2019 CT Volunteer Water Monitoring Conference

STUDENT POSTER SESSION

Poster Citation

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Poster Information (Alphabetical by First Author's Last Name)

P1. Exploring Volunteer Accuracy in the RBV Program

Grace Berthiaume, *Portland High School*

This study analyzed volunteer data and verified state data from several different watersheds in the Riffle Bioassessment by Volunteers Program (RBV). The objective was to determine if there are organisms commonly misidentified by volunteers. The study also compared different years of RBV data to determine whether a change in the organism identification guide improved overall accuracy of volunteer macroinvertebrate identifications.

Grace (Gracie) Berthiaume is a senior at Portland High School. Last summer, she attended UConn's Natural Resources Conservation Academy's Conservation Ambassador Program (CAP), where she became interested in water monitoring. Through the CAP program she learned about the Riffle Bioassessment by Volunteers Program and became interested in her research topic. I am currently involved in the college applications and decisions process, and I hope to study Marine Biology at school.

P2. Long-term water quality monitoring at Long Wharf, New Haven (2012-2019)

Cassandra Bhageloo, *Southern Connecticut State University*
Mallery Breban, *Southern Connecticut State University*
Renee Chabot, *Southern Connecticut State University*

Long Island Sound is an ecologically diverse environment, rich with varied marine ecosystems that provide important environmental and recreational services for Connecticut residents. However, despite its ecological and environmental importance, water quality throughout the Sound is vastly under-monitored, particularly in the vulnerable, densely populated coastal embayments. The Long Island Sound Unified Water Study recently highlighted the importance of expanding and integrating water quality monitoring efforts throughout the Sound to provide uniform, reliable near-shore monitoring data to watershed

managers and the broader scientific/technical community. Students and faculty of the Werth Center for Coastal and Marine Studies established a long-term water quality monitoring program at Long Wharf Pier, New Haven harbor in January 2012. Water quality testing at this location occurs once per week coinciding with high tide. Water quality and meteorological parameters measured include salinity (ppt), specific conductance (mS/cm), dissolved oxygen (mg/L), air and water temperature (°C), wind speed (m/s), relative humidity (%), light intensity (lux), secchi disk depth (m), and pH. The results of the six-year continuous water quality monitoring program will be presented and examined for violations of water quality criteria and overall trends in water quality parameters. Where appropriate, comparisons will be made to similar water quality results from other regional water quality monitoring programs (LISICOS buoy data; CT DEEP water quality monitoring).

Cassandra Bhageloo is an undergraduate at Southern Connecticut State University pursuing a BS degree in Chemistry. She also currently holds a minor in both math and biology and is working towards the successful defense of an undergraduate thesis. Cassandra's research examines the concentration of mercury in the Long Island Sound through the analysis of seven species of macroaglae with the potential to act as bioindicators for trace metal contamination. Cassandra joined the Werth Center for Coastal and Marine Studies as a fellow in 2016. Among other responsibilities, she supervises weekly high tide water quality measurements in New Haven Harbor to examine trends in the water quality of Long Island Sound.

Mallery Breban is a graduating senior at Southern Connecticut State University, pursuing a B.S. in Biology. Her primary research interests are in the fields of entomology and vector biology and she is working part-time at the CT Agricultural Experiment Station, New Haven CT. She has also been volunteering at the Werth Center for Coastal and Marine Studies for two years, performing regular facilities and animal maintenance as well as assisting in the Long Island Sound water quality research.

Renee Chabot is an undergraduate student at Southern Connecticut State University studying Environmental Chemistry (BS) since fall 2017. Renee has been working with the Werth Center for Marine and Coastal Studies since spring 2018. Her research examines the spatial trends in sediment metal contamination throughout the harbors of LIS. Renee also enjoys working in the Werth Center's marine aquarium and collecting New Haven Harbor water quality data.

