44TH ANNUAL MEETING of the MIDWEST AQUATIC PLANT MANAGEMENT SOCIETY

Evolution

FEBRUARY 26-28

2024

HYATT REGENCY

Columbus, Ohio

PROGRAM + ABSTRACTS

THE MIDWEST AQUATIC PLANT MANAGEMENT SOCIETY

OUR VISION

To be the leading regional resource for the sound management of aquatic plants and algae.

OUR MISSION

To promote the exchange of science-based technologies for the management of aquatic resources.

OUR CORE VALUES

Discovery and Innovation
Integrity
Professionalism
Stewardship
Outreach

OUR STRATEGIC GOALS

In five years, MAPMS intends to successfully:

- Expand engagement in MAPMS through improved communication and outreach to key partners.
- Increase member diversity, development, and engagement.
- Broaden the areas of expertise represented in the annual conference and overall society
- Foster relationships with state and regional universities to promote research and student development.

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CONTENTS

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AND HELP US WITH OUR OUTREACH EFFORTS BY COMMENTING, LIKING, AND SHARING. THE MORE INTERACTION WE HAVE THE MORE PEOPLE WE REACH.

PAST PRESIDENTS + MEETING SITES

2023
GARRETT MCCLAIN
Grand Rapids, Michigan

2022
MATTHEW JOHNSON
Lake Geneva, Wisconsin

2021
RYAN THUM
Virtual

2020
JAKE BRITTON
Indianapolis, Indiana

2019
NATHAN LONG
Chicago, Illinois

2018
PAUL HAUSLER
Cleveland, Ohio

2017
DICK PINAGEL
Milwaukee, Wisconsin

2016
JACOB MEGANCK
Grand Rapids, Michigan

2015
JOHN GOIDOSIK
Indianapolis, Indiana

2014
TYLER KOSCHNICK
Lombard, Illinois

2013
MATTHEW JOHNSON
Cleveland, Ohio

2012
DICK PINAGEL
Milwaukee, Wisconsin

2011
JIM KANNENBERG
Grand Rapids, Michigan

2010
DAVID ISAACS
Indianapolis, Indiana

2009
JASON BROEKSTRA
Lisle, Illinois

2008
JOE BONDRA
Sandusky, Ohio

2007
KEVIN DAHM
Milwaukee, Wisconsin

2006
ROBERT JOHNSON
Grand Rapids, Michigan

2005
BILL RATAJCZYK
Indianapolis, Indiana

2004
DAVID ISAACS
Lisle, Illinois

2003
BILL KIRKPATRICK, JR.
Columbus, Ohio

2002
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Milwaukee, Wisconsin

2001
EDWARD BRAUN
Grand Rapids, Michigan

2000
BILL RATAJCZYK
Indianapolis, Indiana

1999
ROBERT JOHNSON
St. Charles, Illinois

1998
JOE BONDRA
Huron, Ohio

1997
SHANE ORR
Madison, Wisconsin

1996
STEVE METZER
Battle Creek, Michigan

1995
SCOTT JORGENSON
Indianapolis, Indiana

1994
GREG CHEEK
St. Charles, Illinois

1993
EVERETT LIENHART
Huron, Ohio

1992
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Milwaukee, Wisconsin

1991
G. DOUGLAS PULLMAN
East Lansing, Michigan

1990
HOWARD KROSCH
Indianapolis, Indiana

1989
RICHARD HINTERMAN
South Bend, Indiana

1988
JAMES SCHMIDT
Columbus, Ohio

1987
CAROLE LEMBI
Grand Rapids, Michigan

1986
DAVID EISENTROUT
Fontana, Wisconsin

1985
NICK GOWE
Ft. Wayne, Indiana

1984
RICHARD HINTERMAN
Indianapolis, Indiana

1983
ROBERT JOHNSON
Ft. Wayne, Indiana

1982
RICHARD SOPER
Midland, Michigan

1981
ROBERT JOHNSON
West Lafayette, Indiana

1980
ROBERT JOHNSON
West Lafayette, Indiana

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An honorary member is someone who has contributed significantly to the field of aquatic vegetation management. They must be a voting member of MAPMS for no less than five years. An honorary member has actively promoted the Society and its affairs during their membership and have been elected by unanimous vote of the Board of Directors. Honorary Members shall hold all rights of Active Members in perpetuity.

NICK GOWE

BOB LANGJAHR

JOE BONDRA

DAVID ISAACS

JIM SCHMIDT

DR. GREG CHEEK

DR. CAROLE LEMBI

RICHARD HINTERMAN

ROBERT JOHNSON

GARY JOHNSON

BILLIE WILSON

EVERETT LIENHART

ED BRAUN

HOWARD KROSCH

CHARLES GILBERT

ROBERT HILTIBRAN

JOE BONDRA
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Respectfully renamed in 2023 to honor the legacy of two-time Past President, and the first recipient of this award, Joe Bondra.

Awarded at the President's discretion. Successful completion of a project taking considerable effort and time resulting in advancement of plant management science, educational outreach and performance above and beyond the call of duty as an officer, chair or special representative of MAPMS; or member or non-member achievement in the science of aquatic plant management and/or participation in MAPMS leading to the advancement of its members, goals, and objectives. Award may be used for an individual, agency, corporation, institution, or other organization in recognition of service.

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2019
DR. MICHAEL D. NETHERLAND

2017
LEAH RUST-ESSEX

2014
DAVID ISAACS

2012
JOE BONDRA

ROBERT L. JOHNSON
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Grants are competitively awarded to qualified graduate students pursuing a degree in aquatic plant management or related field at any accredited university or college, or independent research which contributes to the mission of the Society. MAPMS considers all applications pertaining to research on aquatic plant and algae management, including ecology or biology, and chemical, mechanical, or biological control of aquatic vegetation. Winners are announced at the awards banquet each year. Recipients are required to present their research findings at the annual conference the following year.

