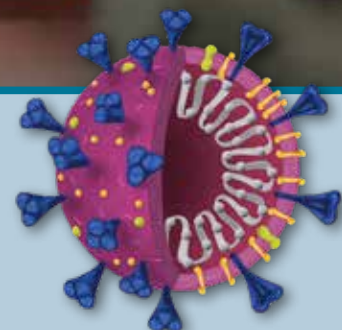




Tracing the Pandemic Through Our Wastewater



Also:
**Combating our Aging
Wastewater Workforce**





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NEIWPCC is a regional commission that helps the states of the Northeast preserve and advance water quality. We engage and convene water quality professionals and other interested parties from New England and New York to collaborate on water, wastewater, and environmental science challenges across shared regions, ecosystems, and areas of expertise.

Interstate Waters

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FROM THE EXECUTIVE DIRECTOR

"Coronavirus surveillance" is one in a string of buzzy topics drawing much-needed attention to the importance of the wastewater industry. Earlier this year, Wastewater and Onsite Systems Division Director Christina Stringer partnered with two Tufts graduate students to help them study the fascinating field of wastewater-based epidemiology (WBE) and its potential to help public health officials track coronavirus infections. This issue of "Interstate Waters" features their work and NEIWPCC's involvement in discussions around WBE (page 6).



On page 10, Program Manager Patty Chesebrough explores the wastewater staffing crisis, another important conversation that the industry has been circling around for the last 30 years or more. As the need for operators and other environmental professionals grows more urgent, NEIWPCC intends to be a leader in attracting a more diverse and inclusive clean water workforce.

One way we're trying to do that is by highlighting our staff and partners who clearly love what they do. On page 12, we profile Dan Miller, habitat restoration coordinator with the Hudson River Estuary Program, who celebrated his 20th year with NEIWPCC in 2020. We hope that by showing the incredible work of people like Dan, young professionals can learn why water resource protection is such an important and rewarding career.

This issue of "Interstate Waters" also highlights our virtual Nonpoint Source Conference (page 13), and an aquatic insect volunteer monitoring program in Maine (page 16). I think there's something for every environmental professional or clean water enthusiast in here.

As we move into the end of the 2021 fiscal year and start preparing for 2022, when we'll be celebrating not only the 50th anniversary of the modern Clean Water Act, but also NEIWPCC's 75th anniversary, I look forward to reflecting with you on all we've accomplished for the region and all we hope to see in the future.

Susan J. Sullivan

NEIWPCC Executive Director

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Connections

Virtual Northeast Aquatic Biologists Conference Reaches a Wider Audience

NEIWPCC's annual Northeast Aquatic Biologists (NAB) Conference, held virtually for the first time, drew more attendees than ever before, with a quarter tuning in from other parts of the country, and even internationally. Held over the course of four half-days in March, NAB registrants could choose from 45 live and recorded presentations on topics such as biomonitoring, chloride, cyanobacteria, lake monitoring, and restoration.



Featured speakers included Tim Martin, a long-term monitoring data analyst with the Minnesota Department of Natural Resources, who presented on water quality trends in the state's sentinel lakes, including increasing surface temperatures in these water bodies; Martyn Kelly, a leading ecologist in the United Kingdom, who compared biomonitoring practices and standards in the U.S. and the U.K.; and Nicole Dahrouge, a graduate researcher at the University of Connecticut, who analyzed the effects of chloride contamination on vernal pool-dwelling wood frog tadpoles.

SRF funds for soil health, with a national overview of both obstacles and opportunities, such as addressing nutrients from agriculture; and two collaborative efforts to acquire land to protect water resources from East and West Coast communities. To learn more, and view presentations from previous engagement sessions, go to: neiwpcc.org/our-programs/srf_workshop/.

Protection

Analyzing the Economic Benefits of a Clean New York-New Jersey Harbor Estuary

NEIWPCC contracted leading experts in environmental economics to conduct an analysis of the economic benefits of having clean water in the New York-New Jersey Harbor Estuary. The study, funded by the EPA and managed by NEIWPCC, will be the first of its kind in the region and could serve as a steppingstone for further work by policymakers and researchers.

