Connecticut Department of Energy & Environmental Protection

Water Monitoring and Assessment Program

2019 Summary Report

Two planning documents guide the Water Monitoring and Assessment Program (the Program). The Connecticut Ambient Water Quality Monitoring Strategy 2015-2024 and Long Island Sound Comprehensive Conservation and Management Plan. These long term planning documents are implemented through an annual work plan and this update provides a summary of water monitoring activities conducted in 2019. This report highlights some of our accomplishments in 2019.

2019 was another very busy year in Water Monitoring! The Program was in the field, collecting samples from freshwater lakes and ponds, river and streams, and Long Island Sound throughout the year to support many Agency objectives. In addition, to meet our Federal Clean Water Act obligations, data collections supported the healthy waters studies, fish consumption advisories, the State Water Plan, impaired waters investigations, watershed management and planning, Long Island Sound Management activities, and the Blue Plan.

In 2019, the 2nd Volunteer Monitoring Conference was organized by staff. There were over 185 conference participants, representing nearly 100 different organizations across the state. This is nearly double the turnout from the first conference 5 years ago.

Emerging topics in water monitoring include cyanobacteria blooms, embayment monitoring, and PFAS. Cyanobacteria blooms in lakes and ponds continues to require significant Program resources to manage. The Program fielded over 350 technical assistance calls and emails during 2019 and this number is projected to increase with increasing public awareness of the topic. We were involved in Governor Ned Lamont's initiative to develop a statewide PFAS Action Plan which was released in November 2019 and we continue to work to develop a PFAS monitoring strategy for ambient waters. New initiatives in Long Island Sound embayments include a project to evaluate benthic macroinvertebrates to aid in our assessments, an evaluation of use of drones to map habitat such as eelgrass, and planning for an intensification of the National Coastal Condition Assessment that will give us data on 60 embayments in addition to the 22 stations that we will sample in the open waters of Long Island Sound in 2020.

Data management and visualization continue to be priority items for the Program. We completed a project to provide near real time visualization for lake profile data this year and continue to work on a project to show hypoxic volume in Long Island Sound. We will be building a new data management system in 2020 which will provide the foundation for future work to support activities in the Division. This is an exciting time and please look for updates on these projects in 2020!

Contents

Photo Credits

Front Cover (Clockwise from top left): Angler at West Branch Farmington River on Opening Day of Fishing Season (Chris Bellucci), Cyanobacteria bloom at Gardner Beach (DEEP staff), Research Vessel John Dempsey underway on Long Island Sound (DEEP staff), Trail Camera picture of coyote and ducks (DEEP staff).

Back Cover (Clockwise from top left): Two bucks duke it out at Whitford Brook captured by one of our trail cameras (DEEP staff). Jennifer Shirk, our Keynote Speaker at the 2nd Volunteer Monitoring Conference (Bob McDonald), Microscope pictures (100x) of cyanobacteria from summer 2019 at 100x- *Microcystis* from Rainbow Reservoir on July 3, 2019 (left), *Anabaena* and *Woronichinia* from Uncas Lake from July 2, 2019 (right) (Walter Tokarz).

Photo credits provided in parentheses
Report designed by: Peter Zaidel

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PROGRAM STAFF

Graham Stevens - Bureau Chief

Phil Trowbridge - Assistant Director

Christopher Bellucci - Program Supervisor

Ansel Aarrestad - Stream Monitoring, Lake Monitoring, Beach Monitoring

Mary Becker - Data Management and Visualization, Stream Diatom Monitoring

Meghan Lally - Stream Fish Community Monitoring, Stream Volunteer Monitoring, PFAS Monitoring

Tracy Lizotte - Windsor Water Lab Manager, Lake Monitoring, Cyanobacteria Technical Assistance

Matthew Lyman - Data Management, Long Island Sound Field Coordination

Katie O'Brien-Clayton - Long Island Sound Assessments, Long Island Sound Volunteer Monitoring

Christine Olsen - Long Island Sound Data Quality Assurance, Long Island Sound Plankton

Walter Tokarz - Clean Water Act Reporting, Freshwater Plankton, Lake Monitoring

Program collaborators

We thank the Following Partners that Provided Program Assistance in 2019!