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The Ohio State University

2022
SYDNEY VANFROST
University of Wisconsin

2020
HANNAH HOFF
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2020
NATALIE MOSES
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2019
JEFF PASHNICK
Montana State University

2019
JENS BEETS
North Carolina State University

2018
GREGORY CHORAK
Montana State University

2018
DALTON SINK
University of Michigan

2017
RYAN VAN GOETHEM
Michigan Technological University

2016
JEFF PASHNICK
Montana State University

2016
CIERA KINLEY
Clemson University

2015
KYLA IWINSKI
Clemson University

2015
ALYSSA CALOMENI
Clemson University

2014
BRADLEY SARTAIN
Mississippi State University

2013
JUSTIN NAWROCKI
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2024 CONFERENCE AGENDA AT-A-GLANCE

MONDAY, FEBRUARY 26, 2024

1:00 PM - 5:00 PM	MAPMS PRE-CONFERENCE BOARD MEETING (MADISON)
1:00 PM - 5:00 PM	EXHIBITOR SETUP (DELAWARE)
3:00 PM - 5:30 PM	CONFERENCE REGISTRATION (DELAWARE FOYER)
5:30 PM - 6:30 PM	STUDENT + NEW MEMBER MIXER WITH EXHIBITORS (DELAWARE)
6:30 PM - 10:00 PM	PRESIDENT'S RECEPTION (DELAWARE) *President Kay invites you to a Casino Night themed reception with a Plant ID workshop, heavy hors d'oeuvres, cash bar, and professionally led games.*

TUESDAY, FEBRUARY 27, 2024

6:00 AM - 7:00 AM	EXHIBITOR SETUP (DELAWARE)
7:00 AM - 8:30 AM	CONTINENTAL BREAKFAST (DELAWARE)
7:00 AM - 5:00 PM	EXHIBITS OPEN (DELAWARE)
7:30 AM - 4:00 PM	CONFERENCE REGISTRATION (DELAWARE FOYER)
8:30 AM - 9:30 AM	OPENING SESSION + KEYNOTE SPEAKER ELI KERSCH (UNION)
9:30 AM - 9:45 AM	REFRESHMENT BREAK + EXHIBITS (DELAWARE)
9:45 AM - 11:45 AM	SESSION A: AQUATIC VEGETATION MANAGEMENT, RESEARCH AND OUTCOMES I (UNION)
11:45 AM - 1:45 PM	LUNCH ON YOUR OWN
11:45 AM - 1:00 PM	PAST PRESIDENTS' LUNCHEON (KNOX)
1:45 PM - 2:45 PM	SESSION B: AQUATIC VEGETATION RESEARCH, MANAGEMENT, AND OUTCOMES II (UNION)
2:45 PM - 3:00 PM	REFRESHMENT BREAK + EXHIBITS (DELAWARE)
3:00 PM - 4:00 PM	SESSION C: REGULATORY UPDATES AND ENGAGING THE PUBLIC (UNION)
4:00 PM	ADJOURN

WEDNESDAY, FEBRUARY 28, 2024

7:00 AM - 8:10 AM	CONTINENTAL BREAKFAST (DELAWARE)
7:00 AM - 5:00 PM	EXHIBITS OPEN (DELAWARE)
7:30 AM - 12:00 PM	CONFERENCE REGISTRATION (DELAWARE FOYER)
8:10 AM - 9:40 AM	SESSION D: SURVEYS, MONITORING, AND MANAGEMENT PLANNING (UNION)
9:40 AM - 10:00 AM	REFRESHMENT BREAK + EXHIBITS (DELAWARE)
10:00 AM - 11:40 AM	SESSION E: WATER QUALITY AND RESTORATION (UNION)
11:40 AM - 1:20 PM	LUNCH ON YOUR OWN
12:00 PM - 1:20 PM	STUDENT + GOVERNMENT AFFAIRS LUNCHEON (MARION)
1:20 PM - 2:40 PM	SESSION F: CYANOBACTERIA AND HABS (UNION)
2:40 PM - 3:00 PM	REFRESHMENT BREAK + EXHIBITS (DELAWARE)
3:00 PM - 4:00 PM	SESSION G: INDUSTRY UPDATES AND MANAGEMENT LESSONS (UNION)
4:00 PM - 5:00 PM	MAPMS MEMBERSHIP MEETING - **ALL MEMBERS REQUESTED TO ATTEND** (UNION)
6:30 PM - 10:00 PM	RECEPTION + 44TH ANNUAL MAPMS AWARDS BANQUET (UNION)

The opinions expressed by presenters, speakers, discussion panelists, committee members, and exhibitors are those of said individuals and are not necessarily those of The Midwest Aquatic Plant Management Society, its Board of Directors, or sponsors.

TUESDAY FEBRUARY 26, 2024

OPENING SESSION

LOCATION: Union
TIME: 8:30 AM - 9:30 AM Eastern Time
MODERATOR: Amy Kay, President MAPMS

8:30 AM Welcome and Opening Announcements. Amy Kay, President MAPMS

8:40 AM KEYNOTE ADDRESS: Rethinking Nature and how we got here. Eli Kersch; LakeTech, Inc. (California)

9:30 AM – 9:45 AM REFRESHMENT BREAK + EXHIBITS: Delaware

SESSION A: AQUATIC VEGETATION MANAGEMENT, RESEARCH AND OUTCOMES I

LOCATION: Union
TIME: 9:45 AM - 11:45 AM Eastern Time
MODERATOR: Brian Isaacs, Director MAPMS

9:45 AM Water Quality and Aquatic Herbicide Applications. Leif N Willey, Aquatic Control, Inc., Seymour, IN

10:05 AM Challenging treatment areas and strategies to drastically improve herbicide efficacy. Justin Nawrocki, UPL, Holly Springs, NC

10:25 AM A look at Indian Lake: A case study of how a reservoir stable state change resulted in an extreme invasion of Eurasian watermilfoil and the need for intensive management. Edward J Kwietniewski, AQUA DOC Lake and Pond Management, Chardon, OH

10:45 AM Evaluating a Novel Copper Formulation for Macroalga Control. Keegan Lund SePRO Corporation, Carmel, IN

11:05 AM Evaluating two use types of Penoxsulam in Minnesota. April R Londo, Minnesota Department of Natural Resources (Presenter), Mark Ranweiler, Minnesota Department of Natural Resources, Justin Valenty, Three Rivers Park District,James Johnson, Freshwater Scientific Services, LLC

11:25 AM Evaluation of Small-Scale Subsurface Penoxsulam Treatments on Waterhyacinth and Waterlettuce. Hannah J Brown, University of Florida Center for Aquatic and Invasive Plants. Benjamin P Sperry, US Army Corps of Engineers, Candice M Prince, University of Florida

11:45 AM – 1:45 LUNCH BREAK

SESSION B: AQUATIC VEGETATION RESEARCH, MANAGEMENT, AND OUTCOMES II

LOCATION: Union
TIME: 1:45 PM - 2:45 PM Eastern Time
MODERATOR: Cory Richmond, Director MAPMS

1:45 PM Helicopter Application with Organic Sticker on Aquatic Weeds. Lucia F Marshall PhD, Biosorb Inc

2:05 PM Aquatic Use Cases for PrecisionVision UAS Aerial Application Technologies, Kelley A Wittenberg, Leading Edge Aerial Technologies

