2019 CT Volunteer Water Monitoring Conference

CONCURRENT SESSION ABSTRACTS

MORNING SESSIONS (A-C)

Concurrent Session A

A1. Characterization of a New Species in the Genus *Didymosphenia* and of *Cymbella janischi (Bacillariophyta)* from Connecticut, USA Room C101

Dr. Diba Khan-Bureau, *Three Rivers Community College*

Two non-native stalk-forming diatoms that were observed in the West Branch of the Farmington River, a tributary of the Connecticut River in Connecticut, are characterized morphologically and barcode marker sequences were obtained. Cymbella janischii, the dominant stalk-forming species during the summer of 2012, previously had not been found in the northeastern USA. Samples of C. janischii were examined microscopically and used to obtain four sequences of the barcode marker, the V4 region of the 18S rDNA gene. Phylogenetic analysis indicated that the four independent sequences of C. janischii were distinct from, but closely related to, published sequences of C. janischii and C. mexicana. A second non-native stalk-producing diatom, resembling Didymosphenia geminata, was examined in 2013 and first reported as Didymosphenia sp. The observed cells had a compressed morphology and were smaller than D. geminata. Sequences of the V4 region, obtained from three independent direct PCR reactions of single cells isolated from the Connecticut samples, indicated a close relationship to three published sequences of D. geminata from Italy, New Zealand and the USA, and to D. siberica and D. dentata from Russia. Frustules of the cells used in the PCR reactions were recovered and examined using SEM, providing a direct link between the observed morphology and sequence data. The morphology of the novel Didymosphenia taxon was compared with that of other Didymosphenia taxa, being most similar to D. pumila, D. laticollis, D. grunowii and smaller cells of D. geminata. Given the unique morphological features of this diatom, it has been named as a new species, Didymosphenia hullii Khan-Bureau, sp. nov.

A2. Preventing the Spread of Aquatic Invasive Species at Boat Launches Room D105

Gwendolynn Flynn, *CT DEEP Boating Division*

It is important to curb the spread of aquatic invasive species because they are detrimental to the ecosystem and can adversely impact recreational activities. The Connecticut Department of Energy & Environmental Protection (DEEP) believes that public awareness and education are key tools to prevent the spread of all aquatic invasive species by recreational boaters and other users. The DEEP Boating Division therefore administers a statewide Volunteer Invasive Investigator Program, designed specifically to help educate people on ways to keep our waters clean and prevent the spread of aquatic hitchhikers into the lakes and rivers of Connecticut. Invasive Investigators check for invasive species and collect information about where boats have been, if any invasive species were found, and what if any cleaning steps were done prior to launch. Volunteers are required to attend training by DEEP Boating Staff to become familiar with the local invasive species and learn how to conduct inspections. Once trained, volunteers serve under the local supervision of a lake or pond organization. If you are interested in starting a program in your area attend this presentation to learn more!

A3. Unified Stream Assessment – Rapid Assessment to Identify Stream Impacts — Room D126

Courteny Morehouse, *Housatonic Valley Association*

Unified Stream Assessment (USA) is continuous stream walk protocol developed by the Center for Watershed Protection created to systematically evaluate stream corridor health and restoration opportunities in urban streams. The USA is a useful in that it is a relatively rapid assessment, it's easy to implement with volunteers, and requires minimal equipment. The USA offers a means of assessing, documenting, and organizing stream corridor data to identify sources of impairment and potential pollution reduction projects. Impacts evaluated include erosion, trash buildup, impacted buffers, and outfalls. This information can prove useful in determining the highest need areas for restoration. This can be useful in watershed planning, municipal planning, and regional conservation prioritization. In 2014 the Housatonic Valley Association (HVA) along with municipalities and key stakeholders EPA watershed planning process in the Still River Watershed, a 75 square mile watershed around Danbury, Connecticut. As part of this process, HVA used USA to map impacts in over 30 miles of streams over the past two years. They are now using this information combined with GIS analysis to identify priority restoration projects for the implementation of the watershed plan. Since then HVA has adapted this protocol for rural streams by including agricultural impacts and added to existing protocol to record impacts such as dams and opportunities for recreation. This method is now being used in the Ten Mile Watershed in Dutchess County, New York to help determine both restoration and conservation opportunities for watershed planning.

A4. RBV Fieldwork and Mentoring Opportunity for Three Rivers Community College Students — Room D206

Jennifer Lafayette*, Three Rivers Community College*
Kristina Beaulieu*, Three Rivers Community College*
Joe Clark*, Three Rivers Community College*

This presentation will provide the perspective of Three Rivers Community College students' participating in the CT DEEP Riffle Bioassessment by Volunteers (RBV) Program in the Wild and Scenic Eight Mile River Watershed. The RBV program encourages student involvement which demonstrates the impact of volunteering on academic growth through engagement. This work provides learning at the university level and preparing for future field work. As students in the Environmental Engineering Technology program mentoring plays a crucial role. In BIO-180, Principles of Environmental Science, students range from every degree program because it is a transferable credit. To pass the class, there must be participation in the bioassessment. This opportunity bridges the gap between the students in the environmental program and those who are enrolled in the Biology class. Students who are familiar with volunteer water monitoring in Connecticut's watersheds demonstrate to others who are unfamiliar. It promotes a great learning experience and partnership amongst students. Every spring, students in the degree program visit the children at Salem Elementary school and demonstrate a RBV for the first graders. This is an interactive experience and provides the children hands-on engagement learning about the macroinvertebrates with the portable simulator we provide. Students in the Environmental Engineering Technology plan of study are also included in a cohort and the club known as T.R.U.E, Three Rivers United Environmentalists. A cohort is a group of students who work through a curriculum together to achieve the same academic degree together. Studies have shown that students involved in cohorts obtain greater academic success.

A5. Forging a Public – Private Partnership: Water Monitoring Before, During, and After the Exide Environmental Remediation Project — Room D211

Mary Hogue*, Fairfielders Protecting Land and Neighborhoods (FairPLAN)*
Geoffrey Steadman*, Fairfield Harbor Management Commission*
Don Gonyea, *CT DEEP Bureau of Materials Management and Compliance Assurance*
Caroline Filmer, *CT DEEP Bureau of Water Protection & Land Reuse*

Our presentation will cover the essential role of water monitoring in the course of planning and successfully completing the Mill River Environmental Remediation Project in Fairfield, Connecticut, a multi-year project to clean up pollution from the Exide Battery Company. The story of the Exide site on the Mill River, its use for manufacturing lead

batteries, the pollution it caused in the river and on-site, and the successful clean-up of the river and site over many years, is part of America's industrial legacy and an important chapter in the history of Fairfield. There is much to learn from what happened here, including lessons to apply in other river clean-up initiatives. Water monitoring helped identify the problem; was necessary to plan and conduct the remediation; and is ongoing to confirm successful completion of this project—arguably the most significant environmental remediation project in Fairfield history.

After the battery plant was shut down in 1981, Exide attempted to remove lead-contaminated sediment from the river. By the late 1980s, however, it was clear from citizen observations and tests conducted by the Town that the river was being re-contaminated by lead waste still emanating from the site. Efforts to clean up first the site and then the river would intensify but not be completed for more than 30 years. The upland site was cleaned up first and then, after decades of difficult planning, work to dredge and process lead-contaminated sediment from the river began in 2014. Sediment was pumped to a carefully monitored on-site processing facility where it was contained in large "geo-tubes" and de-watered. The water was then treated and returned to the river. Approximately 27,000 cubic yards of contaminated sediment was dredged, de-watered, and trucked off-site to landfills as far away as Alabama. This work was completed in 2017.