P3. Oyster growth and survival on an artificial reef in New Haven Harbor

Chloe Chmelar, *The Sound School (New Haven)*
Peter Solomon, *The Sound School (New Haven) *Faculty Advisor*

Oyster reefs have been documented to provide valuable habitat structure and ecosystem services as well as socioeconomic benefits. Native reefs once dominated many estuaries ecologically and economically. Studies have shown depletion and degradation of oyster reefs worldwide. Reef Ball™ Modules (RBM's) are designed to mimic natural bottom structure and are being used to address a variety of environmental concerns. Initial investigations suggest that these artificial forms may have far reaching effects in habitat and species restoration efforts including; designing and growing artificial reefs, coral propagation and planting systems, estuary restoration, mangrove plantings, erosion control, and oyster reef restoration. Students and faculty at the Sound School built five Mini-Bay RBM's using oyster shell as a cement additive. In May of 2018 the aquaculture laboratory at the school successfully spawned oysters. After the spawn three RBM's were placed in a set-tank with 200 micron spat. The RBM's soaked for ten days. In June 2018 the RBM's, three with set and two unseeded, were deployed in nearshore waters by the school campus. This study focused on developing and enacting monitoring protocols for the newly formed artificial oyster reef to examine oyster growth and survival as well as species interactions with the RBMs. Student divers collected data on oyster growth through direct measurements and other species observations were logged. To date the three modules with oyster set have demonstrated successful oyster growth and survival over nearly their entire surface while the unseeded modules have no oyster growth. A variety of crab and fish species were observed using the seeded RBM's. Oyster growth and species interactions continue to be

studied and methods utilizing deployable cameras for more consistent monitoring of species use of RBMs is being investigated.

Chloe Chmelar is a student at The Sound School in New Haven, CT concentrating in environmental science and natural resources. As a junior she earned her open water scuba diving certification and became involved in schools reef ball project. During her senior year, Chloe took over responsibility for developing and enacting monitoring protocols of the schools newly formed artificial oyster reef. She hopes to continue studying biology next year at a university.

P4. Importance of citizen science on osprey populations

Melina Giantomidis, *University of New Haven*

The North American Osprey is an indicator species for fish populations in various bodies of water, including Long Island Sound, due to their diet comprising primarily of live fish. In the 1950's and 1960's, Osprey populations began to drastically decrease due to the insecticide Dichlorodiphenyltrichloroethane (DDT) and dichlorodiphenyldichloroethylene (DDE). DDT is an insecticide sprayed on plants which travels through run-off, leading to bodies of water. Once in water, the insecticide was bioaccumulated by fish that Osprey consumed (Fry 1995). DDT caused the failure to create calcium; leading to egg shell thinning or the inability to create healthy eggs (Fry 1995). Due to the decline of Osprey populations, Ospreys started increasing after the DDT ban. After 1972, Ospreys were monitored by Connecticut's Department of Energy and Environmental Protection where data was collected to view population and reproduction trends. Soon after, Osprey populations began to increase and CT DEEP started Osprey Nation in collaboration with the Connecticut Audubon Society in 2014. Osprey Nation is a citizen science program where stewards report data on the status of osprey nests all over the state of Connecticut. With the citizen science program, trends can be viewed to see if the osprey populations are increasing or decreasing and reproduction success. Stewards have also taken photos and kept note of prey selection of Ospreys throughout the state of Connecticut. A shift in Osprey diet may cause a cascade of effects in the food chain, affecting many other marine species.

Melina Giantomidis is a recent college graduate (2018) with a Bachelor's degree in Marine Biology. She is currently an intern at the Inland Wetlands and Watercourses Department of Greenwich Town Hall and is the Osprey Nation Coordinator for the Connecticut Audubon Society. In 2018, she completed her senior thesis "Seasonal Prey Selection of the North American Osprey (Pandion haliaetus) in Connecticut" from the University of New Haven.