CT DEEP- Pete Aarrestad, Mike Beauchene, Jenese Clark, Melissa Czarnowski, Brian Eltz, Janet Edwards, Corinne Fitting, Roz Grzywinski, Neal Hagstrom, Ali Hibbard, Angela King, Ed Machowski, Mark Parker, Laura Robbins, Tom Tyler, Laurie Valente, Brian Wilson

Connecticut Department of Public Health- Laura Apinis, Stewart Chute, Kim Holmes-Talbot, Sharee Rusnak**,** Brian Toal

New England Interstate Water Pollution Control Commission- James Ammerman, Maryann Dugan, Richard Freisner

Southern Connecticut State University- Steve Burian

United States Environmental Protection Agency- Ralph Abele, Britta Bierwagen, Tim Bridges, Corey Conville, Monique Dulac, Beth Edwards, Tom Faber, Mary Garren, Susan Holdsworth, Susan Jackson, Ed Kim, Katrina Kipp, Emily Nering, Laura Shumway, Hilary Snook, Diane Switzer, Mark Tedesco, Dwane Young

Diane Switzer of USEPA received an award at the 2nd Volunteer Conference for her role as Volunteer Coordinator for the New England states (Bob McDonald photo).

United States Geological Survey- Liz Ahern, Denise Argue, Janet Barclay, Karen Beaulieu, Guy Holzer, Brittney Izbicki, Kaitlin Laabs, Ben Letcher, Joe Martin, Jon Morrison, John Mullaney, Allison Roy, Tim Sargent

University of Connecticut- Mike Dietz, Todd Fake, Ashely Helton, Jim O'Donnell, Chris Perkins, Eric Shultz, Chris Sullivan, Penny Vlahos, Jason Vokoun, Mike Whitney

University of Hartford- Timothy Becker

**Western Connecticut State University-** Theodora Pinou, Ed Wong

We thank the Hard Working volunteer Citizen Scientists that Help Monitor our waters in Connecticut!

Collaborators

Program Highlights by the numbers

- The Water Monitoring and Assessment Team conducted Water Quality Sampling……..
  - **139** unique locations in **109** rivers and streams in **74** Towns representing **76** Subregional Drainage Basins
  - **22** lakes and ponds
  - **17** Water Quality Cruises on Long Island Sound that included **402** site visits
  - Connecticut State Park Designated Swim Beaches that included **1,264** water quality samples
- Monitored **40** stream site locations with trail cameras to support the State Water Plan and Clean Water Act Assessments
- Organized the 2nd Volunteer Water Monitoring Conference that had over **185** conference participants, representing nearly **100** different organizations across the state
- Coordinated with Volunteer Stream Monitors that contributed **125** macroinvertebrates samples and **95** temperature logger samples to our assessment process and increased public awareness of our stream work
- Responded to over **350** technical assistance inquiries from town officials and the public on water quality matters throughout the state
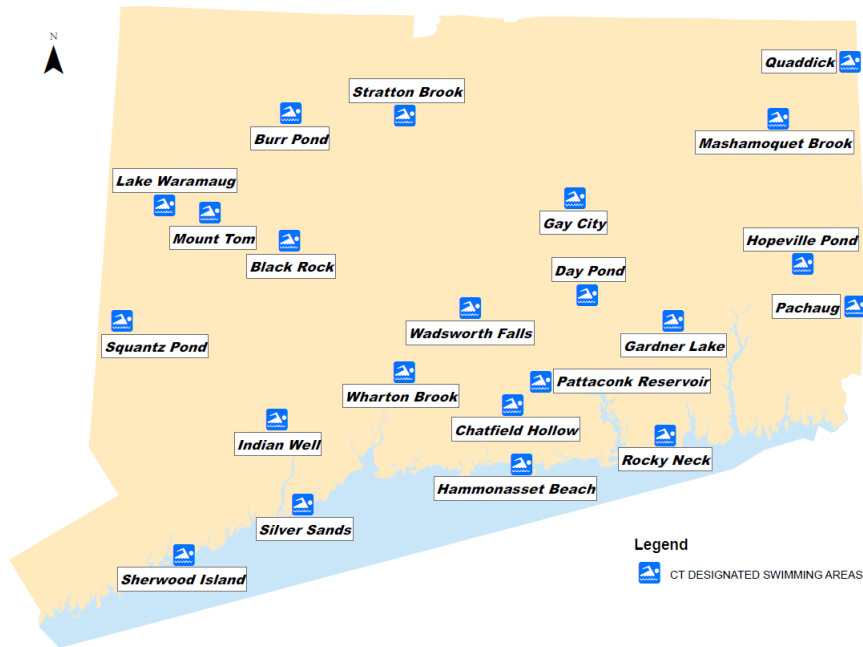
State Park Swimming Beaches

The Program continued to monitor 22 beaches located at our great State Parks. This program requires considerable effort to run and we could not accomplish this without the help of our fantastic Seasonal Resource Assistants. In 2019, we collected over 1,200 water quality samples to support this program.