Throughout this historic project, it is important to recognize the vital role of the Town of Fairfield, including its citizens, civic groups, and elected officials. They were first to identify the problem and pushed for and participated in the solution. Two civic groups, the Mill River Wetland Committee (MRWC) and Fairfielders Protecting Land and Neighborhoods (FairPLAN), had particularly significant roles. MRWC now is starting its 52nd year educating the public about watershed functions and providing outdoor classrooms for student groups via its award-winning River-Lab Program. FairPLAN was a key participant (an "intervenor") in the complicated CT DEEP regulatory process to prepare and approve Exide's remediation plan. In addition, the Fairfield Harbor Management, Shellfish, and Conservation commissions, along with the First Selectman, were instrumental in ensuring that the remediation plan was prepared to the Town's satisfaction; the cleanup was properly and thoroughly conducted; and river conditions were monitored throughout. Water monitoring data were presented in well-attended Town meetings, published on the CT DEEP website, and available at the public libraries. The stakeholder groups held monthly meetings. Some monitoring of water conditions is ongoing. Members of the public and MRWC report a vast increase in the variety and number of wildlife now seen along the river.

A6. 30 Years of Change in Long Island Sound Fish and Water Quality

Room D221

Sarah Crosby, *Earthplace (Harbor Watch)*

Long Island Sound is impacted by many anthropogenic stressors such as eutrophication, climate change, and land use change. Long-term observational datasets enable the determination of trends in indicators of estuarine health as well as the prediction of future conditions. Harbor Watch, a non-profit water quality research and education program, began as a citizen science group in 1986 with the purpose of collecting data on Norwalk Harbor, CT. Here, we present an analysis of this dataset on water quality and demersal fish community composition in this Long Island Sound embayment from 1987−2016. During this 30-year monitoring period, mean water temperature increased, dissolved oxygen decreased, and salinity increased. Fish abundance declined, with declines in the number of fish per trawl observed across multiple species including the commercially-important winter flounder (*Pseudopleuronectes americanus*). Juvenile fish are indicators of estuarine health; as such, these changes suggest a negative shift in the health of this Long Island Sound embayment. Climate change presents an increasing threat to estuaries and the ecosystem services they provide, especially when coupled with other anthropogenic stressors. Management actions are needed at multiple spatial scales, from local to global, to combat these threats to estuarine health.

A7. Managing a Volunteer Lake Monitoring Group: Pleasures & Problems

Room D224

Peter Van Dine, *Friends of Bolton Lake*

In 2012 a minor ecological disaster led to founding of the Friends of Bolton Lakes and its monitoring group. Our first step involved the acquisition, use, and maintenance of monitoring equipment. Then we discovered the joy of learning things you never knew about the lakes that you love, the comradery of working with other people that share that joy, and the realization that your group is actually becoming a real part of the maintenance and preservation of those lakes.

However, there are also problems which must be faced: the realization that the ecology of every lake is different and may require a different approach than to a similar problem in another lake, the ever present need for more funds to continue and expand the work you believe to be valuable, navigating the uncertainties and differences among the separate agencies and municipalities that exercise control over your lake, and collaborating successfully with the professionals whom you must depend upon and with whom you share responsibilities as a volunteer. These issues will be woven into the presentation.

A8. The Cyanobacteria Monitoring Collaborative Overview — Room D226

Hilary Snook, *U.S. Environmental Protection Agency*

Over the past several years, the U.S. EPA New England Regional Laboratory has convened a cyanobacteria monitoring and "bloom watch" program called "The Cyanobacteria Monitoring Collaborative." The Collaborative grew out of a region-wide workgroup of state environmental water quality and beach monitoring programs, departments of public health, tribes, public water suppliers, NGOs, citizen monitoring groups, and academics, with the goal of establishing a uniform and consistent approach to monitoring cyanobacteria while simultaneously educating and informing.

Today, the Collaborative has three major components, BloomWatch, CyanoScope, and Cyanomonitoring. The components are tiered to allow participation from the public (Bloom Watch), trained citizen scientists (CyanoScope), and environmental professionals and trained individuals (Cyanomonitoring). Participation is open to anyone with an interest in learning more about cyanobacteria monitoring, or interested in participating directly by contributing to the developing body of science through collecting data as a citizen scientist or a researcher. Data that is collected is readily accessible to the individuals collecting the data as it is to the scientists doing the research, as it is all available in open public databases.

This presentation will cover monitoring of fluorescent pigments and tracking waterbody biovolumes using inexpensive field fluorometers, the use of smartphone technology in conjunction with on-site field microscopy and "bloom-watch" kits, and the development and utilization of smartphone apps to enable on-site data submissions and spot identifications of bloom cyanobacteria. The presentation will also showcase the on-line "dirty dozen" cyanobacteria key developed by workgroup participants and key techniques for separating cyanobacteria from the myriad of other phytoplankton often found co-existing within a waterbody.

A9. Turning Volunteer Data into Action — Room E227

Judy Rondeau*, Eastern Connecticut Conservation District*

Water quality monitoring volunteers are passionate and dedicated, and collect data that is invaluable to water resource management. But the collection of data is a means to an end and not the end itself. So how is volunteer-collected data used? Join Judy Rondeau of the Eastern Connecticut Conservation District to see how a unique partnership between ECCD and The Last Green Valley Volunteer Water Quality Monitoring Program provides water quality data that is used to plan and implement water quality improvement projects in eastern Connecticut.

Concurrent Session B

B1. The Role of Vegetation in Sequestration of E. coli in the Scantic River (CT) — Room C101

Kirsten Martin, *University of St. Joseph*

Each summer since 2015, several sites along the Scantic River (CT) have been monitored weekly for Escherichia coli levels. High levels (over 575 cfus/100ml) have been recorded throughout the river, leading the CT Department of Energy and Environment to list the lower portion of the Scantic River on its list of impaired waterways. One location, Somersville Mill Pond (Somers, CT), has consistently low levels of E.coli, despite high levels being recorded immediately upriver of the sampling location. The mill pond has extensive free-floating vegetation mats. Research in terrestrial systems suggests that specific types of vegetation have the ability to sequester E .coli in root systems as well as other

plant tissues. In fall of 2017 and summer 2018, two research studies were completed looking at the ability of various forms of vegetation to sequester E. coli. Results from the fall 2017 studied showed that lawn grass had a high capacity to retain E.coli. In the summer of 2018, a research project investigated the ability of free-floating macrophytes to sequester E.coli. Samples of river water and aquatic vegetation were collected weekly from 25 July 2018 to 26 September 2018. Water samples were processed using the IDEXX Colilert methodology. Samples were incubated for 24 hours and viewed under a UV light. The most probably number of E. coli colony forming units were determined from an MPN table story with others!