2:25 PM Wixom & Sanford Lakes: A Re-Birth in Progress. Utilizing Technology and Research to Achieve Target Goals. Paul J. Hausler; Progressive AE, Grand Rapids, MI

2:45 PM – 3:00 PM REFRESHMENT BREAK + EXHIBITS: Delaware

SESSION C: INDUSTRY UPDATE AND MANAGEMENT LESSONS

LOCATION: Union
TIME: 3:00 PM - 4:00 PM Eastern Time
MODERATOR: Jason Euchner, Director MAPMS

3:00 PM AERF Update. Carlton Layne; Aquatic Ecosystem Restoration Foundation, Marietta, GA

3:15 PM APMS Update. Justin Nawrocki, UPL, Holly Springs, NC

3:30 PM RISE Update: Trending Legislative and Regulatory Issues in the Aquatics Industry. Megan Striegel, RISE (Responsible Industry for a Sound Environment), Arlington, VA

3:50 PM IAAP Update. Ed Spanopoulos, Indiana

4:00 PM Adjourn

WEDNESDAY FEBRUARY 28, 2024

SESSION D: SURVEYS, MONITORING AND MANAGEMENT PLANNING

LOCATION: Union
TIME: 8:10 AM - 9:40 AM Eastern Time
MODERATOR: Emily Henrigillis, Director MAPMS

8:10 AM Announcements

8:20 AM STUDENT PRESENTATION A practical guide for genetic surveying and monitoring for Eurasian watermilfoil management and initial insights on rapid herbicide assay development. Ashley L Wolfe, Montana State University (Presenter) Ryan Thum, Montana State University Raymond M Newman, Fisheries, Wildlife, and Conservation Biology, University of Minnesota Alex Bajcz, Minnesota Aquatic Invasive Species Center

8:40 AM Iowa Vegetation Management Update. Amanda M Mackey, Iowa Department of Natural Resources/ University of Nebraska Kearney

9:00 AM Hydrilla in Ohio. Mark J Warman, Cleveland Metroparks, Cleveland, OH

9:20 AM Responding to Michigan's First Hydrilla Detection. Billy Keiper, MI Dept of Enviroment, Great Lakes, and Energy

9:40 AM – 10:00 AM REFRESHMENT BREAK + EXHIBITS: Delaware

SESSION E: WATER QUALITY AND RESTORATION

LOCATION: Union
TIME: 10:00AM - 11:40 PM Eastern Time
MODERATOR: Casey Thompson, Director MAPMS

10:00 AM Implementing New Technologies into your Lake Management Programs. Eli Kersch, LakeTech, Inc, California

10:20 AM Incorporating Phosphorus Mitigation in Lake Management Programs. Reid Morehouse, Jones Lake Management, Cincinnati, OH

10:40 AM Understanding and Managing Phosphorus Dynamics in Aquatic Ecosystems. West M Bishop, SePRO Corporation, Caramel, IN

11:00 AM Advances in Lake Oxygenation to Improve Water Quality and Prevent HABs, Patrick M Goodwin, Natural Lake Biosciences, Madison, WI

11:20 AM Surface Aeration in Shallow Pond Management: A Case Study, Cory Richmond, Kasco Marine, Prescott, WI

11:40 AM – 1:20 PM LUNCH BREAK

SESSION F: CYANOBACTERIA AND HABS

LOCATION: Union
TIME: 1:20 PM – 2:40 PM Eastern Time
MODERATOR: Reid Morehouse, Secretary MAPMS

1:20 PM Evaluation of Nanobubble Ozone Technology (NBOT) for Cyanobacterial Harmful Algal Bloom Control. Cory Richmond, Kasco Marine on behalf of Dr. Eugene Braig, Ohio State University Extension Heather Raymond, Ohio State University, College of Food Agirculture, and Environmental Sciences

1:40 PM In-Season and Overwintering Cyanbacteria Control Methods using Liquid and Granular PAA/Hydrogen Peroxide, Tom Warmuth, BioSafe Systems

2:00 PM Reducing the Probability of Nuisance Algal Blooms in a Hyper-eutrophic Lake with Heavy Cover of Eurasian Watermilfoil and Curly-leaf Pondweed, Jennifer L Jermalowicz-Jones, Restorative Lake Sciences, Spring Lake, MI

2:20 PM STUDENT PRESENTATION: Field-scale Application of Artificial Floating Island for Cyanotoxin Reduction from Residential Raw Sewage Zhaozhe Chen, The Ohio State University, Ozeas Costa, The Ohio State University, Jiyoung Lee, The Ohio State University, Molly Mills, The Ohio State University, Abigail Volk, The Ohio State University

2:40 PM – 3:00 PM REFRESHMENT BREAK + EXHIBITS: Delaware

SESSION G: WATER QUALITY RESTORATION AND INDUSTRY UPDATES

LOCATION: Union
TIME: 3:00 PM - 4:00 PM Eastern Time
MODERATOR: Michael Hiatt, Director MAPMS

3:00 PM STUDENT PRESENTATON Removal of Emerging Contaminants From Aqueous Environment by Using Biochar. Mohammad Khalid, University of North Carolina at Charlotte

3:20 PM Novel adsorption media (Poseidon Pellets™) that removes nutrients in flowing waters. Steve Chamberland, Water Warriors

3:40 PM A Historical Perspective: Changes and Lessons Learned in the Aquatics Industry. Robert L. Robinson, Kasco Marine, Prescott, WI

4:00 PM – 5:00 PM MAPMS MEMBERSHIP MEETING: Union

4:00 PM MAPMS Membership Meeting and Election of Officers. ALL MEMBERS REQUESTED TO ATTEND Amy Kay, President MAPMS

5:00 PM Temporarily Adjourn: Reconvene at the 44th Annual MAPMS Awards Banquet.

6:30 PM – 10:00 PM RECEPTION AND 44th ANNUAL MAPMS AWARDS BANQUET

6:30 PM Reception and Silent Auction (Union)

7:00 PM 44TH Annual MAPMS Awards Banquet (Union)

SILENT AUCTION, BOX RAFFLE, CASH BAR, BANQUET DINNER, STUDENT + SPECIAL AWARDS, AND INSTALLATION OF OFFICERS AND DIRECTORS

10:00 PM CONCLUSION OF THE 2024 MAPMS PROGRAM

PRESENTATION ABSTRACTS

Water Quality and Aquatic Herbicide Applications. Leif N Willey, Aquatic Control, Inc., Seymour, IN

Water makes up the bulk of the applications made to the aquatic environment, and thus the chemical characteristics of the water we use can have significant impacts to the efficacy and environmental safety of products we apply in the aquatic environment. Water hardness, alkalinity, pH, and turbidity all may impact not only the way we use and apply, but also our selection of the herbicides, algaecides and water quality enhancers we have available to use. As responsible stewards of the aquatic environment, it is important to recognize how each of these water quality characteristics interact with the various tools and technology we use to ensure the proper product is being used to achieve the desired outcome.