In recent years, the New York-New Jersey Harbor and Estuary Program and other area partners have focused on improving recreational access to the estuary's waterways, including boating, fishing, swimming, and other activities. The environmental economic analysis will allow stakeholders and decision-makers to document and communicate the true economic value of those benefits, making the case for improving water quality, prioritizing investment, and bringing the advantages of healthy watersheds to underserved communities.

State Revolving Fund Series Explores Nonpoint Source Pollution

NEIWPCC's 2021 State Revolving Fund (SRF) virtual series launched with three sessions this spring. The events provided opportunities for learning and discussion on current practices for utilizing the SRF program for nonpoint source pollution (NPS) projects. Presentations focused on how Washington State uses both SRF and Section 319 NPS management program funding through a combined program; NPS and SRF professionals discussed the use of





Sharing a Vision for a Healthier Narragansett Bay Region

The Narragansett Bay Estuary Program (NBEP) is developing a new 10-year plan for the region, which will provide specific actions surrounding water, wildlife and habitat, quality of life, and the partnership's ability to be a force for change. As part of the planning process, NBEP is seeking input from residents who live, work, or play in the region to share their feedback with its "Vision 2032" survey, found at www.vision2032.org. The survey asks participants about their experiences with nature resources in their communities, how they are impacted, and what changes they would like to see.

Handbook Offers Strategies for Hudson River Flood Resilience

In the state of New York, more than 100 public access sites, including parks, preserves, boat launches, and fishing piers along the shores of the tidal Hudson provide outstanding recreational, scenic, and economic value to the Hudson Valley. However, climate models project the estuary's water levels may rise several feet by the end of this century, threatening the condition and viability of many of these shoreline facilities.

To assist owners and managers to adapt to existing and predicted flooding, the New York State Department of Environmental Conservation (NYSDEC) offers strategies and



solutions in "The Flood Resilience Handbook for Public Access Sites Along the Hudson River." The handbook, produced by WSP engineering, with funding from NEIWPCC in partnership with NYSDEC's Hudson River Estuary Program, provides guidelines in planning for resilience and reducing damage, costs, and other consequences associated with flooding and the effects of climate change.

\$1.4 Million for Lake Champlain Basin Projects

Improvements to water quality and ecosystem health in the Lake Champlain watershed are getting a boost in the upcoming year. The Lake Champlain Basin Program (LCBP) anticipates awarding more than \$1.4 million in grants for clean water projects to be implemented in 2022. NEIWPCC was awarded the funds on behalf of the LCBP through the EPA and Great Lakes Fishery Commission. Grants will be awarded for implementation and planning of clean water projects, habitat and native species conservation, and aquatic invasive species spread prevention and management. Projects located in the New York, Québec, and Vermont portions of the Lake Champlain basin are eligible for consideration. Grant guidelines, applications, and submission requirements are available at lcbp.org/grants.



Education

Interactive Map Explores Rhode Island Salt Ponds

The landscape along Rhode Island's south coast is carved up by salt ponds, each one a unique environment. A new, online resource tells the story of these ponds and the organization that protects them. The Narragansett Bay Estuary Program partnered with the Salt Pond Coalition to create an ArcGIS

HIGHLIGHTS FROM NEIWPCC AND OUR PARTNERS

StoryMap — an interactive, online medium that integrates detailed maps with other visuals and text to communicate science in an engaging way.



Users of this StoryMap can click on different locations along Rhode Island's south coast to learn about each pond. Formed by glacial deposits thousands of years ago, the ponds are each influenced by their unique interactions with salt and fresh water. The Salt Pond Coalition's mission is to protect these water bodies, some of which have seen heavy species and habitat loss over the last few decades and vary in their degree of pollution. The ponds are valuable economic resources for the state and its densely populated coastline. Some are important to the oyster farming industry; many are popular recreational destinations. The StoryMap also describes the "Pond Watchers" program — encouraging community volunteers to help monitor fluctuating bacteria levels in many of these water bodies.