B2. Monitoring the CT River Estuary for Aquatic Invasive Plants — Room D105

Judy Preston, *CT Sea Grant / Long Island Sound Study*
Margot Burns, *Lower CT River Valley Council of Governments (RiverCOG)*

The Connecticut River Estuary is globally recognized as a significant ecological complex of salt, brackish and freshwater tidal marshes that interface with the equally significant and nationally recognized Long Island Sound. Within the past 5 years, the arrival and establishment of water chestnut (trapa natans) has alarmed state and local stewards, as occurrences of this aquatic invasive plant to the north in the river have become increasingly well established, with potentially dire ecological consequences. In 2018, additional surveys throughout the CT River main-stem uncovered multiple occurrences of hydrilla verticillata, an equally threatening aquatic plant, with the extent of lower river occurrences as yet not well known. These species, once established, can fundamentally change the ability of aquatic ecosystems to support the diversity of plants and animals that they have made them notable in a rapidly developing northeastern corridor.

B3. We have Data . . . Now What Do We Do with It? Managing and Sharing Your Thermal Data — Room D126

Carol Haskins, *Pomperaug River Watershed Coalition*
Janel Chap*, Pomperaug River Watershed Coalition*

The Pomperaug River Watershed Coalition (PRWC) has been conducting thermal monitoring in the Pomperaug River Watershed since 2013. While these efforts produced a great deal of data, PRWC now faced the question of how to manage and then share this data beyond CT DEEP. PRWC quickly found that Excel spreadsheets were not sufficient to manage the magnitude of data generated and subsequently created a Microsoft Access database that can quickly calculate the three stream temperature metrics used to determine thermal classifications. For its second goal, PRWC sought a tool to share the thermal data and tell the story of thermal monitoring in its watershed. PRWC harnessed its community partnership with Naugatuck Valley Council of Governments (NVCOG) to create an interactive map that has been integrated into the PRWC website. This map allows users to view photos of the monitoring sites, explore the thermal classifications, and find data summaries for each monitoring season. PRWC is now actively promoting availability of the map and data within the community. In summary, PRWC's Access database provided a streamline process for PRWC to store, manage, and utilize its wealth of stream temperature data, while the interactive map provided a platform to showcase PRWC's thermal monitoring program, inform stakeholders, and garner more support from the community in the organization's mission to protect the Pomperaug River Watershed.

B4. Leveraging Your RBV & Water Quality Data with UConn's Natural Resources Conservation Academy (NRCA) — Room D206

Abby Beissinger*, University of Connecticut*

When high school students team up with adult conservation advocates, good things happen. The University of Connecticut's Natural Resources Conservation Academy (NRCA) trains intergenerational teams in natural resources science and mapping technology to conduct local conservation projects. The result is a "win" for the team, community, and environment. These intergenerational teams are formed and supported through their participation in an NRCA program. This presentation will begin with a brief introduction of NRCA's three environmental programs for teens,

adult conservation volunteers, and teachers, with a special focus on NRCA's Conservation Ambassador Program (CAP) and Conservation Training Partnerships program (CTP). CAP immerses teens in natural resource science through a field experience at UConn and 10-month conservation project in partnership with a conservation partner. CTP trains teens and adult conservation partners together in a 2-day conservation and geospatial workshop that is followed by a collaborative conservation project implemented in their community. CAP and CTP conservation projects integrate free mapping technology and other conservation tools learned during the programs to address a variety of topics. Since 2012, nearly 40 NRCA students have focused on water quality monitoring or RBV sampling that has brought real benefits to the organizations with whom they have partnered. Examples include the redesign of the CT DEEP RBV Field Identification Cards, development of an RBV field trip for freshman at Avon High School, the first spatial comparison of water quality among the Congamond Lakes System, and many more. Join us to discuss the ways in which your organization can partner with or participate in one of our NRCA programs to support and benefit the many unique applications of water monitoring by volunteers in Connecticut!

B5. CT's Priority Watersheds: DEEP IWRM Project Update

Room D211

Chris Sullivan, CT DEEP Bureau of Water Protection & Land Reuse

This presentation will give some early updates on the project work for the Integrated Resource Water Management program and pitch for upcoming public informational meetings held by DEEP. Project work has begun in several of the prioritized watersheds with development of template approaches to be utilized in other watersheds across Connecticut. A major focus of the talk will be to describe partnership opportunities for local watershed groups and examples of current and previous collaboration with advocacy groups.

B6. Connecticut's Response to the Management of Pathogenic *Vibrio parahaemolyticus* in Shellfish

Room D221

***Kristin DeRosia-Banick**, CT Department of Agriculture*

Vibrio parahaemolyticus is a naturally occurring marine bacterium in the same family as those that cause cholera and *Vibrio vulnificus*. Since 2012, the Northeast region of the U.S. has experienced a sharp increase in the number of illnesses linked to *Vibrio parahaemolyticus*. During 2013 the State of Connecticut shellfish control authority closed shellfish harvest areas after an outbreak of illness was linked to oysters harvested from growing areas in Norwalk and Westport. Beginning in 2014, Connecticut's *Vibrio parahaemolyticus* control program managers have worked with industry to incorporate more stringent time to temperature requirements in order to minimize the proliferation of this virulent strain of bacteria, and have been successful in reducing the risk of consumer illness associated with molluscan shellfish. In order to gain a better understanding of *Vibrio parahaemolyticus* levels in Connecticut shellfish, the State's monitoring plan includes the collection of environmental parameters such as water temperature, air temperature, salinity and depth that may correlate to levels of Vibrio bacteria in shellfish. Program managers are working with researchers to analyze this expanded dataset of environmental variables and *Vibrio parahaemolyticus* concentrations in shellfish tissue, to determine the Long Island Sound-specific *Vibrio parahaemolyticus* vs. temperature relationship following methods in the FDA pre-harvest risk model. This information is combined with output from a high-resolution hydrodynamic model of LIS to make daily forecasts of *Vibrio parahaemolyticus* levels available to industry and managers.

B7. Alexander's Lake Killingly – Volunteer Monitoring Results

Room D224

***Rick Canavan**, Tighe & Bond*

Alexander's Lake is an over 200-acre lake in Killingly CT. A citizen's water quality monitoring group has been active at the lake since 2011 working with an environmental scientist. The presentation will present information about; the results of the monitoring program, how the monitoring program has adapted, and presenting information to residents.

Alexander's Lake has very clear waters for a Connecticut lake with annual average Secchi transparencies of between 17 and 26 feet. Chlorophyll-a and total phosphorus monitoring also indicate oligotrophic conditions. The lake did experience cyanobacteria blooms in lake summer in 2013 and 2014. This prompted more investigation into the species

and abundance of algae to be added as a parameter. Concentrations of inorganic nitrogen in forms such as nitrate were found to be very low and were eventually dropped from the monitoring program. Further understanding the water budget for a lake is a long-term study goal. The lake has no major tributary streams or outlet; therefore, the majority of the water inflow and outflow is through groundwater. This helps maintain the lake water quality but makes measuring flows difficult. Presenting technical monitoring information to the lake community is challenging. Reporting attempts to simplify results and avoid both panic and complacency from seasonal variations.