P5. Stormwater runoff in Gorham's Pond

Isabelle Hole, *Darien High School*

As part of UConn's Natural Resources Conservation Academy Conservation Ambassador Program, a project was conducted to explore the effects of storm water runoff on Gorham's Pond in Darien, CT between September 2018 and January 2019. Several water quality parameters (temperature, dissolved oxygen, total dissolved solids, pH, nitrate, nitrite, salinity, and phosphates) were tested at four distinct locations on the pond. This poster explains the methods of obtaining and analyzing data, results, and how the findings may be used. Some of these ways include using data to prove that certain parameters are affecting the water quality of the pond, and providing data to local nonprofits such as the Friends of Gorham's pond in order to secure funding for cleaning up and protecting the pond. This project partnered with SoundWaters (Stamford, CT) for additional guidance.

Isabelle Hole is a senior at Darien High School. She plans to attend Southern Methodist University in Dallas, TX in the fall to double major in human rights and environmental science. Isabelle became involved in water quality testing and developed a passion for marine and environmental science while taking AP Environmental Science and participating in a year-long internship with SoundWaters in Stamford, CT. The internship focused on water quality research in the Long

Island Sound. Isabelle continued this by applying for and participating in UCONN's Natural Resources Conservation Academy's Conservation Ambassador Program, through which she completed this study. After college she is interested in pursuing an environmental law degree in order to become involved in environmental policy. She hopes to continue doing research as well.

P6. CFL volunteer secchi disk monitoring program

Hillary Kenyon, *University of Massachusetts*

The Connecticut Federation of Lakes (CFL) recognizes the importance of scientific data collection in the long-term management of Connecticut's inland waterbodies. Since 2003, the CFL has sponsored a volunteer secchi disk monitoring program. The program initially trained and equipped 51 residents to monitor water clarity throughout the season. Of these volunteers, approximately 35 lakes have since reported data to the CFL. The purpose of the monitoring program is to both educate and engage lake resident communities, and to also provide a continuous water clarity data set for as many lakes as possible through decades to come.

Hillary Kenyon received a B.S. Environmental Science degree from the University of Connecticut and is currently pursuing a M.S. in Soil Science at the University of Massachusetts. Hillary joined Northeast Aquatic Research in 2013 and has since fulfilled the North American Lake Management Society's qualifications to become a Certified Lake Manager. She is well versed in aquatic plant identification and water quality data analysis, and uses her experience as a consultant to help the Connecticut Federation of Lakes advocate for the protection of CT waters.

P7. Mobile phone based citizen science cyanobacteria monitoring

David Lu, *Brown University*
Annie Lu, *Harvard University*

Harmful algal blooms, caused by uncontrolled growth of cyanobacteria, release toxins into the environment that can cause illness to animals and humans that contact it. In 2008, the EPA estimated that Cyanobacteria causes over $2.2 billion in loss and damages in the United States per year. With rising temperatures due to global warming, the growth rate and season of cyanobacteria will increase, further exacerbating the problem. In order to better understand growth patterns, keep track of environments contaminated with harmful algal blooms, and keep civilians safe from cyanotoxin exposure, cyanobacteria monitoring has become one of the top priorities of the EPA. However, cyanobacteria can commonly be confused with non-toxic algae on the macroscopic level. Trained personnel are often required to observe water samples under a microscope to identify the presence of cyanobacteria. In order to aid volunteers in cyanobacteria identification, we developed an inexpensive cell phone-based cyanobacteria monitoring technology that can be used by civilians without any scientific training. We designed an image recognition algorithm trained for cyanobacteria identification and a $1 glass bead microscope that can be attached to any smartphone, converting it into real time cyanobacteria diagnosis instrument. We have successfully trained our cyanobacteria identification algorithm to recognize Microcystis, Aphanizomenon, and Woronichinia, with accuracy levels of 91%. Test result and test location data are sent from the cell phone to be visualized on a live map that marks all water sources where cyanobacteria contamination is present. This is a unique tool that opens up the possibility for crowdsourced cyanobacteria monitoring powered by the public, allowing for a drastic increase in data collection. Additionally, through use, the developed cell phone monitoring tool also educates the public about cyanobacteria and harmful algal blooms.