Challenging treatment areas and strategies to drastically improve herbicide efficacy. Justin Nawrocki, UPL, Holly Springs, NC

Aquatic sites are dynamic and even two treatment areas on the same water-body can have vastly different concentration exposure times (CET). As aquatic invasive species continue to spread they are finding their ways into difficult to treat areas, such as rivers or reservoirs. Environmental and anthropocentric factors can drastically affect retention time of applied herbicide in these dynamic systems. Applicator and customer unrealistic expectations of product abilities as well as budgetary restrictions are also factors that can affect efficacy. Strategies and product selection can be employed that may help mitigate some of the factors shortening the CET. We will discuss several completed projects in which product formulation, application timing, treatment site design and the use of water tracing dye were factors in successful treatments under challenging conditions.

A look at Indian Lake: A case study of how a reservoir stable state change resulted in an extreme invasion of Eurasian watermilfoil and the need for intensive management. Edward J Kwietniewski, AQUA DOC Lake and Pond Management, Chardon, OH

Indian Lake is a 5,163-acre recreational reservoir located in Logan County, Ohio. Managed by the Ohio Department of Natural Resources (ODNR), the system was traditionally known for its light-limiting turbidity which historically would restrict submersed plant growth. Due to a number of complex factors, light availability increased and extended the littoral zone of Indian Lake, subjecting the reservoir to expansive growth of Eurasian watermilfoil (Myriophyllum spicatum). The resulting growth warranted the need for a study of the macrophytic community in the reservoir as well as a holistic management plan. Completed throughout 2022, the results of studies on the macrophytic community showcased an estimated 75.4% of the reservoir being covered in macrophyte growth dominated by native coontail (Ceratophyllum demersum; 52% of represented macrophyte biomass) as well as invasive Eurasian watermilfoil (39%). During this time, trial applications of the selective herbicide Florpyrauxifen-benzyl were conducted to test its effectiveness on milfoil growth on two 200- acre zones of the lake dominated by the macrophyte. The use of Florpyrauxifen-benzyl was found to be highly effective in these test zones resulting in near complete control within both areas. This information was used to spearhead the treatment of 1,088 acres of Eurasian watermilfoil growth in 2023 with a high level of success.

Evaluating a Novel Copper Formulation for Macroalga Control. Keegan Lund SePRO Corporation, Carmel, IN

Starry stonewort (Nitellopsis obtusa) is a problematic invasive macroalga throughout the Midwest and Northeast US that is of growing concern. Since its initial finding in MN in 2015, it has now spread to 28 lakes and rivers in the state. However, with the number of water bodies vulnerable to its infestation, it is still in the early stages of invasion reinforcing the urgency in developing control and containment strategies.To date, chemical and mechanical control strategies have provided annual suppression, but rarely long-term reductions in the infested areas. In 2023, biologists evaluated a novel copper formulation in situ (chelated copper-ethylenediamine with microcrystals) and contrasted this treatment with a historic copper sulfate/endothall combination for starry stonewort control in Medicine Lake (MN). Both treatments drastically reduced biomass but there were notable differences in efficacy and longevity of control. This discussion will explore the development of a novel algaecide, how its microcrystalline form differentiates it from previously utilized algaecides, and the potential applications in macroalga and submersed macrophyte control.

Evaluating two use types of Penoxsulam in Minnesota. April R Londo, Minnesota Department of Natural Resources (Presenter), Mark Ranweiler, Minnesota Department of Natural Resources, Justin Valenty, Three Rivers Park District,James Johnson, Freshwater Scientific Services, LLC

In Minnesota, the invasive plant curly-leaf pondweed is ubiquitous and has been in the state over 100 years. Regardless of its prevalence in the state, this submersed invasive aquatic plant still poses significant problems from creating recreational nuisances to decreasing plant diversity. In addition, management of this plant has varying results primarily due to its unique life cycle and durable turions. Our goals as invasive aquatic plant managers are to minimize the harmful effects caused by invasive plants while protecting the natural resources and their use in the state. This goal is achieved by understanding new tools or implementing old tools in a new way for aquatic plant management and adapt our methods based on observations. Galleon (penoxsulam) was registered for aquatic use in 2007 but was trialed, for the first time, in 2022 by implementing two use type strategies across three lakes in Minnesota. Lake Irene (Douglas County), Josephine (Ramsey County) and Medicine Lake (Hennepin County) treated varying acreages for two consecutive years. Control of curly-leaf pondweed and subsequent native plant responses were evaluated.

Evaluation of Small-Scale Subsurface Penoxsulam Treatments on Waterhyacinth and Waterlettuce. Hannah J Brown, University of Florida Center for Aquatic and Invasive Plants. Benjamin P Sperry, US Army Corps of Engineers, Candice M Prince, University of Florida

Waterhyacinth [Eichhornia crassipes (Mart.) Solms] and waterlettuce [Pistia stratiotes L] are considered the most aggressive invasive floating plants in the southeast United States. Application techniques used to manage these macrophytes are primarily foliar based and have remained mostly unchanged for decades, save for the introduction of several new herbicide chemistries in the last 20 years. Recent research suggests that up to ¼ of foliar spray used to treat these plants is lost to the water column, highlighting that current techniques leave room for improvement. Therefore, there is a need to evaluate other management techniques for floating plants, such as subsurface herbicide applications. Here, we collected pilot data on small-scale static subsurface treatments for waterhyacinth and waterlettuce in a mesocosm study. Plants were grown in 18.9 L mesocosms filled with well-water amended with fertilizer. There were three plants per mesocosm, and four mesocosms per treatment. Plants were allowed to grow for two weeks before penoxsulam was applied at 0, 2, 5, 9, 19, 38, 75, and 150 ppb. Applications were made to the water using a syringe and were held static throughout the experiment. Phytotoxicity data was collected weekly, and biomass was collected at 8 weeks. Between species, waterhyacinth was more sensitive to subsurface penoxsulam treatments. This data provides a framework for researchers to effectively scale-up floating plant subsurface treatment experiments that may contribute to optimizing a new application technique for aquatic plant management.

Helicopter Application with Organic Sticker on Aquatic Weeds. Lucia F Marshall PhD, Biosorb Inc

Helicopter applications with natural-based organic sticker, Biosorb® TopFilm™, are 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 chemical volume, reducing the number of sprays. The results show good control of Salvinia beyond 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. The object is to do the chemistry on the weed and not on non-target species.
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 .