B8. bloomWatch! Monitoring Cyanobacteria Blooms with a Smartphone — Room D226

Jasper Hobbs, *New England Interstate Water Pollution Control Commission (NEIWPCC)*

Are you seeing a normally-clear lake that has suddenly turned the color of pea soup or a blue-green paint spill? It may be a bloom of cyanobacteria, which has the potential to produce toxins that affect humans, pets, and our ecosystems. Unfortunately, state and local officials can't watch every lake at all times. With only a smartphone, anyone can improve our ability to understand where, how, and when these blooms are appearing and are causing issues. bloomWatch is an app designed to engage citizen scientists to help track Harmful Algal Blooms. Users are able to enter relevant information about a body of water, as well as take pictures of potential blooms. Images are uploaded to the bloomWatch project page on CitSci.org, and a notification is sent to a state contact. This is part of an initiative to increase public engagement with identifying these blooms so that they can be properly and effectively monitored. As a part of EPA's Cyanobacteria Monitoring Collaborative, bloomWatch is the easiest way for someone to get involved with volunteer monitoring. The app's potential, however, far exceeds its simplicity. Volunteer groups and watershed associations use bloomWatch to track cyanobacteria blooms on their own lakes. Teachers and instructors can use the database for examples and demonstrations on how to properly identify blooms. Municipal and state staff may receive notice of potential blooms at waterbodies they may not actively sample. This presentation will cover the multiple benefits that come from use of the bloomWatch app, as well as offer some case studies on how the app is effectively used by volunteers, watershed associations, and state environmental departments.

B9. Working "Hand-in-Hand" with Municipalities to Identify and Correct Pollutants Impacting Local Waterways — Room E227

Lori Romick, *Town of Orange Health Department*

Municipal Offices have the local information and the enforcement officers often needed to get corrective actions but, are limited in the resources of time and Staff. Non-profit organizations have volunteers to conduct "Citizen Science" monitoring and survey studies but, they do not have the authority to enforce laws. Therefore, it is critical for non-profits to partner with municipal offices in order to make effective environmental improvements. Create a supportive working relationship by taking the time to learn how town offices interact with each other and how processes in town work. Well-trained volunteers who learn how to work effectively with municipalities will gain their respect and support to ultimately achieve results and a long-lasting partnership.

Concurrent Session C

C1. Monitoring Water Quality to Assess Impacts of a Small-Scale Hydromodification in the North Branch Park River — Room C101

Dr. Bin Zhu, *University of Hartford*

Construction activities in and along urban streams may cause an overall decline in water quality and aquatic ecosystems. In this case study, water quality impacts of local hydromodification in an urban stream were investigated. At the site of interest, workers removed a stream crossing consisting of an embankment with culverts and replaced it with a small bridge (single span of 25 m) in an effort to improve flow capacity. Water samples were taken at four sites along the North Branch Park River in Connecticut. Turbidity and dissolved oxygen (DO) were measured in situ, and

nitrate and total phosphorus (TP) were measured in the laboratory. Benthic macroinvertebrate samples were also collected and analyzed for taxon richness and Shannon-Weaver species diversity. Data were compared between upstream and downstream sites and before, during, and after hydromodification. One-way ANOVA combined with the post hoc Turkey test were used to derive statistical significance. During construction, turbidity increased temporarily by 60.9% (from 2.48 to 4.00 NTU). Once construction was completed, DO increased locally from 11.0 to 13.0 mg/L. Benthic macroinvertebrate taxon richness and species diversity declined by 61.6 and 32.6% respectively, with no recovery observed in the year following construction. However water quality was only affected within 50 m downstream. It is concluded that small-scale hydromodification temporarily increased the turbidity as a result of increased sediment input. Benthic macroinvertebrate communities declined in the immediate downstream vicinity of construction but are expected to recover soon given that turbidity recovered to pre-construction levels, and DO increased. These outcomes emphasize that water quality monitoring is important not only for large-scale hydromodification but also for smaller scale stream modifications.

C2. Beyond Sampling for Water Quality and Paddling with a Purpose! Room D105

***Alicea Charamut**, Connecticut River Conservancy*

Monitoring for various water quality criteria is extremely important but aquatic invasive plants have an impact on recreation and water quality as well! Monitoring for aquatic invasive plants can be a great way to engage paddlers and boaters in preserving the water quality and biodiversity in your watershed. Learn how the Connecticut River Conservancy has put the passion behind paddlers' love for the waters they frequent into building an effective strategy to keep tabs on European Water Chestnut.

C3. Using Citizen Science for Large-Scale River Monitoring in Fairfield County Room D126

***Nikki Spiller**, Harbor Watch*

Poor water quality threatens the value of Long Island Sound and its ability to provide a variety of ecosystem services. Tributaries serve as conduits for human-derived pollutants to enter Long Island Sound, such as sewage pollution. It is critical to quantify and reduce pollution sources within the watershed to protect ecosystem and human health. Limited government resources for ongoing monitoring has resulted in limited data sets and undetected sources of pollution in many waterways in Connecticut. Citizen scientists can provide assistance for regulatory agencies by gathering water quality data.

Here we present a case study of a citizen science research group conducing large scale river monitoring in Fairfield County. Harbor Watch began collecting instream data in 1998 and has grown the breadth of testing over the last 2 decades. In 2018, Harbor Watch studied over 20 rivers for fecal coliform, Escherichia coli, dissolved oxygen, water temperature, and conductivity. The data collected is actionable and used by state and local government agencies to make water quality improvements.

C4. CT DEEP's RBV Program as Part of an Integrated Middle School Science Curriculum Room D206

***Tom Fahsbender,** Washington Montessori School*
***Nora Hulton,** Washington Montessori School*

We in Connecticut are lucky to have a landscape that can be read through a variety of lenses, from the aesthetic to the academic. Our geology tells a story over a billion years old; the brook trout in our streams are the descendants of ice-age ancestors; the rivers and streams we study show evidence of hundreds of years of human activity and industry; and, finally, the ecology of our streams can tell us a great deal about the current health of the ecosystem. When our students prepare to go out on the river for the RBV program, they have already learned a great deal about our local geology and how mountains, continents, glaciers and oceans have shaped the landscape. Through readings in local history and field trips to the sites of long-gone farms, mines, mills and railroad beds, our students get a sense of how humans have changed the land and then how the land has renewed itself. The final piece is the biology of rivers and macroinvertebrates. The science curriculum we have developed is specific to the Shepaug River valley and our middle-

school students, but can be tailored to fit any location, academic level, and nearly any level of commitment, from a few hours of preparation to a full semester course.

C5. Results from Two Long-Term Water Temperature Monitoring Efforts in the Niantic River Watershed

Room D211

Don Danila, *Niantic River Watershed Committee, Inc.*
Judith Rondeau, *Niantic River Watershed Committee, Inc.*

The Niantic River Watershed Committee (NRWC) is comprised of members from the four towns forming the river's watershed. Among the NRWC concerns are water quality (WQ) in the Niantic River and its tributary streams. The NRWC has performed WQ sampling since 2012, focusing on basic WQ parameters and the nutrient nitrate. For specific purposes we also performed two long-term water temperature (WT) monitoring studies in tributary streams located in East Lyme. These studies used HOBO Tidbit v2 loggers that continuously monitored WT and recorded hourly means.

The first study examined the effect of a solar power development that discharged its stormwater into a cold-water trout stream tributary of Cranberry Meadow Brook (CMB). WT was monitored before the solar site was cleared, during its construction, and finally during its initial operation. Using records of local precipitation along with the WT information, we found that the solar power development, which apparently lacked robust stormwater discharge controls, significantly affected the tributary stream, including warming WTs. However, overall, there were no significant effects to the WT of CMB downstream of the tributary confluence after the solar power project was completed and in operation.

