

DAY 1

Keynote Speaker, West Bishop, PhD, SePRO, *Cyanobacteria and the Future of Freshwater: Ours or Theirs*

Summary: We can have a beneficial impact on the quality of our water resources in the future. The trajectory at present is a concern, there is certainly more we can do. Our waters face severe challenges such as dynamic water use, intense weather events, carbon dioxide increases, ozone, salinity, invasive species, eutrophication, climate change and more. All of these factors can interact to promote cyanobacterial harmful algal blooms. One of the largest concerns with these organisms is their ability to produce some of the most potent natural compounds that can invoke severe harm to humans and wildlife. The present understanding, impending knowledge, and future prediction on these cyanobacteria is that there will be more toxins, exposure routes, interactive effects, and chronic diseases identified. Impacts from toxins cannot be abated just by closing affected systems. Allowing cyanobacteria to exist allows for a chronic toxin exposure, potential hot spot accumulations and can alter the system to promote continued blooms. Everyone is needed to effectually change the trajectory of our waters. This presentation will provide a new perspective of risks and discuss actions that can be taken to address HABS to ensure safety and usability of our water resources.

Speaker Bio: Dr. West Bishop is the *Algae Scientist and Water Quality Research Manager* at SePRO Corporation, a position he has held for over 10 years. Dr. Bishop has presented more than 100 professional presentations and published numerous articles in peer-reviewed and other literature and is a certified lake professional through NALMS. Dr. Bishop's graduate education consisted of a Masters at Clemson University and Doctorate at NC State University and focused on managing nuisance algae/cyanobacteria. Dr. Bishop current focus includes inventing, developing and implementing numerous proactive and reactive solutions to improve water quality and control nuisance cyanobacteria. He collaboratively works to solve large-scale algal issues across the country. He is also the Host of AlgaeCorner®, an informational video series on algae. With over 30 episodes and cumulative over 30,000 views.

***European Frog-Bit: An Emerging Concern in the Great Lakes Region.* Mark Warman, Aquatic Invasive Species Project Coordinator, Cleveland Metroparks**

Summary: Miniature lily pads of European frog-bit (*Hydrocharis morsus-ranae*) first escaped an experimental farm in Ottawa, Canada, in the 1930's and have spread rapidly in the past ten years. Over 4,000 observations of European frog-bit have been recorded in Pennsylvania, Michigan, Ohio, New York, and Ontario since 2010 - a concerning development for other Great Lakes states. Record high water levels have lifted European frog-bit from coastal wetlands into new habitats and plants continue to be discovered at inland and isolated waterbodies, state parks, and wildlife sanctuaries. Cleveland Metroparks will discuss methods of spread, management techniques, and conclude with collaborative efforts to stop the spread of European frog-bit.

Speaker Bio: Mark Warman works for Cleveland Metroparks on a aquatic invasive plant Early Detection and Rapid Response project in Ohio's Lake Erie Basin. His main responsibilities are to inventory invasive macrophytes, assist landowners with management strategies, and coordinate partners to protect Ohio's water resources. Funding for the project comes from Ohio DNR and US Fish and Wildlife Service via the Great Lakes Restoration Initiative Program.

**NALMS Update, John McCoy, North American Lake Management Society (NALMS)
Region 3 Director**

Speaker Bio: John McCoy has worked on water pollution remediation and watershed restoration for more than 30 years. He is currently the Watershed Manager for the Columbia Association in Columbia, Maryland. Previously he served for over a decade at Maryland Department of Natural Resources including serving as the Director of the Ecosystem Restoration Center from 2005 to 2010. John worked on watershed related projects ranging from small reforestation projects to large comprehensive watershed restoration programs. John managed the evaluation of the State's nonpoint source pollution control programs at the Maryland Department of the Environment and the Maryland Department of Health and Mental Hygiene from 1985 to 1995. John holds degrees in Biology and Agronomy. He is also currently serving on Maryland's Patuxent River Commission and as a Trustee for the Middle Patuxent Environmental Trust.