Students and Volunteers Celebrate Another Season of Eel Research

Donning tan waders and face masks, volunteers and students from 13 schools ventured into the Hudson River and its tributaries to collect and count tiny American eels. This migratory fish is born in the Sargasso Sea in the Atlantic Ocean and enters North American estuaries, including the Hudson River, as see-through "glass eels" each spring. With the guidance of New York State Department of Environmental Conservation (NYSDEC) staff, the Hudson River Eel Project participants checked specialized nets and traps at 12 locations during the migration season to monitor the health of the population.

The project engages students, teachers and community volunteers, who learn about their local ecosystem in a hands-

on way while collecting information about migrating fish and environmental conditions. The 14th season of the project wrapped up with a total of 77,350 glass eels caught, counted, and released upstream. NYSDEC staff, scientists and program participants then celebrated with outdoor "Eelebrations" to discuss final data, thank volunteers, and share stories and experiences.

LUSTLine Explores the Rise of Electric Vehicles

The latest issue of "LUSTLine" explores the phasing out of gasoline powered vehicles and the rise of electric, and how this will affect the future of gas stations. Many of the country's underground storage tanks have aged beyond their life spans, creating a "ticking time bomb" for increasing the likelihood of systems leaking, leading to contamination. In other articles, readers can explore the challenges and solutions associated with a lack of data standards for the underground storage tank (UST) community, and delve into the compatibility of emerging fuels and UST systems.

"LUSTLine" reports on news from federal and state programs to control leaking underground storage tanks. NEIWPCC maintains a full archive of past issues and an index organized by topic at www.neiwpcc.org.



Assessing Lake Champlain's Conditions Through Ecosystems Indicators

The Lake Champlain Basin Program (LCBP) released an updated "State of the Lake and Ecosystems Indicators Report," assessing recent conditions, successes, and ongoing challenges. The report describes Lake Champlain in terms of the four goals of LCBP's strategic plan: clean water, healthy ecosystems, thriving communities, and an informed and involved public.

An ecosystem indicators scorecard gives an at-a-glance status and trend of the Lake's five major segments for indicators of clean water, healthy ecosystems, and — new this year — climate impacts. A new metric helps readers understand changes in how often the lake freezes over and potential impacts of warming trends on its ecosystem. In addition, the report shares maps and



charts related to everything from beach closures resulting from cyanobacteria blooms, mercury loads in fish, invasive species, to public access locations. It also provides tips detailing everyday actions readers can take to support a healthy Lake Champlain basin.

Read NEIWPCC's 2020 Annual Report

NEIWPCC's annual report for fiscal year 2020 highlights the staff's work throughout the Northeast to help preserve and advance clean water, accomplished under the launch of a new strategic plan and the impacts of the coronavirus pandemic. Available on NEIWPCC's website, the report shows how NEIWPCC continued to establish new collaboratives, support program partners and state environmental programs, and represent member states' interests on important water quality issues to federal parties. It also illustrates how NEIWPCC served as facilitator and coordinator to help partners respond to challenges presented by the COVID-19 crisis and create new solutions. For example, less than a year after establishing the goal to offer online continuing education for wastewater and water professionals, it suddenly became necessary to revolutionize the 50-year-old in-person training programs, resulting in new virtual courses offering crucial training for maintaining operator licenses.



Engagement

NEIWPCC Responds to EPA's Proposed PFAS Rule

NEIWPCC joined with several other water associations in authorizing a letter responding to the EPA's advanced notice of proposed rulemaking, "Clean Water Act Effluent Limitations Guidelines and Standards: Organic Chemicals, Plastics and Synthetic Fibers Point Source Category." The letter outlines considerations of state environmental programs for the EPA in regard to the future rule and lists specific recommendations. In carrying out the programs of the Clean Water Act, Safe Drinking Water Act, and other national and state environmental statutes, states must address national regulatory changes and data collection efforts that can affect their ability to manage surface water, drinking water, and cross-media pollutants.