A second study examined the possibility of using WT records to estimate the relative contributions of CMB, a cooler tributary of Latimer Brook (LB), and that of the somewhat warmer upper LB to their combined flow in downstream LB. This information is of important in the NRWC's assessment of nitrogen flux into the Niantic River, as nitrate contributions differ between these two streams. Using a simple regression model with the long-term WT data we found that upper LB contributed about 62% and CMB 38% of their combined flow in lower LB. We also interpreted model residuals to note effects likely related to winter icing, summer sun exposure, and drought conditions affecting stream flow. We conclude that simple long-term WT monitoring using reliable recorders can answer specific questions provided that a study design is carefully constructed and implemented.

C6. Establishing Monitoring Networks for Coastal Acidification

Room D221

Parker R. Gassett, *University of Maine*
Katie O'Brien-Clayton, *CT DEEP Long Island Sound Monitoring Program*

Nearshore environments in the Northeastern United States and the communities that rely on them are uniquely vulnerable to ocean and coastal acidification (OCA). Existing networks of volunteer and citizen science water quality monitors in the Northeast United States are now well positioned to contribute to acidification research. Relating marine habitat protection, nutrient pollution control and watershed management efforts to involve current understanding of coastal acidification processes in the near shore environment offers new opportunities for mitigation and adaptation. However, we lack comprehensive monitoring at spatial and temporal scales needed to characterize OCA in the context of coastal variability and to provide actionable information for managers. Therefore, crowdsourcing comparable water quality measurements related to OCA offers an opportunity to expand regional observations. Based on the 2018 publication of the EPA "Guidelines for Measuring Changes in Seawater pH and Associated Carbonate Chemistry in Coastal Environments of the Eastern United States", we conducted a series of on-line and hands-on workshop trainings in Connecticut, Massachusetts, and Maine with stakeholder groups and more than 40 community water monitoring programs, focused on approaches for calibrating pH measurements and expanding sampling of total alkalinity and dissolved inorganic carbon. Here, we summarize efforts facilitated by NECAN (Northeast Coastal Acidification Network) to establish these new frameworks for regional ocean and coastal acidification monitoring that link citizen science activities with Federal, State, and private research capacity.

C7. From Green to Clean: Four Decades of Lake Science

Room D224

Sean Hayden, Lake Waramaug Task Force

The Lake Waramaug Task Force is a non-profit organization of volunteers and scientists that provides leadership in restoring and maintaining the ecology and water quality of Lake Waramaug and its watershed. Our presentation will examine what has worked and what has not when bringing the lake back from the brink. Also we will review how we are getting more "eyes on the lake" to minimize the negative human influences on lake water quality.

C8. Cyanobacteria Monitoring Pilot Project: Roseland Lake (Woodstock, CT)

Room D226

***Jean Pillo**, The Last Green Valley*

Harmful Algae Blooms caused by cyanobacteria (blue green algae) are an increasing concern in lakes and ponds. In bloom concentrations, certain cyanobacteria types may produce cyanotoxins that are a human health risk. Decaying cyanobacteria can increase the biological oxygen demand in the water, depleting dissolved oxygen concentrations leading to fish kills.

In 2018, The Last Green Valley volunteer water quality monitoring program initiated a pilot project to track the relative abundance of cyanobacteria in Roseland Lake, Woodstock, CT using protocols developed for citizen science monitoring by the US EPA's Cyanobacteria Monitoring Collaborative (CMC). There are three programs of increasing complexity developed by the CMC. The easiest to participate in is Bloom Watch, which involves a visual assessment of lake conditions using a smart phone app to report algae blooms. The CyanoScope program involves use of a plankton net to collect and then identification the types of cyanobacteria in the lake using a digital microscope. The images and georeferenced information were later uploaded to a dedicated iNaturalist site for verification of the identification and data sharing. The third program, CyanoMonitoring, involves water sampling and sample analysis for pigments associated with cyanobacteria collected at biweekly intervals over the summer season. Water samples were analyzed for the relative abundance of chlorophyll and phycocyanin using a fluorimeter.

This presentation will overview all three programs and demonstrate what we learned and what we didn't learn about Roseland Lake using these techniques, review the time commitments of the various procedures and how we plan to expand the program going forward.

C9. How Water Quality Data can be used to Effectuate Change

Room E227

***Alicia Mozian,** Town of Westport; Sasco Brook Pollution Abatement Committee*

The Sasco Brook Pollution Abatement Committee, a collaboration between several government, non-government and private partners, was formed to address the pollution problems causing the closing of shellfish beds at the mouth of Sasco Brook. This presentation will provide an overview of the watershed and a discussion of why and how the Sasco Brook Pollution Abatement Committee was established. We will summarize our efforts to write a watershed management plan, highlight several of our land use management public outreach efforts, and review how water quality data was used to track down problems and measure results of management efforts. Today, the Sasco Brook watershed is greatly improved; we are excited to share our success.

AFTERNOON SESSIONS (D-F)

Concurrent Session D

D-F10. Monitoring to Influence and Support Municipal Decision Making: How Can (and Can't) Towns Use Volunteer Data? (Workshop/Panel Discussion) MPR *(*110 minutes)*

Moderators:

- ***Meghan Lally**, CT DEEP Volunteer Water Monitoring Program*
- ***Darcy Winther**, CT DEEP Inland Wetlands and Watercourses Program*

Panelists:

- **Hillary Kenyon,** *Northeast Aquatics (Professional Limnologist)*
- ***Alicia Mozian**, Town of Westport Conservation Director (Inland Wetlands Agent)*
- ***Lori Romick**, Town of Orange Health Department (Town Sanitarian)*
- ***Pat Young,** Salmon River Watershed Partnership (Watershed Group Coordinator)*
- ***Jennifer Yoxall,** Carmody Torrance Sandak & Hennessey LLP (Land Use Attorney)*

Volunteer water monitors are often the eyes and ears of the waterbodies in their local communities. Their efforts can both serve to protect waters from future degradation as well as alert authorities to water quality violations or concerns. When collected properly and communicated in the right way volunteer water monitoring has the power to make a real difference at the local level. Unfortunately, frustration often arises when municipalities aren't able or willing to consider volunteer data in the way the volunteer had hoped. This panel discussion aims to prevent such frustration by demystifying the municipal regulatory structure and offer tips for how volunteer data can effectively be used at the local level.

This workshop will begin with a primer on municipal water law, led by Jennifer Yoxall. Ms. Yoxall is a lawyer who specializes in land use law. She will review the major municipal land use and water commissions and their roles in town decisions. She will also discuss the criteria that an inland wetlands and watercourses agency can consider when reviewing permit applications and how volunteer data can and can't be used within the inland wetlands context.

A panel discussion will follow to address some common questions surrounding volunteer monitoring and municipal law. Participants will include a professional limnologist, a land use attorney, a municipal sanitarian, a municipal wetlands agent, and the coordinator of a watershed-based volunteer monitoring program. Topics to be addressed by the panel will include:

- What type of information can local commissions consider when reviewing a permit application?
- How can volunteer monitors work with their town agents to address suspected water-related violations?
- When do volunteer organizations need to partner with an expert?
- How can volunteer monitoring be used to inform local water protection and land use conservation efforts?

If you plan to attend this presentation, please feel free to submit any additional questions you'd like the panel to address to DEEP.VolunteerWaterMonitoring@ct.gov.