Virtual Workshop: Use of Lateral Flow Test Strips for Detection of Algal Toxins in Recreational Water, Jane Love, Eurofins Abraxis

Summary: This virtual workshop will demonstrate the use of lateral flow test strips for the rapid detection of algal toxins in recreational water. It will provide insight into how test strips can be used to deliver rapid results for fast, field-friendly, data-driven decision-making that allow for timely response to potential HAB threats to public health.

Speaker Bio: Jane holds a Bachelor of Science in Biological Sciences from the University of Delaware. For the past 5 years she has worked for Eurofins Abraxis, helping lake managers, public water systems and researchers to identify the appropriate testing solutions to meet their specific water quality and environmental application needs.

Implementation of Various In-Lake Management Techniques to Address HABs in Lake Hopatcong, NJ, Fred Lubnow, PhD, Princeton Hydro

Summary: Lake Hopatcong, located in Sussex and Morris Counties, New Jersey, is the largest lake in the State. As a result of some large Harmful Algal Blooms (HABs) experienced over the 2019 summer season, the Lake Hopatcong Commission received a grant to implement a variety of near-shore in-lake management projects to prevent, mitigate and/or control HABs. These projects were initiated over the 2020 growing season and included applications of PhosLock, the use of Biochar for phosphorus removal, the use of a strong oxidizing algicide, upgrading some existing stormwater structures, the refurbishing and installation of Floating Wetland Islands and the installation of various types of near-shore aeration systems. Through the use of long-term and project-based water quality data, the relative effectiveness of some of these projects was assessed and evaluated for lakes throughout the Mid-Atlantic region of the United States.

Speaker Bio: Dr. Fred S. Lubnow is the Director of the Aquatic Programs at Princeton Hydro, and the office manager of the Exton, Pennsylvania office. Dr. Lubnow received his Bachelors of Science in Biology from Susquehanna University (1988), his Master's degree in Environmental Sciences (1992) from the University of California Davis and his Ph.D. in Limnology (1994) from the University of California Davis. Dr. Lubnow has been an environmental consultant for over 20 years and has worked on a variety of ecosystems throughout the Mid-Atlantic States. His areas of

expertise include the identification of algae and zooplankton, the management of blue-green algae and their cyanotoxins, the design and implementation of in-lake management strategies and the development of watershed-based management plans that focus on nonpoint source pollution. Dr. Lubnow was the Region III Director of the North American Lake Management Society and the Treasurer for the Pennsylvania Lake Management Society. Dr. Lubnow is also an adjunct professor at Delaware Valley University, where he teaches a course and laboratory on Watershed Management.

How to Develop a Watercraft Inspection Program to Prevent the Spread of Aquatic Invasive Species, Sarah Whitney, SeaGrant

Summary: Aquatic invasive species (AIS) are species found outside their natural geographic range that cause ecological or economic harm, or harm to human health. Recreational boating is one pathway that can move plants and animals from one water body to another in a short amount of time, which can lead to the spread of aquatic invasive species. Examples of species spread by boats and trailers in Pennsylvania include zebra mussels, hydrilla, and Eurasian watermilfoil, among others. One way to prevent the spread of AIS is to inspect a boat or trailer and remove any visible plants, animals, or organic materials before the boat or trailer is launched into a different lake or pond. This presentation will outline what a watercraft inspection program is, what to consider before starting a program, and what it takes to run a program. It will also include an overview of how to do a watercraft inspection.

Speaker Bios: Sarah Whitney is the Director for Pennsylvania Sea Grant. Sarah joined Pennsylvania Sea Grant in 2004, developing and leading extension projects focused on aquatic invasive species prevention and watershed planning. She earned a Master of Forestry degree with a focus on protected area management from the Yale School of Forestry and Environmental Studies and a bachelor's degree in Biology from Bates College.