Aquatic Use Cases for PrecisionVision UAS Aerial Application Technologies, Kelley A Wittenberg, Leading Edge Aerial Technologies

This study investigates the efficacy of UAS aerial applications of imazapyr at three different rates and two concentrations in the elimination of torpedo grass. Applications were performed using the Leading Edge PV40X UAS at 5, 10, and 20 gallons per acre, at concentrations of 1 lb ai per acre and 0.5 lb ai per acre, with 24 total experimental plots. Satellite imagery taken two months post treatment shows lower NDVI values for all treatment combinations compared to untreated control. The data suggests that there is some level of efficacy to this treatment method, at both concentrations. Further study is recommended, and future trials at different times of year, with different levels of flooding in the area, are being discussed.

Wixom & Sanford Lakes: A Re-Birth in Progress. Utilizing Technology and Research to Achieve Target Goals. Paul J. Hausler; Progressive AE, Grand Rapids, MI

Catastrophic dam failures in May of 2020 resulted in the loss of Wixom and Sanford lakes and a resultant occupation of exposed bottomlands by opportunistic woody species. Local residents soon realized that the woody vegetation could cause detrimental navigational and habitat loss if left unchecked. in 2021, both the Wixom Lake Improvement Board and Sanford Lake Improvement Board developed and financed a program to address these issues and developed a strategic plan based on research and available technology. This presentation will summarize activities to date and the progress towards the ultimate goal of achieving optimum bottomland conditions prior to re-filling bottomlands in the spring of 2026.

RISE Update: Trending Legislative and Regulatory Issues in the Aquatics Industry. Megan Striegel, RISE (Responsible Industry for a Sound Environment), Arlington, VA

As aquatic plant management professionals, you are well versed in both best management practices and solutions to the issues you are managing from day to day. But are you aware of trending legislative and regulatory issues with the ability to impact the aquatics industry? Join RISE to hear about the latest both in Washington, D.C, and in statehouses across the country!

A practical guide for genetic surveying and monitoring for Eurasian watermilfoil management and initial insights on rapid herbicide assay development. Ashley L Wolfe, Montana State University (Presenter) Ryan Thum, Montana State University Raymond M Newman, Fisheries, Wildlife, and Conservation Biology, University of Minnesota Alex Bajcz, Minnesota Aquatic Invasive Species Center

Invasive watermilfoil strains can differ in their growth, spread, impacts and herbicide response. For example, strains of both Eurasian (Myriophyllum spicatum) and hybrid (M. spicatum x M. sibiricum) watermilfoil (collectively referred to as Eurasian watermilfoil) have been characterized as resistant or susceptible to specific herbicides (e.g. fluridone and 2,4-D). Identifying resistant and susceptible strains can inform managers as to whether a specific herbicide should be used to treat a lake. One practical challenge is that herbicide response data is missing for most watermilfoil strains, and characterizing every strain is not feasible. Integrating genetic surveying and monitoring could help prioritize strains for herbicide characterization. In this presentation, we provide practical guidelines for genetic sampling, identify key signatures to streamline strain prioritization, and provide an update on the development of rapid herbicide assays. To date, we have identified over 300 strains from over 400 lakes across the United States sent by state agencies, aquatic plant managers and citizen scientists. We have built a user-friendly application, Milfoil Mapper, to house strain distribution and herbicide response information, and to make them available to the public. In addition, we are developing small-scale herbicide assays to increase the number of characterized strains. We envision an operational workflow where the integrating of genetic survey and monitoring into Eurasian watermilfoil management plans helps identify priority strains for efficient herbicide characterization.

Iowa Vegetation Management Update. Amanda M Mackey, Iowa Department of Natural Resources/ University of Nebraska Kearney

The vegetation management program stationed out of Boone, Iowa has been in operation for 27 years. Approximately 120 presence/absence surveys are conducted each year on lakes across the state of Iowa. These surveys help identify species present in all lakes and help to guide management activities such as vegetation management with herbicides on invasive and nuisance species. In 2023, the program adopted the comprehensive style vegetation survey method to get better biovolume estimates of vegetation in the lakes and urban ponds and paired this with Biobase sonar imaging outputs to make more targeted management decisions. Highlights for the program include conducting under-the-ice surveys to detect, monitor, and treat Curly-leaf Pondweed before ice-out. And treating Brittle Naiad on a system with steep-and-deep contours.

Hydrilla in Ohio. Mark J Warman, Cleveland Metroparks, Cleveland, OH

Hydrila (Hydrilla verticillata) populations have been detected at large, public waterbodies in Ohio over the last five years. To date, the plants have been identified in at least 25 waterbodies across 19 counties. Cleveland Metroparks has conducted an early detection and rapid response project since 2017 and have surveyed over 500 waterbodies for Hydrilla and other aquatic invasive plants. The Project Coordinator will discuss distribution and abundance, treatment approaches, and the ways Hydrilla is shifting perceptions of water resource management in the Buckeye State.

Responding to Michigan's First Hydrilla Detection. Billy Keiper, MI Dept of Enviroment, Great Lakes, and Energy

In September 2023, Hydrilla (Hydrilla verticillata) was detected for the first time in Michigan. Staff from the Michigan Department of Environment, Great Lakes, and Energy (EGLE) will present on this recent finding. The goal of response efforts is to eradicate hydrilla from Michigan's waters. We will provide information on site history and progress to date including surveillance efforts and control actions used.

Implementing New Technologies into your Lake Management Programs. Eli Kersh, LakeTech, Inc, California

This presentation will provide real-world examples of how real-time water quality monitoring equipment is being leveraged for the management of numerous lakes in North America.

Incorporating Phosphorus Mitigation in Lake Management Programs. Reid Morehouse, Jones Lake Management, Cincinnati, OH

Nutrient mitigation, especially phosphorus, has been at the forefront of aquatic ecosystem management over the past 10 years. Gaining traction from the harmful algal blooms and human health and safety, nutrient mitigation is one of the newest tools brought into the management framework for a variety of entities. Here, we discuss the multitude or tools at our disposal and how to incorporate them into our daily management strategies. Everything from flowing waters to stagnant retention ponds will be discussed with some examples of from the field.