D-F11. Aquatic Invasive Plant Identification Workshop *(*110 minutes)* Room D105

***Greg Bugbee**, CT Agricultural Experiment Station*
***Summer Stebbins**, CT Agricultural Experiment Station*

Connecticut's lakes and ponds are among the State's most important natural resources. They provide wildlife habitat, drinking water, irrigation, hydroelectric power, scenic views, recreation, and highly desired waterfront real estate. Revenues associated with boating, fishing, and other purchases aid the State's economy. Value-added real estate taxes provide working capital for towns. In recent decades, invasive aquatic plants have spread to Connecticut's lakes and ponds severely threatening their water quality, ecosystems and economic value. Since 2004, the Connecticut Agricultural Experiment Station Invasive Aquatic Plant Program has assessed the severity of this problem through detailed vegetation surveys of over 250 water bodies. We have documented over 100 native and 14 invasive plant species. Approximately two-thirds of the lakes and ponds contained one or more invasive species. Eurasian watermilfoil, variable watermilfoil, fanwort, curly leaf pondweed (Potamogeton crispus) and minor naiad (Najas minor) are the most frequently found invasive species. New arrivals to the State include; hydrilla (Hydrilla verticillata), Water chestnut (Trapa natans) and Brazilian waterweed (Egeria densa). Statewide control efforts rely on prevention, detection and scientifically based management options. Prevention entails stopping the plants from entering waterbodies from boats, trailers, discarded aquarium contents and other means. Detection of plants in a lake while the population is small offers the possibility of control before they become a major problem. Both prevention and detection requires identification skills. This workshop will train citizen scientists in invasive aquatic plant identification. This workshop consists of a PowerPoint presentation that offers an overview of the problem and aquatic plant characteristics. Afterwards live invasive aquatic plant specimens will be on display for participants to identify.

D12. Make it a Festival! Project WET Room D126

***Doris Johnson,** CT Dept. of Energy & Environmental Protection*
***Sue Quincy,** CT Dept. of Energy & Environmental Protection*

Connecting water quality concepts with the public is a challenge. Project WET has helped provide educational materials for over 30 years. Using these and other resources you can engage participants of all ages in understanding the work and importance of water quality monitoring and involve them in resource conservation. This presentation will focus on the use of water festivals to engage with your community through school or public events. Learn about new Project WET resource materials and receive the Make a Splash training manual to help you plan for your next project. Project WET CT has expanded its resources and support of outreach educational methods to help you connect with your community. In the face of limited funding opportunities CT WET has focused on collective impact activities to support outreach education to schools and public. Learn how your organization can participate in water education outreach initiatives that bring awareness to action.

D13. Planning for Flood-Resilient and Fish-Friendly Road-Stream Crossings in the Housatonic River Watershed Room D206

***Lindsay Keener-Eck,** Housatonic Valley Association*

Within the Housatonic River watershed, there are thousands of points where roadways, driveways, and trails cross rivers and streams. Initial results of an ongoing study conducted by the Housatonic Valley Association (HVA) indicate that a relatively large proportion of the non-bridge road-stream crossings evaluated to date in the watershed are barriers to fish and wildlife movement and are likely to fail (i.e., water over the road) in a 25-year recurrence interval flood or less. Given this number of problem structures, a strategic approach to restoring habitat connectivity and reducing flood risk at road-stream crossings is necessary. In 2015, HVA began a pilot project to develop town-specific Road-Stream Crossing Management Plans in seven towns in Northwest Connecticut. The primary objectives of this work are to: 1) help communities identify highest priority replacement projects based on conservation value, flood risk, and maintenance need, 2) encourage adoption of culvert design Best Management Practices, and 3) create a new tool for securing financing for replacement projects. As part of this process, HVA staff conducts field assessments of every road-stream crossing structure in the target town using standardized protocol developed by the North Atlantic Aquatic Connectivity Collaborative (NAACC). These field assessments can be done with the aid of volunteers. After data

collection and analysis, HVA works with the towns to prioritize structures, develop implementation strategies for the highest priority replacements, and integrate assessment results into local highway infrastructure and hazard mitigation planning. Even more important than the construction of a flagship replacement project in each town is the opportunity to show local highway managers and decision makers that the same best management practices that restore fish and wildlife passage also reduce flood risk and long-term maintenance costs. Replacing problem culverts with structures that conserve natural stream processes is a single solution that can increase the climate resiliency of both the built and natural environment.

D14. Natural Resource Maps on the CT ECO Website

Room D211

***Emily H. Wilson**, University of Connecticut CLEAR*
***Cary Chadwick**, University of Connecticut CLEAR*
***David Dickson**, University of Connecticut CLEAR*

The Connecticut Environmental Conditions Online (CT ECO) is a website that houses and serves most of Connecticut's statewide, natural resource geospatial layers as well as all of Connecticut's digital statewide, aerial imagery (18 datasets spanning nearly 30 years) and elevation data. The maps are provided in multiple formats intended for all levels of users from static pdf maps and interactive viewers to web services and data download. CT ECO includes water resource information and data viewers that may be useful for resource management and monitoring efforts. Data layers, such as water quality and topography are available in viewers like the Advanced Viewer and Elevation Viewer. A recent addition to CT ECO is the MS4 Viewer which includes information on stormwater impaired waterbodies. The presentation will introduce and demonstrate resources available on CT ECO with an emphasis on water. CT ECO is a collaboration between the University of Connecticut Center for Land Use Education and Research (UConn CLEAR) and the Connecticut Department of Energy and Environmental Protection (CT DEEP).

D15. IEC's Coordinated Volunteer Pathogen Monitoring

Room D221

***Jessica Bonamusa**, Interstate Environmental Commission*
***Evelyn Powers**, Interstate Environmental Commission*

The Interstate Environmental Commission's (IEC) coordinated volunteer monitoring program is intended to empower and engage citizens in the management of water quality issues that have an impact in their communities, while producing high-quality data. Volunteer monitoring (also referred to as citizen science) is an opportunity for people in communities to participate in scientific investigations, such as ambient monitoring surveys. Volunteers from community groups collected pathogen samples to better understand their environment and address local issues of concern. The program targeted areas that are not routinely monitored by regulatory agencies or other established monitoring programs. Samples were taken by volunteers along publicly-accessible shoreline areas and in tidal creeks. In addition to routine water quality parameters (such as Dissolved Oxygen, Temperature and Salinity) analyzed in-situ by volunteers, the program included collection of samples that were transported to the IEC's laboratory for analysis of pathogen indicators (Enterococcus and fecal coliform). Outputs included expanded monitoring in areas used for recreation on or near water, and publicly available high-quality data that may indicate "hotspot" areas needing follow-up monitoring and further attention, including track down efforts. IEC provided assistance in project design, sampling site selection, hands-on field sampling training, supplies and equipment, and provided QA/QC oversight for the project. Laboratory analyses for pathogens were conducted in the IEC laboratory located in Staten Island, New York, by NEIWPCC IEC District staff.