Little plants, big potential for bioremediation: Determining variation in duckweed response to cyanotoxins, Lacey D. Rzodkiewicz, University of Pittsburgh

Summary: As harmful algal blooms are expected to increase in both occurrence and intensity, potential bioremediators have received renewed attention. Duckweeds, a group of small, mostly clonal floating aquatic plants, have been implicated as bioremediators for a number of contaminants due to their ability to uptake and sequester chemicals; the plants rapidly produce more individuals allowing for large mats of duckweed to remove pollutants from the water and be harvested. Duckweed may similarly uptake cyanotoxins while limiting the growth of cyanobacteria through competition for nutrients and limiting light. However, it is unknown if various duckweed species or individual genotypes, i.e., clonal lines, within a species differ in their ability to tolerate cyanotoxins. We have begun comprehensive screening involving exposure to microcystin and *Microcystis aeruginosa* of multiple duckweed species and clonal lines to explore ideal candidates for bioremediation. Preliminary data indicates significant variation in growth and biomass ($p < 0.05$) among clonal lines within species. Origin of clonal lineages indicates the possibility that historical exposure to harmful algal blooms may influence tolerance to cyanotoxins. As such, lineages with significant differences in growth between control and cyanotoxin treatments are being tested for transgenerational effects which may stabilize macrophyte communities.

Speaker Bio: The presenting author, Lacey D. Rzodkiewicz, is a second-year graduate student at the University of Pittsburgh. She received her BS in biology from Allegheny College with her bachelor's thesis on the allelopathy of anatoxin-a under the supervision of Dr. Milt Ostrofsky earning departmental honors prior to completing her MS in conservation biology at Central Michigan University advised by Dr. Daelyn Woolnough with her thesis focusing on the response of freshwater mussels to realistic mixtures of contaminants of emerging concern, and she received. Her current dissertation work with Dr. Martin Turcotte is to focus on the eco evolutionary dynamics of toxigenicity using harmful algal blooms as a study system. Current work includes field, mesocosm, and lab studies of the interactions of toxic cyanobacteria with herbivores and competitors.

Are you Covered? Let's Talk about PPE, Genevieve Christ, Penn State Extension

Summary: This presentation covers different types of PPE, limitations of PPE, and how to store, clean, and determine what PPE you need.

Speaker Bio: Genny Christ received a Bachelor of Science Degree in Agricultural Science from Penn State and a Master of Science Degree in Agronomy from Iowa State. She is employed with Penn State Extension's Pesticide Education Program as an Extension Educator. She is involved with K – 12th grade education and outreach, pesticide safety, presentations, and other related educational activities. She is a certified Public Pesticide Applicator. Prior to working for the Pesticide Education Program, she spent two years as a Penn State Extension Nutrient Management Specialist and four years working for Conservation Districts as an Agricultural Conservation Specialist. She also has experience with pesticide sales, research, and safety.

DAY 2

Keynote Speaker, *Regenerating Watershed Soils Revitalizes PA Lakes*, Kris Nichols, PhD, KRIS Systems

Summary: Regenerating soil in PA watersheds is a critical proactive step to lake health, because soils have always been the natural filtration system to provide clean air and water. To act as a water filter, soils need to be regenerated with organic matter. Just like manufactured filters for water and air purification, carbon is a key purification agent as it is capable of binding nutrients, pesticides, and other chemicals. Increasing carbon content in soils also improves soil structure by helping to form and stabilize soil aggregates (i.e. pellets or clods) which improves water infiltration and water-holding capacity to reduce runoff and leaching of contaminants. Although Regenerative Agriculture have become the new buzz words, the heart of this production system is soil health or soil regeneration. To regenerate soil, farmers and ranchers need to treat the soil like a living organism and put into place practices that address the six soil health principles: 1. Keep it green and growing; 2. Energize with diversity; 3. Reduce or eliminate synthetic inputs; 4. Integrate livestock; 5. Protect with soil surface with residue or cover; and 6. Reduce or eliminate soil disturbance. One easy way to understand what this means is to treat the soil like you are supposed to treat yourself. Keeping it green and growing is like feeding the soil small meals throughout the day where the food for the soil comes primarily from green, growing plants. Energizing with diversity is like eating a diverse diet and is done by having a more diverse crop rotation and adding cover crops. Wearing clothing and applying sunscreen are mechanisms people use to protect their