Understanding and Managing Phosphorus Dynamics in Aquatic Ecosystems. West M Bishop, SePRO Corporation, Caramel, IN

Phosphorus is a critical element in aquatic ecosystems for supporting life, though excessive amounts or imbalance can degrade ecosystem quality and functioning. Acquisition and cycling, from sediments to wildlife and aquatic plants (which can contain up to 1% phosphorus by dry weight) will be discussed in relation to cyanobacterial growth as well as numerous other interactive factors. The goal is to help lake managers make more informed decisions on management approaches that align with the holistic ecological system. Strategic, scientific-based solutions will be required to preserve prioritized uses of water resources, especially in a predicted increased cyanobacteria dominated environment. The talk will also cover some approaches to management of nutrients in different types of aquatic systems with diverse uses. Data supporting the achievement of the prioritized use objectives and effectiveness will be presented.

Advances in Lake Oxygenation to Improve Water Quality and Prevent HABs, Patrick M Goodwin, Natural Lake Biosciences, Madison, WI

Traditional aeration systems, which rely on water mixing and bubbles to add oxygen to water, often fail to meet and sustain desired dissolved oxygen levels (DO), reduce ammonia, and prevent fish kills. Mixing from aeration systems increases bulk water temperature, leading to thermal stress on fish and reduced feeding rates. Mixing can also increase lake turbidity via sediment re-suspension and, during warmer months, will often exacerbate water quality by bringing nutrient-rich water upwards to the surface. Major advances have been made over the past three years to address the limitations of traditional aeration systems described above. Oxygen Saturation Technology ™ (OST) is the first commercial oxygenation system that delivers oxygen to target waters with zero bubbles, no mixing, and no sediment re-suspension while maintaining the natural aquatic ecosystem (preserving thermal stratification). OST ™ allows for pre-programable DO levels to be maintained continuously 24-7 365 days a year.

Surface Aeration in Shallow Pond Management: A Case Study, Cory Richmond, Kasco Marine, Prescott, WI

The lake and pond management industry standard has long been to aerate shallow ponds with surface aeration and aerate deep basins with bottom diffused aeration. This presentation will explore types of surface aeration, zone of influence of surface aerators, optimal applications for surface aerators over bottom diffused aeration, and a case study highlighting the relationship between surface aeration and fluctuations in dissolved oxygen in a shallow pond.

Evaluation of Nanobubble Ozone Technology (NBOT) for Cyanobacterial Harmful Algal Bloom Control. Braig C Eugene, Ohio State University Extension Heather Raymond, Ohio State University, College of Food Agirculture, and Environmental Sciences

Effective Cyanobacterial Harmful Algal Bloom (CHAB) control strategies are needed to address recreational and drinking water effects. Nanobubble ozone technology (NBOT) is an emerging treatment, but CHAB efficacy studies are limited. Lab and mesocosm NBOT experiments and full-scale field NBOT treatment trials were conducted June 2021 through October 2023. Lab studies evaluated nanobubble size distribution, density, lifetime, aqueous ozone and hydroxyl radical production, and effect of organic matter on dose response. Mesocosm studies compared efficacy of NBOT to traditional algaecide treatments and evaluated effects on non-target organisms. Conventional algaecides had severe detrimental effects on zooplankton while the low-dose NBOT treatment had a positive effect (increased zooplankton abundance), and the high-dose NBOT treatment had only minor negative effects. NBOT treatment reduced CHABs at all doses. Multi-month NBOT trials were conducted at Lake Sylvan and Grand Lake Saint Marys' West Beach. Lake Sylvan trials showed promise, but interpretation of results is complicated by the nature of that year's growing season. Cyanobacteria and toxin concentrations were higher during the Grand Lake Saint Marys beach NBOT trials and treatment effects were localized. Recreational advisories at the treatment beach were reduced compared to neighboring beaches in the first year, but subsequent shorter duration trials on a higher biomass bloom did not appear to be effective. Work continues to determine effective NBOT dose response to inform operational guidance.

In-Season and Overwintering Cyanbacteria Control Methods using Liquid and Granular PAA/Hydrogen Peroxide, Tom Warmuth, BioSafe Systems

Peroxide based algaecides have been shown to be effective in mitigation and control of cyanobacteria in various methods of application. Lab scale trails of liquid Peroxyacetic acid (PAA)/hydrogen peroxide and solid SCP (sodium carbonate peroxyhydrate) on cyanobacteria give direction on developing effective dosing in field applications for cyanobacterial harmful algal blooms (cHAB) in-season as well as early season/overwintering benthic populations from which planktonic blooms develop later in the spring and summer. More recently, extensive research through private and federal (ACOE) researchers have shown that overwintering treatments appear to be potentially effective options to minimize the impacts, severity, or frequency of cyanobacterial blooms.

Reducing the Probability of Nuisance Algal Blooms in a Hyper-eutrophic Lake with Heavy Cover of Eurasian Watermilfoil and Curly-leaf Pondweed, Jennifer L Jermalowicz-Jones, Restorative Lake Sciences, Spring Lake, MI

Indian Lake is located in Logan County and is a man-made impoundment that is 5,104 acres in surface area with a mean depth of 4.5 feet and a maximum depth of 16.0 feet. The lake drains into the Great Miami River. The lake has a shoreline length of 41.2 miles without the islands and 67.9 miles including the islands and possesses numerous islands and canals. The water volume previously determined by the Ohio EPA in 1973, was approximately 46,000 acre-feet (US EPA National Eutrophication Survey, 1973). In the past 48 years, the water volume of Indian Lake has significantly declined likely due to excessive siltation from immediate watershed inputs. In 2022, the lake community developed a lake management plan for restoring the lake to reduce these inputs, along with nutrients, cyanobacteria, and excessive invasive Eurasian Watermilfoil and Curly-leaf Pondweed. There are 447 publicly owned lakes in the State of Ohio (Ohio DNR, 1980). Furthermore, all state waters are protected as potential public water supplies. For this reason, protection of Indian Lake water quality is critical relative to toxic cyanobacteria reduction. In 2023, approximately 1,122 acres of milfoil were treated with a systemic herbicide, and 1,821 acres of Curly-leaf Pondweed were mechanically harvested. Selective mechanical removal of dense Coontail was also carefully executed to prevent removal of too much cover that would exacerbate blue-green algal blooms. Although chlorophyll-a increased, the blue-green algal blooms were limited due to adequate cover of remaining native submersed aquatic vegetation.