D16. Using Smartphone Apps to Inform Stakeholders of Lake Management Issues

Room D224

***James Fischer**, The White Memorial Conservation Center, Inc.*

Bantam Lake is a premiere recreation destination within the state of Connecticut and like many other lakes, it has important environmental issues that impact recreation and conservation decisions. Bantam Lake experiences cyanobacteria (a.k.a. blue-green algae) blooms annually which require the use of chemical treatments for control. Cyanobacteria concentrations can change rapidly and force local officials to restrict lake usage (i.e. beach closures). In addition, several invasive plants inhabit the lake and require the use of herbicide for effective control. These

management efforts ultimately prevents the need to restrict lake access, but it also requires that timely and effective communication tools are developed to inform stakeholders. Stakeholders can make informed recreation decisions when provided with information that educate them about the factors that contribute to these highly dynamic environmental issues. Any communication tool that is developed should encourage stakeholders to participate in the data collection so that they can contribute to the project and increasing stakeholder engagement. The Bantam Lake Protective Association and White Memorial Conservation Center developed My Bantam Lake as a communication portal that provides up-to-date forecasts of cyanobacteria activity and other lake management issues via a website and smartphone app. Data collected by limnologists contracted by BLPA is published at http://mybantamlake.org. The information is presented using a variety of icons, charts of basic lake measurements, and then followed by a more detailed analysis. Thereby encouraging stakeholders to make informed recreational decisions using information about the current state of the lake. The website also informs visitors of the health risks associated with blooms and the daily decisions they could make to reduce their impact on the lake such as excess nutrient run-off, which aids the bloom growth and formation. Stakeholders upload images of blooms and scums, thereby turning them into citizen scientists and alerting lake managers of changes to the lake. We will review usage statistics for these communication portals which indicates the relevance of these tools to stakeholders.

D17. Monitoring Streamflow with Trail Cameras

Room D226

***Melissa Czarnowski**, CT DEEP Bureau of Water Protection & Land Reuse*

How do you monitor streamflow without a stream gage? DEEP's solution: trail cameras. Pictures are data. Trail cameras provide qualitative and semi-quantitative data that allow us to monitor the change in streamflow over time. Trail cameras are most commonly used to capture wildlife by a motion-detect setting. They can also be set to take pictures at specific times each day. DEEP has developed a method using the images to rate the streamflow into categories ranging from dry up to flood. With this method, we can analyze the change in streamflow over time. In addition, a database has been developed to manage and query the images. This presentation will describe how to use a trail camera for monitoring streamflow, tips, and our lessons learned. A few topics that will be discussed include battery usage, the importance of high quality photos, field tips, and data management.

Concurrent Session E

Talks D10 and D11 continue into Session E (and F); refer to the abstracts on the previous pages for information on these talks.

E-F12. Lessons Learned from More than thirty Years of Volunteer Monitoring

Room D126

***Elizabeth Herron**, University of Rhode Island (URI) Watershed Watch*

URI Watershed Watch (URIWW) shares lessons learned over three decades running a large statewide (and then some) volunteer water quality monitoring program for not only lakes and ponds but rivers, streams and salty sites. How did we figure out the what, where, when, how and who? Who to partner with and how to meet diverse goals? How to fund a long-term cost-effective program that many think should be free (after all aren't they volunteers)? How to figure out and meet data quality objectives? We will share information and links to resources to help guide the development of new or expansion of existing volunteer monitoring programs. If there's time we'll examine monitoring results from some of our long-term sites, emphasizing the value of these unique datasets. As one of Rhode Island's oldest and largest volunteer monitoring programs, URIWW has worked with a wide range of local groups to help them answer their water quality questions. Recognizing that watersheds don't respect boundaries, URIWW has worked with groups in Connecticut for decades, and is always looking for opportunities to share resources and ideas! A Cooperative Extension housed program, we have been fortunate to help facilitate citizen scientists throughout New England and the nation, so have a broad range of knowledge and experiences to discuss.

E-F13. Opportunities for Students in Watershed-Level Investigations and Partnerships (*70 minutes) Room D206

***Tara Jo Holmberg**, Northwestern CT Community College*

This session will illustrate how students can become involved in watershed-scale investigations by using examples from the ecology, botany, and environmental science courses at Northwestern Connecticut Community College (NCCC).

The smallest community college in CT, NCCC is small, rural, and socioeconomically stressed, but encompasses the largest service area, as compared to the other 11 community colleges of the state. It is in the midst of some of the largest tracts of protected land and water in CT, as well as some of the more polluted, leading to many opportunities for study. NCCC's student demographics tend older than a traditional college student body; enrollees have a wide variety of backgrounds in science and connection to nature. With these opportunities and challenges in mind, the STEM Department and the Natural Resources program have committed to reconnecting students with nature, the EE curriculum, and their communities through place-based service learning (SL) and citizen science (CS).

During the session, four types of SL/CS projects in courses at Northwestern Connecticut Community College will be discussed: longitudinal monitoring studies of two local rivers; a campus-based LID project that started in 2009; an undergraduate research project on local brownfields and their impacts; and a watershed-based forest study linked to a national research effort. These citizen science activities are linked together in a holistic, watershed-based model for students who take all courses in the Natural Resources program. However, each project also exists as a stand-alone endeavor with its own learning outcomes for a particular course.

The details of each of these projects will be described including: role of the projects in formal courses, project beginnings and sustainability, integrating quality control into the collection process, usage of the data, outcomes and assessment of the various projects, funding approaches and community partners associated with each venture, and the role of student reflections in the integrated experience. In addition to these elements, strategies for other educators and community partners to develop similar relationships will be discussed. Finally, attendees will be given a brief overview of the philosophy of service-learning (SL) and citizen science (CS) and why these fit particularly well within the scope of EE. The specific benefits of SL/CS within these fields will be highlighted as well as some of the challenges that should be identified and addressed before embarking on this type of project.

E-F14. Many Projects, One App: Simplifying Your Citizen Science Data Collection with EpiCollect 5 *(*70 minute workshop)* Room D211

***Cary Chadwick**, University of Connecticut CLEAR*
***David Dickson**, University of Connecticut CLEAR*

If you're still using clipboards, handheld GPS units, pencils, cameras, or notebooks to collect your monitoring data, then this presentation is for you! Mobile applications for smartphones and tablets have created a whole new class of citizen scientists. These apps have simplified data collection and have made it easier to coordinate volunteer monitoring efforts. This presentation will show you how to use Epicollect5, a free, multi-platform (iOS & Android) citizen science mobile app and website to improve the outreach and efficiency of your monitoring projects. The application empowers you to create robust forms using a simple, web-based form builder and deploy them to multiple mobile devices for offline data collection in the field by an individual, team, or the public at large. Epicollect5 provides free and unlimited data storage and visualization tools (map, tables, and charts) and allows for export to tabular or spatial formats. This presentation will teach you how to create a form, share it, collect data using your device, view and download the data on the web, and display it on the Epicollect5 website and Google Maps. Audience participation is encouraged (but not required), so be sure to bring along your cellular compatible smartphone or tablet.

E15. Unified Approach to Water Quality Monitoring Long Island Sound Embayments

Room D221

***Elena Colón**, Save the Sound*
***Bill Lucey**, Save the Sound*

Historically, it's been difficult to compare water quality conditions in the Sound's many inlets because the monitoring work is conducted by different groups with different monitoring approaches. Launched by Save the Sound in 2017, The Unified Water Study: Long Island Sound Embayment Research (UWS) is a water quality monitoring protocol developed so local monitoring groups around Long Island Sound can collect comparable data on the environmental health of our bays and harbors. Participating groups are provided with monitoring equipment, training, Standard Operating Procedures, a custom study design for their monitoring locations, inclusion in an EPA-approved Quality Assurance Project Plan (QAPP), and other resources they need to successfully collect high quality monitoring data. This groundbreaking water testing program will dramatically increase available data on the health of Long Island Sound. The data will further our understanding of the Sound and inform and support our actions to preserve and protect it.