Development of the future rule will enable states to acquire PFAS data towards state- and site-specific PFAS standards and regulations. PFAS standards would allow states, the EPA, and their stakeholders to better control and prevent PFAS pollution, with a holistic and integrated water management approach. This includes working across EPA programs and with other federal agencies to ensure consideration of potential impacts to human health, aquatic life, drinking water, and the environment from PFAS throughout a chemical's lifecycle — from manufacturing through processing, distribution, and disposal.



For more information about these stories, go to the News page on NEIWPCC's website, at www.neiwpcc.org. You can also get our online news posts sent straight to your inbox! Email communications@neiwpcc.org to subscribe to our e-newsletter, "Streamlined."

2022 Northeast Aquatic Biologists Conference

Portland, ME
March 2-4, 2022

www.neiwpcc.org

Tracing the Pandemic Through Our Wastewater

Christina Wnek

BY ELYSSA ANNESER

The sewer is the conscience of the city.” Phyllis Rand, of the Greater Augusta Utility District, shared this quote from Victor Hugo’s “Les Misérables” during a recent training on wastewater-based epidemiology. Rand emphasized how pollutants, diseases, and other materials in our wastewater are valuable data that tell stories about a community.

In the last two years, water flushed down the drain has been providing researchers and public health officials important insights into the spread of the

coronavirus. Not only can wastewater provide a snapshot of the virus’s current prevalence in a community, but it can also help predict future cases of COVID-19.

Wastewater-based epidemiology (WBE) involves testing samples from wastewater to detect specific substances or viral fragments, and then using statistical modeling techniques to measure and predict public health trends

or outcomes.

Wastewater surveillance is a relatively new field, but as the SARS-CoV-2 virus spread around the world in early 2020, so did interest in tracking the virus in wastewater. Individuals infected with SARS-CoV-2 shed the virus in their feces throughout their illness, and viral fragments remain detectable through wastewater sampling and surveillance programs for a few days. The amount

New Field with a Promising Track Record

Wastewater-based epidemiology has only been used as a method to study public health since the early 2000s.

In 2005, researchers implemented WBE as a method to quantify the use of cocaine and other illicit drugs in several European communities. These studies proved that WBE can be an effective surveillance tool to measure drug use in a defined population.

In a study published in 2020, researchers mapped opioid use in a North Carolina community by collecting wastewater samples from residential manholes. They were able to use that data to recommend targeted policies and programs, like more robust drug takeback programs, outreach materials, and other resources at pharmacies in specific areas of the community.

During the 2009 swine flu pandemic, researchers used WBE to trace the use of Tamiflu (oseltamivir), a flu anti-viral drug, in populations in the United Kingdom.

WBE has also been used for polio surveillance since the early 2000s, helping to reduce the prevalence of the virus in Pakistan and other countries.

Elyssa Anneser and Emily Riseberg graduated with master’s degrees in public health from Tufts University in spring of 2021. They worked with Christina Stringer, Ph.D., director of NEIWPCC’s Wastewater and Onsite Systems Programs, on the biostatistics project shared here, for their Applied Learning Experience at Tufts. They’re both currently serving as NEIWPCC interns supporting a project investigating regional biosolids generation. Kale Connerty, NEIWPCC information officer, also contributed to this article.

of a virus an infected individual sheds can be represented in the population's wastewater, for as long as the virus particles persist in the environment. However, the exact amount of the virus a person sheds in their fecal matter over the course of their infection is still an unknown variable.

Nevertheless, wastewater-based epidemiology has been an important public-health surveillance tool to complement traditional clinical surveillance for COVID-19. WBE can provide a more accurate understanding of the number of coronavirus cases in a community. For instance, both asymptomatic and symptomatic individuals will be detected in wastewater samples. Scientists can also use the viral concentrations in the wastewater stream and observed cases of the disease to predict future cases.