skin while retaining residues and using cover crops and mulches protect the soil surface from the erosive forces of wind and water and soil radiation. Reducing or eliminating soil disturbance from practices such as tillage is similar to protecting your body from wounds or damage. These principles add carbon to the soil and/or reduce carbon loss. Farmers and ranchers revitalize PA lakes by utilizing practices that address the principles. Government entities need to implement and support programs for regenerative farmers and ranchers. Consumers endorse this revitalization by the choices they make at the market and by working with government entities and groups like PALMS to design and implement regenerative agricultural policies.

Speaker Bio: Dr. Kris Nichols, Soil Microbiologist. Dr. Kris Nichols is a leader in the movement to regenerate soils for healthy crops, food, people and a planet. She is the Research Director at MyLand Company LLC. She is also the founder and principal scientist of KRIS (Knowledge for Regeneration and Innovation in Soils) Systems Education & Consultation; Research Consultant with Canadian Organic Growers; Soil Microbiology Research Advisor with the Food Water Wellness Foundation; and Research Director with Carbon Sync. She is also working with Dr. Arjun Makhijani, President of the Institute for Energy and Environmental Research, on a project combining Regenerative Agriculture and Renewable Energy (RARE) to reduce the economic risks in transitioning to regenerative agriculture. Kris participates on the Land Use & Agriculture Task Force for the HRH Sustainable Markets Initiative; Advisory Board for the Real Organic Project; Scientific Advisory Board with the Savory Institute's – Ecological Outcome Verification (EOV) program; and as a Soil Science Advisor with Health First.

Previously, Dr. Nichols was the Chief Scientist at Rodale Institute and a Research (Soil) Microbiologist with the USDA, Agricultural Research Service (ARS). During her time with USDA, she focused on mycorrhizal fungi and the investigation of glomalin – a substance produced by AM (arbuscular mycorrhizal) fungi. Glomalin contributes to nutrient cycling by protecting AM hyphae transporting nutrients from the soil to the plant and to soil structure and plant health by helping to form and stabilize soil aggregates. Kris received Bachelor of Science degrees in Plant Biology and in Genetics and Cell Biology from the University of Minnesota in 1995, a Master's degree in Environmental Microbiology from West Virginia University in 1999, and a Ph.D. in Soil Science from the University of Maryland in 2003. Throughout her career, Kris has given over 300 invited presentations to a wide variety of audiences throughout the world, authored or co-authored more than 25 peer-reviewed publications including two book chapters, been cited or interviewed for more than 50 magazine or newspaper articles, highlighted in several books, and has numerous videos on-line at . Dr. Nichols has received several awards including the 2012 Conservation Research Award from the International Soil and Water Conservation Society.

Managing Waterbodies of All Shapes and Sizes: Comparing and Contrasting the Unique Elements of Pond and Lake Management, Joe Pinkerton, Aquatic Environment Consultants, Joshua Burnside, Black Lagoon Lake and Pond Management

Summary: Throughout the Northeast and Pennsylvania specifically, thousands of waterbodies (ponds and lakes) exist. Varying in size from your local farm pond or stormwater pond, to large man-made reservoirs, and function, drinking water, irrigation, to recreational activities each waterbody demand unique approaches tailored to its specific needs and management objectives. While the principles of lake and pond management remain constant, there are also several differentiating factors between the two. Large lakes are experiencing an uptick in the presence of

both Harmful Algae Blooms (HABs) and nuisance aquatic invasive species (AIS) which are garnering national attention. While ponds are ever changing dynamic systems and are being constructed at an increasing rate to handle the demands of stormwater management. This presentation will discuss the similarities and differences in managing these types of waterbodies, and the unique challenges that managers face on a daily basis.