Kettletown Beach was closed to swimming in 2019. Years of monitoring has confirmed that the water quality at Kettletown State Park is often poor and unsuitable for swimming which has resulted in frequent beach closures.

Dr. Mike Dietz of UCONN talks about large pervious pavers at a bus stop on Storrs Campus as DEEP staff Brian Wilson, Phil Trowbridge, and Tracy Lizotte look on (Chris Bellucci photo).

2019 Highlights

- Piloted a web application for beach surveys to electronically track environmental site conditions to evaluate a preemptive closure model and help inform sources of indicator bacteria for potential remediation

- Completed a walking tour of Low Impact Development at UCONN Campus with Dr. Mike Dietz

- Completed sanitary beach surveys at Gardner Lake, Gay City, Indian Well, and Wadsworth Falls

LONG-TERM MONITORING PROJECTS

STREAMS

Streams are one of the most studied and best understood water resources in CT due to our long term trends monitoring work. We conducted sampling at 109 rivers and streams in 2019. Our sampling includes water chemistry, water temperature, biological monitoring of fish, diatom, and macroinvertebrate communities. Our sampling is greatly enhanced by our cooperative network of USGS streamflow gages and our collaboration with DEEP Fisheries. Important data analysis continues to better define healthy waters and cold water habitat. Stayed tuned in 2020 for more on these topics.

A brown trout (top) and Atlantic salmon (bottom) from fish community sampling on the Pequabuck River, Bristol (DEEP staff photo).

A random selection of cobbles from Charters Brook stream bottom for diatom sampling (DEEP staff photo).

Sampling for benthic macroinvertebrates (Peter Zaidel photo).

Lakes

Water Quality sampling was conducted at 22 lakes and ponds in 2019 as we continued to expand our lake monitoring effort. The Program participated in a project to explore the use of sediment diatoms to assist with lake assessments. This is part of our Regional Monitoring Network for Lakes Workgroup that is a nice partnership with USEPA, several states, and Tetratech. We are also leading an effort using trail cameras to measure ice on and ice out for long term trend monitoring. We piloted this idea at Lake Wononscupomuc in Salisbury and also are evaluating a continuous water temperature buoy array at the deep hole location. These data will contribute to a regional data set to evaluate temperature stratification patterns at healthy lakes.

Lake Program staff Tracy Lizotte and Ansel Aarrestad sample the deep hole site at Lake Wononscupomuc, Salisbury, CT (Peter Zaidel photo).

A cyanobacteria bloom at Uncas Lake, Lyme, CT, from the air (A local resident provided the photo).

The topic of Cyanobacteria continues to be prevalent in the news and we are seeing more interest and questions from the public on this topic (see **Water Monitoring Technical Assistance** Section)

Cyanobacteria occur naturally in lakes and ponds throughout Connecticut. In ordinary circumstances, cyanobacteria cause no apparent harm, however warmer water temperatures and high nutrient concentrations may induce a rapid increase in their abundance. This response is commonly called a "bloom" because normally clear water becomes markedly green and cloudy. Cyanobacteria can produce a mix of toxins, including skin irritants and potent liver toxins, and thus pose serious health implications. The Program put considerable effort into helping lake communities following cyanobacteria blooms at Uncas Lake, Glasgo Pond, and Rainbow Reservoir this year.

LONG ISLAND SOUND

The John Dempsey cruising on the Connecticut River (DEEP staff photo).

A view of boats on a Long Island Sound embayment (Chris Bellucci photo).

Since 1991, the Program has conducted an intensive year-round Long Island Sound Water Quality Monitoring Program . From October to May, in situ data and nutrient samples are collected once a month from 17 sites. Data from the surveys are used to quantify and identify annual trends and differences in water quality parameters relevant to hypoxia (low dissolved oxygen), especially nutrients, temperature, and chlorophyll. These data are also used to evaluate the effectiveness of the management program to reduce nitrogen concentrations to measure attainment of the Long Island Sound TMDL.