Comparing COVID-19 Cases to Wastewater Data

Wastewater facilities around the world have been partnering with researchers to embark on WBE studies. Utilities in the Northeast have been eager to participate in these efforts. In 2020, the Massachusetts Water Resource Authority, which services Greater Boston, began partnering with BioBot Analytics, a wastewater epidemiology company, to analyze their influent samples for the presence of SARS-CoV-2 fragments. Likewise, the Portland Water District in Maine partnered with St. Joseph's College to analyze their influent samples. The Greater New Haven Water Pollution Control Authority in Connecticut partnered with Yale University to analyze samples of their wastewater residuals.

In the spring of 2021, Elyssa Anneser and Emily Riseberg, two graduate students in the public health program at Tufts University, worked under the guidance of NEIWPC Wastewater and Onsite Systems Program Director Christina Stringer, to investigate the statistical relationship between SARS-CoV-2 concentrations in wastewater and COVID-19 reported cases. They evaluated the data from Boston, Portland, and New Haven using four different types of statistical regressions to model the rate of COVID-19 cases in those communities. These models — linear, generalized additive, Poisson, and negative binomial — take into account covariates that can affect the data, like temperature and flow rate in the wastewater streams. Each

What's the Difference? SARS-CoV-2 versus COVID-19

Often in the media and in daily conversation people use the terms SARS-CoV-2 and COVID-19 interchangeably. But technically, they do not mean the same thing.

Coronaviruses are a category of virus that cause a variety of upper-respiratory tract illnesses, varying in severity. According to the CDC, there are seven coronaviruses that can infect people, the first of which were identified in the mid-1960s. SARS-CoV-2, the newest of the seven, is the abbreviation for severe acute respiratory syndrome coronavirus 2.

COVID-19 is the specific illness caused by SARS-CoV-2 and is very similar to severe acute respiratory syndrome (SARS), a disease caused by another coronavirus: SARS-CoV. COVID-19 is symptomatically similar to SARS and, while generally considered less severe, appears to be more easily transmitted from person to person.

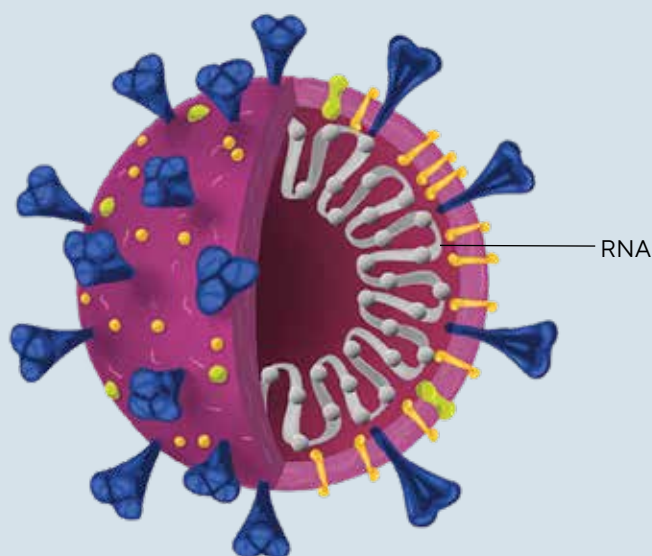
What Are We Actually Sampling?

Footprints on a beach, a snake's shed skin, and a skeleton: These were metaphors that Scott Firmin of the Portland Water District shared during one of our recent wastewater operator trainings, to describe the portion of the SARS-CoV-2 virus that is being measured in the wastewater.