Speaker Bios: Joseph Pinkerton; Aquatic Biologist/ Aeration Specialist –

Joe was born and raised in Lancaster, PA where he graduated from Conestoga Valley High School. He then graduated from Shippensburg University with a Bachelor of Science degree in geo-environmental studies. Joe has been working with AEC since 2000. He manages ponds and lakes throughout Pennsylvania, as well as parts of Maryland and Northern Virginia. In addition to his work with aquatic plant control and water quality monitoring, Joe manages the aeration department at AEC. Joe has served as a director on the Northeast Aquatic Plant Management Society board. He currently lives in Chambersburg, PA with his wife and two sons.

Joshua Burnside; Territory Manager/ Aquatic Specialist –

Josh graduated from Delaware Valley College in 2013 with a bachelor's degree in Environmental Science. He began his career in pond and lake management immediately following graduation. He currently works for Black Lagoon Pond and Lake Management as a Territory Manager and Aquatic Specialist, where he oversees clientele in Pennsylvania, New Jersey, Maryland and Delaware. Joshua holds aquatic pesticide application licenses in four states and is a SePro preferred applicator. A lifelong resident of Southeastern Pennsylvania, he currently resides in Broomall, PA with his wife, Samantha, and dog, Rory. Joshua is the current President of PALMS and has been a past exhibitor. He is also a member of the Northeast Aquatic Plant Management Society, NEAPMS. An avid outdoorsman, Josh spends most of his free time hunting, fishing, and trail running throughout most of the mid Atlantic

Aeration of Shallow to Moderately Deep Lakes and the Benefits of Bioaugmentation Using Concentrated Bacteria Additives, Ed Molesky, Aqua Link

Summary: Over the years, lake aeration has been an extremely powerful tool for improving the water quality, water clarity and aesthetics of lakes and reservoirs throughout U.S. The most common approach to aerate shallow to moderately deep lakes is by destratification. For this approach, air bubbles are released near the lake bottom. In turn, these air bubbles rise to the lake surface thereby allowing for lake water mixing and circulation. Bioaugmentation is another in-lake management tool that has gained popularity and success in the U.S. over the past 15 years. This lake management technique involves adding beneficial bacteria or microbes to improve water quality and water clarity. The use of this technique is commonly implemented simultaneously with lake aeration. In this presentation, lake destratification will be discussed in terms of design, installation and maintenance. Special attention will be given to the benefits and drawbacks of using multiple smaller aeration systems versus using a single larger system. In addition, the benefits of lake aeration will be discussed and how these benefits can be further enhanced using selected strains of beneficial bacteria in conjunction with lake aeration.

Speaker Bio: Ed Molesky is the incoming President of PALMS. This makes him the first 3-Peat President for the organization. As for his day job, Ed is the President of Aqua Link and Hydro

Logic Products in Doylestown PA. Aqua Link is an environmental consulting firm specializing in pond, lake, stream and watershed management and restoration. Hydro Logic Products manufactures its own line of pond and lake aeration equipment and sells pond and lake management products and supplies throughout the U.S. and internationally.

Ed received his B.S. Degree in Biology and M.S. Degree in Environmental Pollution Control from The Pennsylvania State University. He is a Certified Lake Manager (CLM) through the North American Lake Management Society (NALMS). Ed has over 30 years of experience in water resources management and has participated in numerous lake and watershed studies throughout the U.S.

Ed is passionate about the outdoors and enjoys any kind of boating and fishing. Ed is married and loves spending time with his wife, Kim, their three children and golden retrievers. He still talks a good game about fishing but in reality, he really spends most of his spare time floating aimlessly on Lake Wallenpaupack drinking Coronas...