- Seventeen Water Quality Cruises were conducted on Long Island Sound that included 402 site visits were completed in 2019 onboard the 50 foot Research Vessel John Dempsey.

- We are conducting a needs assessment of the RV John Dempsey with our Fisheries Division as the vessel is more than 30 years old. The Program has a unique partnership where our Marine Fisheries Program and Water Monitoring Program jointly use the same vessel to conduct our monitoring.

New Initiatives

- A project in cooperation with UCONN is underway to develop a method and computer visualization of the volume of hypoxia in Long Island Sound. This will enhance our hypoxia monitoring efforts and increase our understanding of hypoxia in the Sound.

- We are in the beginning stages of evaluating the use of benthic macroinvertebrate community as a biological addition to our embayment assessments.

PFAS (Per- and polyfluoroalkyl substances)

Governor Ned Lamont established the Connecticut Interagency PFAS Task Force in July 2019. This Task Force produced a PFAS Action Plan in November 2019. The Plan called on DEEP to develop and implement a strategy to monitor surface waters and fish tissue for PFAS. The Program, in consultation with Fisheries Division and the State Department of Public Health, is developing a sampling plan with the goal of implementing the plan in 2020. Look for more information on PFAS sampling in future summary reports.

Statewide Study of Mercury In Fish Tissue

A cooperative project with UCONN Department of Natural Resources and the Environment and New England Interstate Water Pollution Control Commission is underway to sample and analyze the mercury contamination in fish tissue of largemouth and smallmouth bass in Connecticut Lakes, repeating sites used in the previous two statewide assessments. In addition to providing a current snapshot of fish contamination levels and distribution patterns, the project will provide data for statistical comparisons of new and previous data to assess trends. This information will be used to inform the annual fish consumption advisory. Sampling started in 2019, will continue in 2020 and a summary report will be available in 2021.
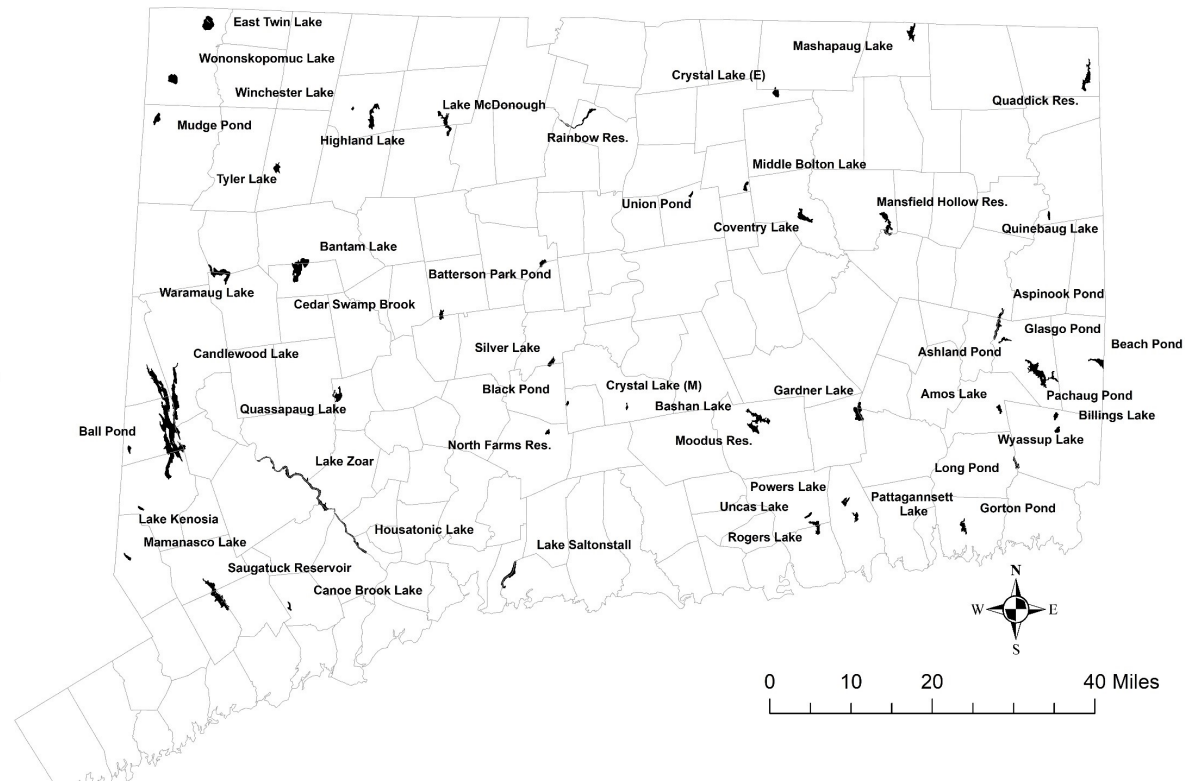
Lake and ponds that will be sampled for the mercury fish tissue study.