Field-scale Application of Artificial Floating Island for Cyanotoxin Reduction from Residential Raw Sewage Zhaozhe Chen, The Ohio State University, Ozeas Costa, The Ohio State University, Jiyoung Lee, The Ohio State University, Molly Mills, The Ohio State University, Abigail Volk, The Ohio State University

Microcystin (MC) stands as the most prevalent cyanotoxin associated with freshwater harmful algal blooms (HABs), posing substantial health risks to both humans and aquatic ecosystems. Artificial floating islands (AFIs) present a promising solution to MC reduction. In this study, we implemented AFIs with two native aquatic plants, Carex comosa (bristly sedge) and Eleocharis obtusa (blunt spike-rush), in the equalization basin of a wastewater treatment plant to treat residential raw sewage preliminarily. Over three months in late summer and fall, we monitored MC concentrations, physico-chemical parameters, nutrient levels, and plant biomass. Results indicated that the AFI system reached the highest of 77.9% reduction in MC levels during the active plant growth period. Precipitation emerged as a critical factor affecting MC reduction in natural settings. Plant assimilation was identified as the primary contributor to MC reduction under natural conditions, given the low susceptibility to temperature changes. While temperature and nutrient levels did not directly influence MC reduction rates, they impacted plant growth, thereby indirectly affecting AFI performance. Notably, C. comosa exhibited higher potential for MC reduction than E. obtusa, attributed to its rapid growth and greater biomass yields. This study is the first exploration of field-scale AFI applications targeting MC as the primary pollutant, emphasizing the viability of field-scale AFIs as a sustainable and effective strategy for MC reduction.

Removal of Emerging Contaminants From Aqueous Environment by Using Biochar. Mohammad Khalid, University of North Carolina at Charlotte

Highways are considered a major source of pollution to stormwater and its runoff can introduce various contaminants including nutrients, Indicator bacteria, and heavy metals which can have negative impacts on receiving waters. Also, the roadside soil gets compacted over time and can't infiltrate the stormwater through it. The situation becomes worse if it is clay soil resulting in increased runoff. This study assessed the ability of biochar, a carbon-rich byproduct generated from the pyrolysis of biomass, the removal of contaminants and to improve the water-holding as well as infiltration capacity of soil biochar mixture. For this, commercially available biochar was strategically selected. Lab scale batch testing was done to find the preliminary estimate of contaminants removal along with saturated hydraulic conductivity, and water retention capacity. Furthermore, from the preliminary results, the bench scale filtration columns were designed to evaluate the performance of biochar in the long term. Based on specific infiltration capacity soil biochar column packing was done. The testing has been conducted for nutrient, heavy metal, and indicator bacteria analysis over a year, which includes different weathering conditions. The results from saturated hydraulic conductivity show that biochar was able greatly improve the infiltration capacity which is attributed to the high porosity of the biochar soil mixture. The data from the column testing shows that biochar has the ability to significantly remove different contaminants. Overall, this study demonstrates that biochar could be efficiently applied with clay soil to improve the soil's hydraulic characteristics as well as to remove the pollutants from stormwater runoff.

A Historical Perspective: Changes and Lessons Learned in the Aquatics Industry. Robert L. Robinson, Kasco Marine, Prescott, WI

I hope to share how the industry has changed in terms of size, number of tradeshows, marketing, expectations for the future, technology, consolidation, people, and water management choices and approaches. I believe people management is probably THE most important part and it includes employees, regulatory agencies, competitors, customers, and consumers. The goal is to share what I have learned from a historical perspective and hopefully pass on at least a few tidbits of information that people find useful.

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2023 MAPMS BUSINESS MEETING MINUTES

2023 MAPMS Annual Business Meeting
Amway Grand Plaza Hotel (Grand Rapids, MI)
3:20 PM on March 15, 2023
Ambassador West

Call to Order – McClain
Roll Call – Filpansick

Present Garrett McClain (President)	Present Matthew Johnson (Past-President)
Present Amy Kay (President-Elect)	Present Landon Wiet (Vice-President)
Present Steve Zulinski (Treasurer)	Present Leif Willey (Editor)
Present Pete Filpansick (Secretary)	Present Emily Henrigillis (Director)
Present Jason Euchner (Director)	Present John Goidosik (Director)
Present Ed Spanopoulos (Director)	Present Casey Thompson (Director)
Present Reid Morehouse (Director)	Present Sydney Van Frost (Student Representative)

Approve the Agenda: Motion: Thompson Second: Kay Unanimous

Review the 2022 Annual Business Meeting Minutes: McClain: included in the program.
Motion: Spanopoulos Second: Johnson Unanimous.

President's Report: McClain: Good meeting so far, thanked Amy for the program, thanked members for participation.

Secretary's Report: Filpansick: No report.

Treasurer's Report: Zulinski: Presented society financials.
- $10,251 profit from last year's conference due to record attendance. This year was similar numbers.
- Current balance of $132,484 without paying for this conference.
- RLJ generated $15 in last year after paying the grant.
- Balance is $28K thanks to $10K from Richard Hinterman after 501c3. We are going to continue to pursue new opportunities to build up this fund, striving to make it self sustaining.

Motion to accept officer's reports: Motion: Kay Second: Willey Unanimous.

Standing Committee Reports

Nominating: Johnson: Excellent group of nominations for the board. Encourage anyone who is interested in participating to join a committee, talk to the board members.
- Nominations are: VP Filpansick, Treasurer Zulinski, Directors: Foreman, Hiatt, Isaacs, McCloud, Richmond.

Motion to approve ballot Thompson, Second: Kay, Unanimous.

All candidates gave brief introductions of themselves. Ballots were distributed, votes cast, and ballots collected.

Past Presidents Advisory: Johnson: No report.

Membership: Spanopoulos: Great attendance. Pleased with student/new member mixer.

By-Laws: Spanopoulos: No report.

Editorial: Willey:

- Aware of mobile issues with website.
- Post conference survey will be going out soon, please respond.
- Directory updating soon, new password will be in the spring newsletter.
- Post conference newsletter in April.
- We are looking for photos for the website, please consider sending to editor.

Finance: Zulinski: MAPMS Longevitiy Fund down 14.6%. RLJ Longevity fund was up $11 from a CD. Moving into a new investment vehicle with maximum security.

Internal Audit: McClain: Everything is in line.

Governmental Affairs: Morehouse: Great luncheon today. Most attendees agree with our strategic plan.

Local Arrangements: Goidosik: Thank Bill Torres for all the work he does for us. Banquet will be in this same room at 630PM. Credit card & room charge only bar, no cash. Continue to purchase raffle tickets and silent auction. Please consider attending the RISE session tomorrow morning.

Exhibits: Goidosik: 30 exhibitors, including two non-profits. Higher number than in years past. Thank you to all exhibitors for their contribution and support.

Publicity: Henrigillis: Please follow us on social media, we are growing our online presence. Updating AIS handouts, will be delivered soon and we can get them from Cygnet or Aquatic Control or the MAPMS Board.

Student Affairs: Heath: RLJ $10K increased outreach this year. Decision is made and will be revealed at the banquet. Thank you to Sydney Van Frost for serving as student representative, recruiting on a new student for the upcoming year. Increased student participation this year. Paper awards will be presented tonight.