David Lu is a junior at Brown University, studying chemistry and computer science. David has years of experience working in microbiology and microscopy research, having conducted research on gene editing in tuberculosis bacteria at Brown University and protein imaging using Cryo-EM at the Lawrence Berkeley National Lab. By combining his

studies in computer science with his background with microscopy research, the idea of using cell phone based machine assisted detection of microbes was formulated. This would become the basis of H2Ok, of which he is the CEO and co-founder of. In the future, David hopes to pursue a career in water technologies or clean energy.

Annie Lu is a freshman at Harvard University studying Economics and Computer Science. She is the CFO and co-founder of H2Ok Innovations, and is in charge of market research, data analysis, and business strategy. When watching her friends partake in the long-standing Harvard tradition of jumping off the bridge into the Charles River, Annie was appalled by how polluted the river was. She discussed the issue with her brother David, and from that conversation, H2Ok was born. Annie wishes to pursue business and politics in the future. In the past, she has been greatly involved in social entrepreneurship, founding her own 501(c)(3) nonprofit BridgEd that addresses the socioeconomic gap in education by connecting low-income high school students to free college counselors.

P8. Mercury accumulation in urban park ponds: Has urbanization changed would-be wildlife habitats into ecological traps?

Shane McLaughlin, *Trinity College*

Ponds are ecologically important as centers for biodiversity, and those within urbanized watersheds typically have altered hydrology, morphology, and water chemistry. The accumulation of heavy metals, such as mercury (Hg), in subaqueous pond sediments has the potential to harm pond ecosystems, but the behavior of Hg in urban ponds is poorly understood. I investigated Hg accumulation in the sediments of seven urban ponds in Hartford County, based on approximately ten sediment samples per pond. Elizabeth Park Pond in West Hartford was found to have the largest mean sediment Hg concentration of the study ponds. I also investigated higher resolution spatial variability of Hg accumulation within the sediments of Beachland Park Pond, in West Hartford, Connecticut. This was done by directly analyzing for Hg the fine (<63 μm) fractions of 70 sediment samples, which were collected at 14 distinct sites around the pond's perimeter, in groups of 5 individual samples. Mean Hg concentration exceeded the Threshold Effect Concentration (TEC) at four sample sites, and the Probable Effect Concentration (PEC) at a site on the northeastern shore of the pond. An analysis of variance (ANOVA) and post hoc Tukey test revealed that mean Hg concentration at this site differed significantly from all other sites. The relative lack of variability among most sample sites was to be expected due to ubiquitous atmospheric deposition of Hg, and additional Hg sources must be considered for the four sites which all exceed at least the TEC. It is possible that flooding events cause water and contaminants to flow out of the nearby Trout Brook and into Beachland Park Pond. It is more likely that the accumulation of Hg in the northeastern pond shore is a result of prevailing regional wind patterns altering the deposition pattern, but more research must be done to investigate temporal variation in Hg concentration.

Shane McLaughlin is a senior Environmental Science student at Trinity College who has a passion for conservation. He has conducted research with Professor Amber Pitt at Trinity for over two years, including summer projects, as well as spending four months in Tanzania studying and doing research in wildlife management with the School for Field Studies in 2017. Shane previously presented research on mercury in urban ponds at the 2018 North American Congress for Conservation Biology, as well as numerous research symposia on Trinity's campus.