DEPLOYING TRAIL CAMERAS TO SUPPORT STATE WATER PLAN AND STREAM ASSESSMENTS AND MORE....

The Program monitored the amount of water in streams at 40 locations with trail cameras to support the State Water Plan and Clean Water Act Assessments in 2019. Through our pilot study which was initiated in 2016 with 7 sites locations, we have been able to grow the number of sites we are monitoring as well as our ability to interpret the images and make them useable data to summarize our findings.

In brief, our methodology includes classifying the images into 6 stream connectivity categories which enables us to calculate stream metrics and quantify and communicate our findings. We also began piloting using trail cameras to measure ice on/ice out at Lake Wonoscupomuc, Salisbury.

Melissa Czarnowski setting a trail camera to help monitor and assess stream connectivity (Peter Zaidel photo).

Trail cameras can be used to measure the onset of ice on lakes and also when ice goes out in the spring. These measurements can help us understand the factors that influence the annual variability in nutrient availability and cyanobacteria blooms (Chris Bellucci photo)
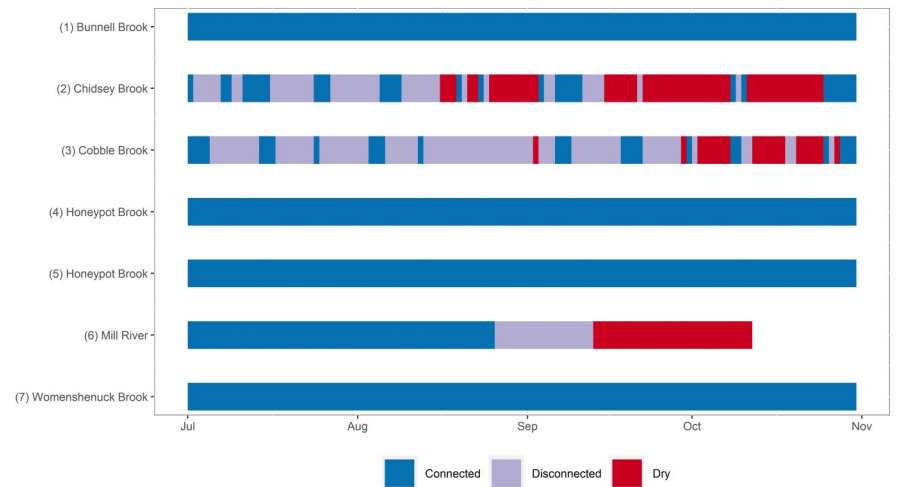
An example of stream connectivity metrics that can be developed from trail camera images at seven study sites from July—August 2017. Expect more detail on this methodology under development in 2020.

BUILDING DATA VISUALIZATION TOOLS

Uncas Lake was sampled by the Program on May 7, 2020 (DEEP staff photo).

An example of an automated data visualization tool for lake monitoring data that the Program is working to refine in 2020. These data were collected from a sonde used to conduct lake sampling at the deep hole location. We can provide near real time information on location of sampling, water temperature, and dissolved oxygen profile as well as important information like chlorophyll and phycocyanin, information important to managing nutrients and cyanobacteria blooms.