E-F16. Citizen-Led Environmental Observatory (CLEO): A Volunteer Lake Monitoring Program Template *(*70 minute Workshop)*

Room D224

***Dr. Jen Klug**, Fairfield University*
***Rebekah White**, Friends of the Lake*

CLEO, Citizen Led Environmental Observatory is a dock monitoring program for lakes. CLEO was developed through a collaboration between Fairfield University professor Dr. Jen Klug and Friends of the Lake on Lake Lillinonah. We have developed a tool kit for implementing a water quality monitoring program for use by community-based organizations in partnership with local public health departments, local non-profit environmental organizations, or academic institutions. The CLEO protocol was developed to monitor algal blooms in Lake Lillinonah but could be readily adapted for use in other systems or to monitor other concerns. Specifically the kit details methods for measuring the presence of algal blooms (e.g. water clarity and water color) as well as variables that contribute to algal growth (e.g. water temperature and nutrient concentration). We will share our training kit which includes a full power point training presentation, starter data sheets and protocol sheets for each monitor to refer to while performing their data collection independently in the field. The power point presentation, which can be modified as needed, allows any organization to consistently and easily conduct their own annual quality assurance training. The initial program requires minimal low-cost tools which we will demonstrate during the presentation. We will also demonstrate how we utilize and present our data yearly. This program can easily be used in conjunction with other monitoring programs such as the EPA Cyanobacteria Collaborative. Our program started with one dedicated monitor at one site and will continue into its 13 year this season with five dedicated sites and numerous volunteers. Join us to learn how you can be the initial monitor and voice for your lakes health.

E-F17. Vernal Pool Identification, Ecology and Monitoring Workshop *(*70 minutes)*

Room D226

***Ed Pawlak,** Connecticut Ecosystems, LLC*

Vernal pools provide breeding habitat for a diverse suite of amphibians, some of which are state-listed. The presentation will focus on basic elements of vernal pool identification and ecology. Lessons learned from a multi-year vernal pool monitoring program conducted by members of the Connecticut Association of Wetland Scientists will be presented. Benefits of a "citizen science" vernal pool monitoring program will be discussed.

E-F18. Workshop on Plankton Collection, Evaluation and Data Recording in a School Curriculum *(*70 minutes)* Room B210 (Lab)

***Sara Jannott**, Mill River Wetland Committee*
***Nicole Nuttall**, Mill River Wetland Committee*
***Carrie Rullo**, Mill River Wetland Committee*

Mill River Wetland Committee, Inc. (MRWC) is a non-profit organization devoted to strengthening environmental science education and developing general public understanding through the study of river basin systems. MRWC's primary product is the River-Lab Program, a unique hands-on science inquiry program of environmental education. Through participation in classroom learning activities and local hands-on study-trips, students in grades 3 thru 7, with adult volunteer guides, experience science as it directly affects their community. MRWC writes and provides teacher manuals, student books and classroom activities, creates and provides extensive training for four consecutive study-trips and is available for professional development for teachers. The outdoor study-trips to the local river or estuary are central to the students' and volunteers' application of scientific study. The program has been designed around inquiry-based science curriculum and small group instruction, in line with the student-led learning methodology of the Next Generation Science Standards.

This workshop will demonstrate the 5th grade laboratory investigation portion of MRWC's River-Lab Program. Attendees will use microscopes to identify and record freshwater plankton on data sheets. Excellent specimens will be projected onto a large screen using a compound microscope fitted with a FlexCam. Plankton and insect larvae commonly found in the Mill River in Fairfield will be discussed. The ability to expand the program for long term data collection and/or water monitoring for more advanced grade levels will be explored.

In addition to these observations, central concepts of the workshop are:

- Using plankton discovery to understand the role of seasons, weather, and human impact on the health and productivity of ecosystems.
- The role of plankton as the basis of the food chain;
- The significant contribution of phytoplankton to the production of oxygen on earth; and
- The importance of preserving slow moving, backwater areas to allow plankton to flourish.

Concurrent Session F

Talks D10, D11, E12, E13, and E14 continue into Session F; refer to the abstracts in Sessions D and E for information on these presentations.

F15. Protecting and Improving Water Quality in Norwalk Harbor Room D221

***Geoffrey Steadman**, Norwalk Harbor Management Commission*
***John Pinto, Ph.D.,** Norwalk Harbor Management Commission*
***Tony Mobilia,** Norwalk Harbor Management Commission*

Over the past 25-years, the Norwalk Harbor Management Commission and Norwalk Shellfish Commission (NSC) have collaborated to protect and improve water quality in Norwalk Harbor through sponsoring water quality monitoring programs. The priority to establish water quality monitoring programs is set forth in the locally-adopted and state-approved Norwalk Harbor Management Plan (the Plan). Both Commissions work jointly with the Mayor's Water Quality Committee on water quality initiatives, giving special attention to reducing storm water pollution and effluent runoff into Norwalk Harbor. Of particular significance is the effect of water quality on Norwalk's shellfish resources, recognized throughout the state as being of exceptionally high value for commercial and recreational purposes and of singular importance in Long Island Sound. The Plan encourages and supports implementation of feasible measures to protect and improve surface water quality and establishes policies for reduction, elimination, and mitigation of point and nonpoint sources of pollution. The Plan includes the City's most detailed and enforceable water quality policies,

including monitoring policies. The NHMC reviews all proposals with input from the NSC for consistency with the Plan especially with regard to water quality policies.

In addition, the NHMC conducts scientific studies that target water quality initiatives. The recent "Norwalk River and Harbor Bacterial Data Analysis Study," for example, includes analyses of a) NHMC-and NSC-funded data (collected by Earthplace Harbor Watch volunteers) from upstream in the Norwalk River, b) Bureau of Aquaculture data from the harbor, and c) rainfall and streamflow data that show the link between rainfall, elevated bacterial levels in the urbanized section of the watershed, and elevated bacterial levels in the harbor. Another major NHMC study, "Yankee Doodle Bridge Stormwater Assessment Study", was conducted in the course of the NHMC's cooperative efforts with the CT DOT during their plans to refurbish the I-95 Yankee Doodle Bridge over the Norwalk River. As a result of these efforts, the final bridge design includes storm water management measures to improve water quality. It is the NHMC's hope that similar engineered approaches can become the standard for other transportation infrastructure projects, with the same benefits to water quality in other Connecticut waterways and Long Island Sound. In 2019, the NHMC and NSC are working with the CT DOT to develop appropriate water quality monitoring protocols to be employed during CT DOT's multi-year project to replace the Metro-North Railroad Bridge over Norwalk Harbor, the largest infrastructure project in the city since I-95 was built. Through its water quality initiatives, including monitoring and data analysis efforts, the NHMC provides information to support science-based decisions to protect and improve water quality in Norwalk Harbor. In this regard, the NHMC's experience is instructive for other coastal towns.

Talks E16, E17 and E18 continue into Session F; refer to the abstracts in Sessions E for information on these presentations.