P9. Water quality monitoring at Batterson Park Pond

Alexander Merinov, *Avon High School*

This project involved collection and analysis of water quality data at Batterson Park Pond in Farmington, CT, as part of the University of Connecticut Natural Resources Conservation Academy, Conservation Ambassador Program (CAP). The goal of this project was to assess physical and chemical indicators of water quality at Batterson Park Pond in order to determine whether the Pond was adequate for recreation

and sports. Water quality data was collected from three areas at Batterson Park Pond on nine afternoons in October and early November 2018 and evaluated for TDS and pH. The results were quite promising in showing that the water at Batterson Park Pond is clean and fit for recreational use. Judging by the relatively high water quality there is a fair argument to be made that the Hartford Board of Parks and Rec should reopen Batterson as a state park.

Alexander Merinov is an 11th grade student at Avon High School. He became interested in research and in water quality issues after attending a summer camp organized by UConn's Natural Resources Conservation Academy (NRCA). He is also a member of the AHS crew team, which practices on Batterson Pond, the focus of his study. The Park surrounding the pond is poorly maintained, there is litter everywhere, and my crewmates and I had a lot of concerns about the water in the pond being polluted. Upon completing high school, Alexander intends to go to college to become a pharmacist.

P10. Elements of the Eightmile River watershed area that create healthy habitats for forest birds

Kelly Morgan, *Three Rivers Community College*
Lorenzo Enderle, *Three Rivers Community College*

The Eightmile River was signed into legislation as A National Wild & Scenic River System in 2008 by President George W. Bush, recognizing it as one of the nation's great river systems. From its smallest feeder stream, to the river itself, there is no other near-coastal river system between Boston and New York that is functioning much as it did before colonization. The Eightmile watershed contains all the elements that make for a healthy, natural river system. Much of the watershed is overlaid by the Lyme Forest Block, which in 2016 was recognized as an Important Bird Area by Audubon Connecticut, in partnership with the State of Connecticut Department of Energy & Environmental Protection. This 60,000 acre block includes wooded areas in six towns in southeast Connecticut (East Haddam, Colchester, Lyme, Old Lyme, East Lyme, and Salem) The woodlands in this region contain habitat that is important to the Cerulean Warbler and Wood Thrust. The worldwide populations of these birds are declining drastically, and the Lyme Forest Block Conservation Project is an effort to strengthen the conservation of this area and halt bird population declines. With over 150 miles of pristine rivers and streams flowing through this relatively undeveloped rural land, the Eightmile watershed contains numerous elements which create an enormous diversity of habitats for a wide variety of birds all year round. Elements will include the diverse habitats, food source, and native plants, etc.

Kelly Morgan is a non-traditional Environmental Engineering Technologies student at Three Rivers Community College. As an Assistant for Audubon Connecticut's Lyme Forest Block Conservation Project, Kelly is able to educate and share with others her love for birds, forests, and other natural resources in Southeastern Connecticut.

Lorenzo Enderle is an Environmental Engineering Technologies student at Three Rivers Community College. He is also an Assistant for Audubon Connecticut's Lyme Forest Block Conservation Project.

P11. The effect of nitrogen on the carbon utilization of microbial communities in different types of urban ponds

Meg Shah, *Glastonbury High School*

It has been established that the substrate utilization of microbial communities sampled from polluted wetlands significantly increases after treatment, however these studies have sampled from larger bodies of water and cannot account for more stochastic ecosystems such as urban ponds. In this study, 3 urban ponds of varying pond buffer radii (Arboretum Pond: 187.1m, Salmon Brook Pond: 59.5m, Eastbury Pond: .8m) were sampled from commercial and residential areas in Connecticut. The study measured the utilization of carbon sources using BIOLOG Ecoplate™ techniques to examine the effects of ammonium on

microbial communities that are crucial in nutrient cycling of urban ponds. Arboretum Pond experienced an overall decrease in carbon utilization after added ammonium, Salmon Brook Pond experienced little change, and Eastbury Pond experienced significant increases.