Uncas Lake

Sample Date: 5/7/2019

Secchi Depth (m): 1.8

Total Depth (m): 11.9

Acres: 69
Town: LYME
Drainage Basin: Eightmile River

SPECIAL PROJECTS
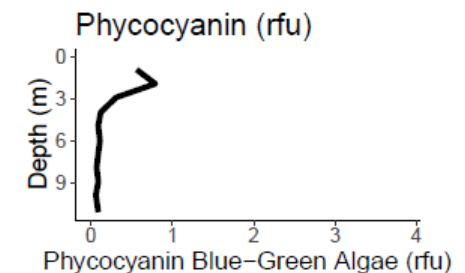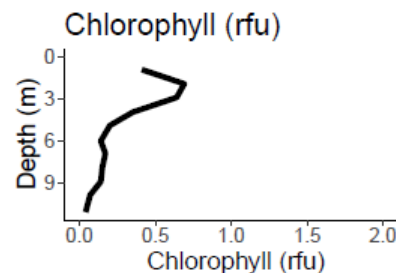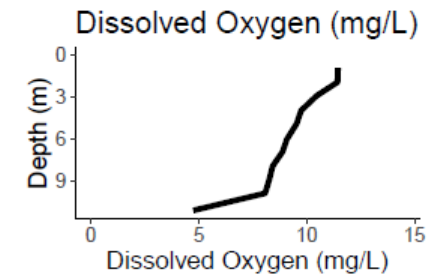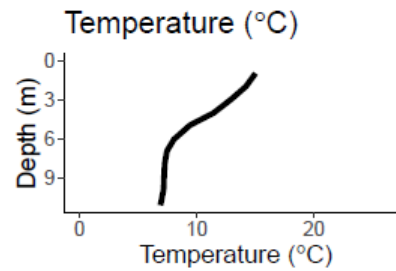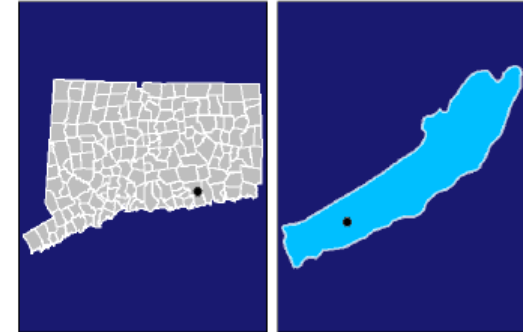
2ND VOLUNTEER MONITORING CONFERENCE, THREE RIVERS COMMUNITY COLLEGE, NORWICH, CT

The 2nd Connecticut Volunteer Monitoring Conference was held on Friday, April 5, 2019 at Three Rivers Community College. There were over 185 conference participants, representing nearly 100 different organizations across the state. This is nearly double the turnout from the first conference 5 years ago.

Meghan Lally and Katie O'Brien-Clayton were conference sponsors for DEEP. Dr Diba Khan-Bureau in the Three Rivers College Environmental Engineering Program graciously provided the space for the conference and many thanks to her students for helping to make the conference run smoothly!

Many thanks to the Conference Advisory Board for their contributions and making this conference a great success!

Jane Brawerman- CT River Coastal Conservation District

Sarah Coccaro- Town of Greenwich Conservation Commission

Sarah Crosby- Harbor Watch

Tom Fahsbender- Washington Montessori School

Mike Jastremski- Housatonic Valley Association

Alisa Phillips-Griggs- Farmington River Watershed Association

Fran Pijar- Clean Up Sound and Harbor

Paul Shafer- Candlewood Valley Trout Unlimited

Peter Van Dine- Friends of Bolton Lakes

Rebekah White- The Connecticut Federation of Lakes

Pat Young- Salmon River Watershed Partnership

Congressman Joe Courtney gives opening remarks at 2nd Volunteer Monitoring Conference (Bob McDonald photo).

Shell Day

The Program helped to organize the first ever "Shell Day" to monitor for the effects of ocean acidification. Ocean acidification is the term used to describe the lowering of the pH of the ocean due to climate change. This event was part of a Northeast Coastal Acidification Network regional effort stretching from New York to Maine. Monitoring teams collected 500 samples for total alkalinity analyses from 100 unique sampling sites. Program staff facilitated the sampling event for eight groups in Long Island Sound (four in Connecticut). The data will help DEEP to assess the extent and potential impacts of ocean acidification in Long Island Sound and Connecticut's harbors and bays.

Participants at the NCLI® Great Park Pursuit event at Chatfield Hollow check out some of the live macroinvertebrates we use to assess stream health (Chris Bellucci photo).

No child Left Inside® Great Park Pursuit

The Program participated in the No Child Left Inside® Great Park Pursuit Event in May 2019 at Chatfield Hollow State Park. We set up "touch stations" with live macroinvertebrates and microscopes to educate event participants on the importance of biological indicators and stream health.

