLMP's inception. His gifts as a visionary as produced what is known today as "The PondMedics Family of Brands." The Family of Brands includes companies such as: Fountain Freedom, AquaInject, dredge SMART and American Truxor Direct. Each of these brands represent the innovation and dedication Trent has invested in the industry of surface and storm water. His development of unique business models and supporting technology has opened new doors to serve clients in a way that avoids profiting from clients' pain, and instead, creates a truly unique alignment of incentives and win-win between surface water companies and their clients.

Over the years, Trent served as a board member and President of the Texas Aquatic Plant Management Society, and has been the President of the Upper Trinity Conservation Trust since 2009. Trent is a graduate of Texas Tech University and is an AFS Certified Fisheries Professional. Additionally, Trent is a FAA licensed drone and private pilot. Traveling the country speaking at various industry events keeps him busy, but when he's not working, Trent can be found with his wife, Emily, and their 6 kids exploring, traveling, fishing on Lake Texoma and enjoying the experience of general aviation.

John Madsen

Aquatic Ecosystem Restoration Foundation

John D. Madsen, PhD Dr. John D. Madsen is a consulting scientist. He retired from federal service in December 2022 from his position as a Research Biologist with the US Department of Agriculture, Agricultural Research Service, Invasive Species and Pollinator Health Research Unit on the campus of University of California-Davis. Previously, he was a faculty member at Mississippi State University for eleven years, and a Research Biologist with the US Army Engineer Research and Development Center. Dr. Madsen has been researching the biology, ecology and management of aquatic weeds and their impact on native aquatic plants for over 30 years. Dr. Madsen is currently an associate editor for Journal of Aquatic Plant Management and is a past Editor as well as a former Director and Past-President of the Aquatic Plant Management Society. Dr. Madsen has a Bachelor of Science degree from Wheaton College, Wheaton, IL, and Master of Science and Doctor of Philosophy degrees in Botany from the University of Wisconsin-Madison.

Lucy Marshall, PhD

BioSorb Inc.

Dr. Marshall received her undergraduate at Rollins College and her Ph.D. in biochemistry from Rice University. After postdoctoral work, she joined Monsanto where she became Research Group Leader in formulations. Her expertise is in pharmaceutical and agricultural product development, primarily in membrane transport and delivery to tissues. Dr. Marshall founded Biosorb Inc. and patented Biosorb® technologies using natural products to reduce the chemical load on the environment. Today's presentation emphasizes "ultra-low volumes" to manage weeds in waterways. www.Biosorb-Inc.com.

Monica McGarrity

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 17 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 aquatic invasive species prevention and outreach, detection, ecology, management, and research. Monica represents TPWD on several interagency working groups and committees at state, regional, and national scales.

****Tighearnan Juarez Murphy***

Texas State University

Tighearnan is pursuing his PhD in Geography at Texas State University. He earned his bachelor's degree in Physical Geography and Master's degree in Geography from Texas State University in 2017 and 2022. His current research includes the influence of invasive saltcedar on the riparian geomorphology of the upper Brazos River. His interests include fluvial processes, biogeography, geomorphology, and remote sensing.

Cory Richmond

Kasco Marine

Cory Richmond has been in the aquatics industry for about 10 years: 2 years with the Ohio EPA studying fish biodiversity, 7 years with AQUA DOC Lake and Pond Management as a technician, salesman then manager, and 1.5 years with Kasco as the Midwest Territory Sales Manager. He graduated from Ohio State University with a Bachelor's degree in Natural Resource Management. Cory has lived in Ohio his whole life and enjoys live music, fishing, boating, traveling and spending time with family and friends.

Wells Shartle

Tarrant Regional Water District

T. Wells Shartle is an Environmental Tech II for Tarrant Regional Water District. He has 10+ years of experience managing vegetation and monitoring water quality in the George Shannon Wetland for Water Reuse at 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.

Levi Sparks

Bandera County River Authority and Groundwater District

Levi Sparks grew up on a family farm and ranch in West Texas near Abilene and proceeded to earn a BS in Wildlife Biology, a minor in Mass Communications with a specialization of Public Relations, and a MS in Biology with a focus on Fisheries Ecology. After graduation, he became an Aquatic Ecologist for the Bandera County River Authority & Groundwater District which encompasses the headwaters of the Medina River and the Sabinal River and a Certified Lake Manager certified with the North American Lake Management Society. In his tenure there, he has developed and overseen all the invasive species programs involved with the District and in that context, was one of the first members of the Healthy Creeks Initiative, a program designed by Texas Parks and Wildlife for controlling invasive plant species in the Hill Country of Texas. He is also involved in the District's water quality monitoring programs and heavily involved in the groundwater teams.

Kristina Tolman

Edwards Aquifer Authority

Kristina Tolman has worked as Habitat Conservation Plan Coordinator at Edwards Aquifer Authority (EAA) since 2016. Prior to EAA, she worked as a GIS Analyst at the Meadows Center for Water and the Environment at Texas State University. She received her bachelor's degree in Geography and her Masters of Applied Geography for Environmental Resource Studies at Texas State University. Her thesis was a comprehensive habitat suitability analysis of the endangered plant, Texas wild-rice, in the San Marcos River. In her free-time she enjoys gardening and kayaking rivers in Central Texas.

***Katie Vasquez**

University of North Texas

Katie Vasquez is currently a research biologist working at the Lewisville Aquatic Ecosystem Research Facility (LAERF) on the Aquatic Plant Ecology Team in the Environmental Laboratories Branch (EL) of the USACE- Engineering Research Development Center (ERDC). She assists with research on invasion and restoration ecology of freshwater macrophytes with an emphasis on restoration and development strategies for invasive aquatic plant management and native aquatic and riparian plant restoration. Katie is also a graduate student at the University of North Texas, where her master's research involves analyzing macroinvertebrate community dynamics found within restored native macrophytes in two freshwater reservoirs post *Hydrilla* invasion in Austin, TX.

Casey Williams

Bio-West Inc.

A graduate of Texas State University, Casey Williams has been an aquatic plant ecologist with BIO-WEST Inc. since 2013. He lives in San Marcos, Texas.