Meg Shah is a junior at Glastonbury High School. She is currently enrolled in a school program known as Advanced Research Mentorship (ARM). As an ARM participant, Meg is given release time every week to conduct authentic research at Connecticut College under the guidance of her mentor, Dr. Bernhard. In class, she is assigned to write research proposals and final research papers, communicate our project in grant-fund simulations, create a poster display, and compete in regional science competitions. This program has taught Meg incredible skills that many people her age do not have the opportunity to experience. She is excited to share her newfound knowledge with CT Volunteer Water Monitoring Conference attendees.

P12. How does water chemistry vary spatially in the Congamond Lake System?

Brooke Tillotson, *Suffield High School*

The objective of this study was to collect depth profile data in multiple locations in the Congamond Lake System to evaluate how the spatial differentiation in the health of the North, Middle, and South Ponds compare. The experiment consisted of sampling 64 sites in the Congamond Lake System by depth profiling from the surface to the bottom using a YSI Multi-Parameter water quality meter. The researcher canoed to each site, logged the GPS coordinate, wrote down observations, recorded the total depth using a Sonar Fish Finder, collected a water sample for turbidity analysis, and recorded data using the YSI probe for every meter in the determined site. Sites were tested for barometric pressure, temperature, conductivity, dissolved oxygen, and pH. The hypothesis that the three basins with the Congamond Lake System would vary from each other but would not spatially variate within themselves was reinforced by the data. Results indicated that each basin was individually different, but did not spatially variate within themselves. In addition, the collected data showed that the quality of the water degraded going north to south; therefore ranked from best to worst is as follows: North Pond, Middle Pond, and South Pond. The variation between basins most likely occurs because of isolation from concrete culverts. This data can be applied to future water quality data acquisition because the current method of collecting data by sampling one site per basin is sufficient, limiting time and energy.

Brooke Tillotson is a senior at Suffield High School and attends the Suffield Agriscience Program. Brooke is an active member of 4-H, District IV FFA President, and serves as Suffield High School's National Honors Society President. She attended the University of Connecticut Natural Resources Conservation Academy in 2017. She developed two community projects including a historical interactive map for the Windsor Locks Canal Trail as well as a study on the spatial variation and depth profile of the Congamond Lake System. Brooke will be attending Cornell University this all with a major in Environmental and Sustainability Sciences.

P13. Escherichia coli and total coliform concentrations around a sanitary sewer overflow in Trout Brook in West Hartford, CT

Lexi Zanger, *Trinity College*
Charlotte Robbins, *Trinity College*

Urban waterways throughout the world are polluted by industrial effluent, agricultural and stream water runoff, and untreated sewage. Escherichia coli (E. coli) and total coliform come from untreated sewage and are often measured to assess stream health. Hartford, Connecticut is a post-industrial city with an outdated sewer system that uses sanitary sewer overflows (SSOs) to prevent wastewater treatment plants from being overwhelmed during precipitation events. These SSOs release wastewater along with untreated sewage into Trout Brook, acting as a point source for E. coli and total coliform pollution. We

measured E. coli and total coliform concentrations in water samples around the West Hartford, CT SSO in Trout Brook. We measured temperature and stream flow to measure correlations with bacteria concentrations. We found that the SSO had significantly higher E. coli and total coliform concentrations than any of the other sites, indicating it is a point source of pollution in Trout Brook. We also found a positive correlation between E. coli and total coliform concentrations and water temperature. The US EPA has identified SSOs as dangerous to public and environmental health and has mandated the Metropolitan District to eliminate all SSOs by 2023. Until the West Hartford SSO is eliminated, Trout Brook must be continuously monitored, and the public must be warned, as E. coli concentrations exceeded federal and state recreational freshwater safety thresholds on multiple days that we sampled.

Lexi Zanger is an undergraduate at Trinity College. She majors in Environmental Science and minors in Legal Studies. Lexi is interested in environmental education and conservation.

Charlotte Robbins is an undergraduate at Trinity College. She is double majoring in Environmental Science and Urban Studies. Charlotte is interested in urban public health and climate adaptation.