River doctors Tracy Lizotte and Walter Tokarz at the NCLI® Great Park Pursuit event at Chatfield Hollow (Pete Zaidel photo).

OUTREACH

Presentations at Technical Meetings in 2019

"Temporal variation in benthic algal assemblages and biomass in streams along a nutrient gradient in Connecticut: Implications for bioassessment" Karen Beaulieu and Mary Becker presented at Northeast Aquatic Biologists Meeting, Saratoga Springs, NY

"Transforming hourly flow habitat images into a knowledge base for assessment" Joseph Spada, Nick Muise and Mary Becker presented at Northeast Aquatic Biologists Meeting, Saratoga Springs, NY

"*CT DEEP's Volunteer Water Monitoring Program: How Rebranding a 15-Year Old Program Doubled Data Usability and Tripled Program Efficiency*" Meghan Lally presented at Northeast Aquatic Biologists Meeting, Saratoga Springs, NY.

"Turning Data into Information to Influence Water Management Policy: Examples from Connecticut."
Chris Bellucci presented at Northeast Aquatic Biologists Meeting, Saratoga Springs, NY.

"Using Trail Camera Images to Evaluate Stream Flow-Habitat Connectivity" Chris Bellucci, Mary Becker, Melissa Czarnowski and Corinne Fitting presented at Connecticut Conference on Natural Resources, Storrs, CT

"20 years of bug-based volunteer water quality monitoring" Meghan Lally presented at Connecticut Conference on Natural Resources, Storrs, CT

"Monitoring Water Quality & Inventorying Stream Biology: DEEP Partnership Opportunities" Meghan Lally presented at 2019 Connecticut Land Conservation Conference, Middletown, CT

"Creating and Growing a Cyanobacteria Monitoring Program in Connecticut to Inform Public Health Decisions at Beaches" Walter Tokarz, Tracy Lizotte, Ansel Aarrestad, Mary Becker, and Chris Bellucci presented at North American Lake Management Society meeting, Burlington, VT

"Using Trail Camera Images to Evaluate Stream Flow-Habitat Connectivity" Chris Bellucci, Mary Becker, Melissa Czarnowski and Corinne Fitting presented at National Monitoring Conference, Denver, CO.

"Turning Data into Information to Influence Water Management Policy: Examples from Connecticut."
Chris Bellucci presented at National Monitoring Conference, Denver, CO.

"Cyanobacteria in CT's Lakes: What Can We Do to Help Manage the Water Quality of Our Lakes?" - Tracy Lizotte presented at Western Connecticut State University, Danbury, CT
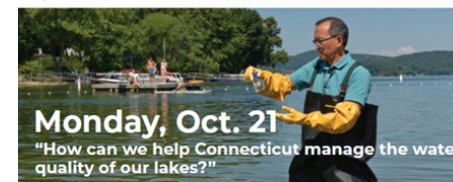
"CT DEEP's Lake Monitoring and Assessment Program" Chris Bellucci presented at Western Connecticut State University, Danbury, CT

Water Monitoring Technical Assistance

Our Monitoring Program continues to grow its public interface by providing technical assistance related to water quality monitoring. The Program fielded over 350 inquiries from the public either by email or telephone. A technical assistance inquiry, represented by the bars in the chart, is single "touch" by email or phone call. Technical assistance conversations can go on for weeks or even months on the same subject matter, for example, a cyanobacteria bloom.

Technical question about lakes is by far the most common. Most lake inquiries are about cyanobacteria blooms as the relate to water quality, swimmer health, and recreation. To answers some questions up front, we are working with the State Department of Public Health to develop fact sheets and to revise the signs we post at access points on lakes and ponds with cyanobacteria blooms. We are also working with the State Department of Public Health and the State Veterinarian to develop fact sheets that can provide timely information on cyanobacteria blooms.

The number of technical assistance inquiries for lakes far out numbers those of other waterbodies in 2019. Most lakes discussions are related to cyanobacteria blooms.

A cyanobacteria bloom at Kettletown State Park swim area. Poor water quality from frequent indicator bacteria exceedances and cyanobacteria blooms like this one observed in August 2015 resulted in closure of the swim area this year. (DEEP staff photo).

CT DEEP Water Monitoring and Assessment Program 2019 Summary Report