Special Committee Reports

2024 Time & Place: Kay: Hyatt Regency Downtown Columbus, OH. Trying somewhere new.

2025 Time & Place: Wiet: Palmer House Chicago, IL.

Silent Auction & Raffle: Thompson: “Buy raffle tickets. Buy raffle tickets. Buy raffle tickets.”

Sponsorship: Johnson: Great thank you to all the sponsors, totaling over $30K this year. Highlighted diamond level sponsors (AC, Cygnet, SePRO, Sygnenta, UPL Environmental Solutions). Platinum level sponsors by name. Gold sponsors by name. Silver level sponsors by name. Bronze level sponsors by name.

Strategic Planning: Filpansick:

Motion to approve the Committee Reports: Thomspon Seconded by: Kay Unanimous

Old Business
No old business to discuss.

New Business
No new business to discuss.

Temporary Adjournment until Banquet Motion: Morehouse Second by: Spanopoulos Unanimous at 3:59 PM.

Meeting called back to order by McClain 0:00 PM

President's Address
McClain recognized all Honorary Members, Past Presidents, and Sustaining Members in attendance.

Honorary Memberships
Spanopoulos presented honorary memberships to Nick Gowe and Bob Langjahr.

Board of Directors Election Results
McClain announced election winners

Vice President – Pete Filpansick
Treasurer – Steve Zulinski
Directors – Brian Isaacs, Michael Hiatt, Cory Richmond

McClain awarded outgoing board members plaques in recognition of their service. Treasurer Steve Zulinski, Director Ed Spanopoulos, Director John Goidosik.

Sponsors Recognition
Goidosik thanked all sponsors and presented plaques to the Diamond Level Sponsors: Aquatic Control, Inc., Cygnet Enterprises, Inc., SePRO Corporation, Syngenta, UPL Environmental Solutions.

Exhibitor Recognition
Goidosik thank all exhibitors for their support and announced the Exhibitor Excellence Award winner.

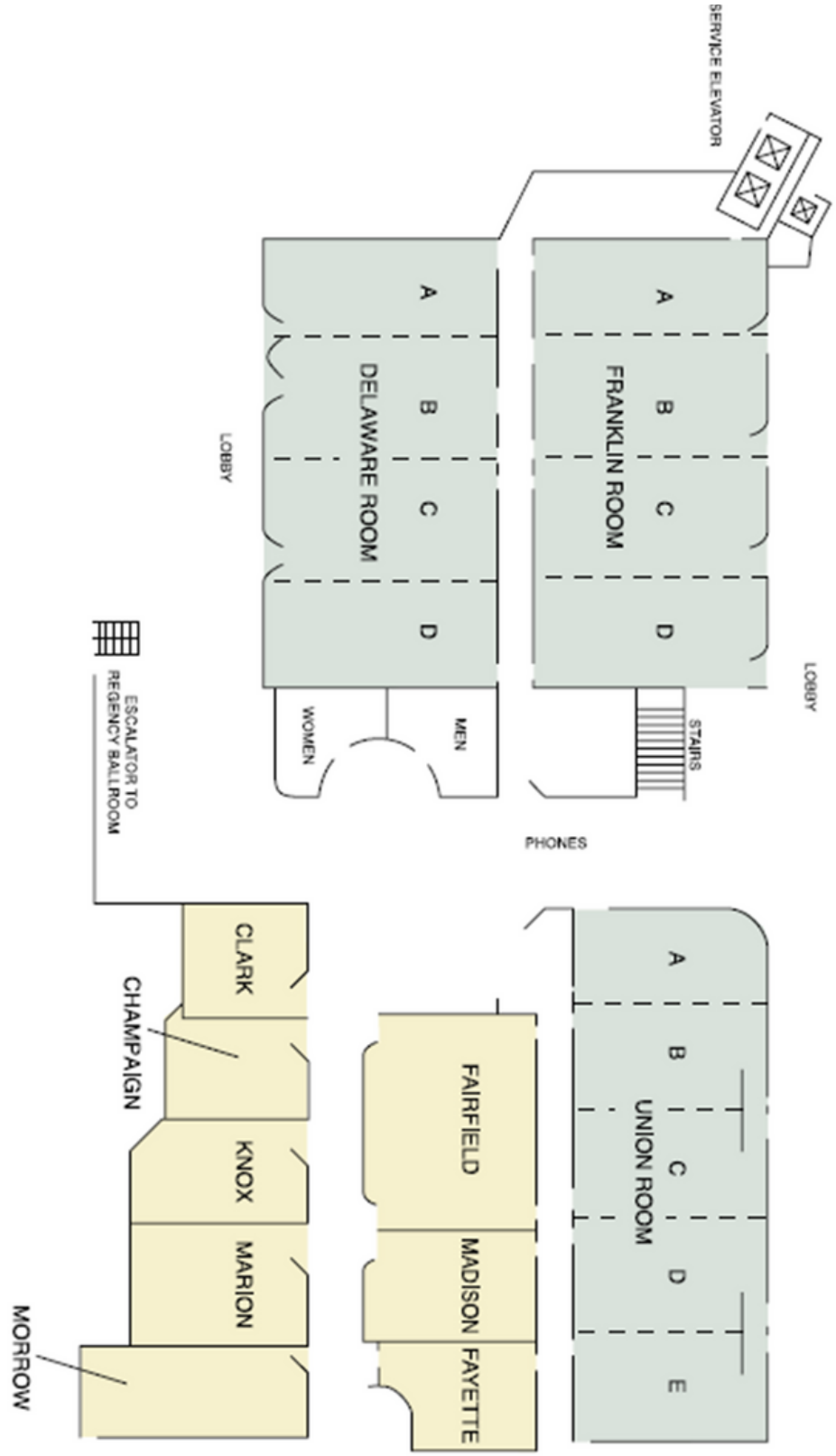
Student Awards
Heath announced the student winners.
RLJ Memorial Research Grant:

Oral Presentations

1st Place ($300)	2nd Place ($200)	3rd Place ($100)

President's Closing Remarks
McClain introduced and appointed incoming President, Amy Kay.
Kay thanked McClain and the BOD for their hard work and awarded the Presidential plaque to McClain.
Adjournment
Kay called for a motion to adjourn. Motion by: Seconded by:

HYATT REGENCY COLUMBUS
FLOOR PLAN



UPCOMING MAPMS ANNUAL CONFERENCES

2025

CHICAGO, ILLINOIS
February 24th-27th
Palmer House

2026

INDIANAPOLIS, INDIANA
February 9th-12th
Hyatt Regency

NOTES

2024

WWW.MAPMS.ORG