Lakes 101: An Introduction to Basic Concepts in Lake Morphometry, Physics, and Chemistry, Milt Ostrofsky, PhD

Summary: Effective lake management is based on an appreciation of the unique features of each lake and a basic understand of lake processes. It is a truism in ecology that everything is connected to everything else, and this is certainly the case for lakes. The ratio of watershed area to lake area affects water residence time in lakes, and land use in the watershed affects the export of critical nutrients to the lake. Wind fetch is a significant predictor of thermocline depth, and the resulting seasonal thermal stratification allows the summertime depletion of hypolimnetic dissolved oxygen that, in turn, can trigger phosphorus release from sediments that can be a major contribution to a lake's nutrient budget. This talk will examine morphometric variables (watershed size, land use, lake area, depth, and wind fetch), some physical attributes (light penetration, thermal stratification) and chemistry (alkalinity and buffering capacity, dissolved oxygen, phosphorus). Armed with a better understanding of these unique features, lake associations can make informed decisions to protect or enhance water quality.

Speaker Bio: Milt Ostrofsky is an emeritus Professor of Biology at Allegheny College in Meadville, Pennsylvania where he has taught Limnology, Ecology and Biostatistics since 1978. He started his career with the Vermont Department of Water Resources as part of the summer lakes and ponds water quality monitoring program. He moved on to environmental consulting for a number of years working mostly with the effects of the power-generating industry on hydroelectric and cooling-water reservoirs. He received his Ph. D. at the University of Waterloo where his thesis research examined the trophic changes in newly constructed reservoirs in the subarctic. He spent two years as a post-doctoral fellow in limnology at McGill University testing nutrient budget models in remote northern regions (Northwest Territories, Ungava Peninsula). He is a director of the Conneaut Lake Aquatic Management Association, and the French Creek Valley Conservancy, and a member of the Edinboro Lake Watershed Association. His interests in lakes are diverse. His current research focus is on the dynamics of nutrients in lakes and their watersheds, and paleolimnology.

Survey Before You Stock – How a Fisheries Survey Can Help Avoid Costly Fisheries Management Mistakes, Mike Reiner, Aqua Link

Summary: Pond and lake owners often make fisheries management decisions, especially stocking, without having any data on their fishery. This usually leads to wasted time, money, and can even adversely impact the existing fishery. Before any fisheries management decisions are made, a fisheries survey should be performed to provide pond and lake owners with the data they need to make scientifically sound and cost effective fisheries management decisions moving forward. This presentation will discuss the importance of fisheries surveys, equipment, methods and tips for collecting fisheries data, as well as data interpretation for developing a fisheries management plan. Additionally, the importance of collecting water quality and bathymetric data will be discussed as it relates to developing a well-rounded fisheries management plan.

Speaker Bio: Mike Reiner is an Aquatic Biologist for Aqua Link and Hydro Logic Products. Aqua Link is an environmental consulting firm specializing in pond, lake, stream and watershed management and restoration. Hydro Logic Products manufactures its own line of pond and lake management products and supplies throughout the U.S. and internationally through its online store. Both companies are located in Southeastern Pennsylvania.

Mike received a B.S. Degree in Environmental Science while attending Delaware Valley University located in Bucks County, Pennsylvania. Currently at Aqua Link and Hydrologic Products, Mike handles a variety of tasks including fisheries survey planning and preparation, water quality data collection and analysis; report preparation; aquatic pesticide applications; equipment and fountain repair; aeration system and water fountain installations.

Mike is an avid outdoorsman and spends most of his free time hunting and fishing.

PA HABs task force panel and discussion

Panel members: Brian Chalfont, PA DEP; Josh Lookenbill, PA DEP; Rich Pugh, PA Department of Health; Michael McCaskill, PA Department of Health; and Nick Decker, Pennsylvania Department of Conservation and Natural Resources.