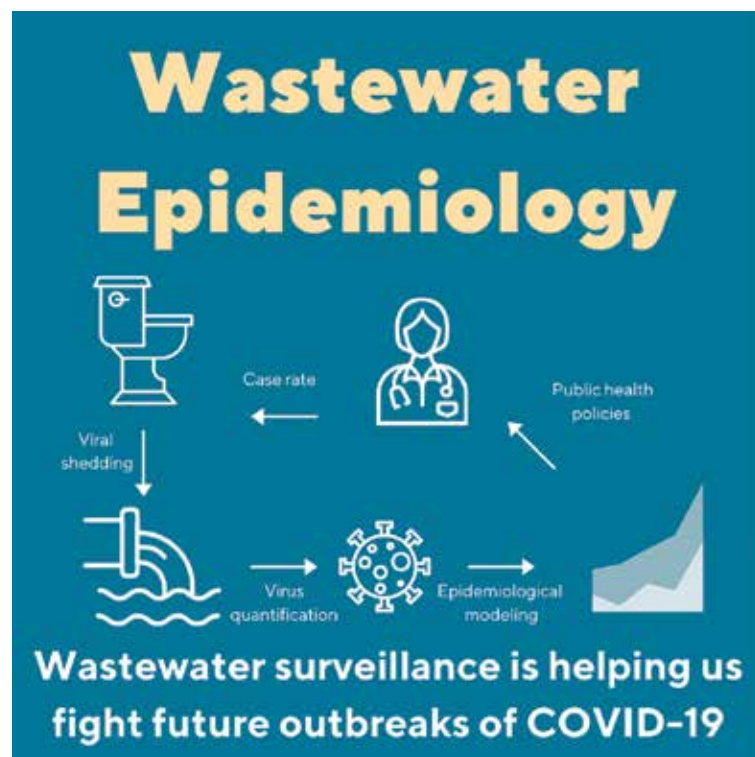
I personally like the skeleton metaphor best. When we excrete virus particles through our feces, they enter the harsher environment of the wastewater stream. While we were uncertain at the beginning of the pandemic whether viable copies of SARS-CoV-2 could persist in wastewater and be transmitted to people, studies have shown that this is unlikely. Viruses cannot replicate outside their hosts, and virus particles gradually break apart and become "fragments." The "fragment" we are able to measure is the virus RNA, which contains the genome of SARS-CoV-2.

The Joint Environmental Training Coordinating Committee (JETCC) held a virtual training at the end of June, where Rand, Firmin and I discussed the history of water and wastewater public health surveillance, how it works, how it can be used, utilities' sampling regimes during the pandemic, ethical considerations, and more. JETCC and NEIWPC will hold this training again on November 17. Check out our calendar online at bit.ly/NEIWPCtraining for this and other opportunities to earn training contact hours.

— Christina Stringer



This illustration of the SARS-CoV-2 virus anatomy was adapted from an image by Maya Peters Kostman for the Innovative Genomics Institute (<https://innovativegenomics.org/free-covid-19-illustrations/>).



Evan Johnson of the Portland Water District collects composite wastewater samples for analysis.

Anneser and Riseberg created this infographic for the Portland health department.

model represents different potential relationships between the variables.

Anneser and Riseberg verified an association between the data sets and determined which models best predicted the COVID-19 case rate based on the wastewater SARS-CoV-2 concentrations and different covariates. They found that the generalized additive and negative binomial models best represented the actual data across all three locations. The graphs on page 9 show the actual number of COVID-19 cases reported in each location and the number of cases predicted by the generalized additive regression.

While Anneser and Riseberg's project was a secondary analysis of the data from

New Haven and Boston, this was the first look at wastewater and incidence data in Portland. Anneser and Riseberg met with the Portland public health department to help develop an infographic and posters that can be used to explain WBE's uses and benefits to the community.

In addition, this was the first project to compare different statistical analytical approaches between multiple locations among New England communities. Although more research and data are needed, this work represents a promising first step towards providing predictive models of COVID-19 cases to public health officials for decision-making purposes.

This past year has seen an immense

investment in WBE and environmental surveillance. Looking ahead, WBE can be instrumental in spotting outbreaks of COVID-19 early and allow for public health intervention to break the course of transmission. WBE is also expected to be used to investigate the effectiveness of vaccines in halting the spread of COVID-19. In the future, WBE approaches may strengthen the world's pandemic early warning system or even assist with surveillance for the annual flu.

Vaccination campaigns are in full swing around the world but challenges, like new virus variants, remain. Wastewater-based epidemiology has great potential to guide public health officials through the hopeful end of the pandemic. 🌈



The Deer Island wastewater treatment plant, the second largest sewage treatment facility in the United States, is operated by the Massachusetts Water Resources Authority. Anneser and Riseberg used SARS-CoV-2 wastewater data from the MWRA as part of their research.

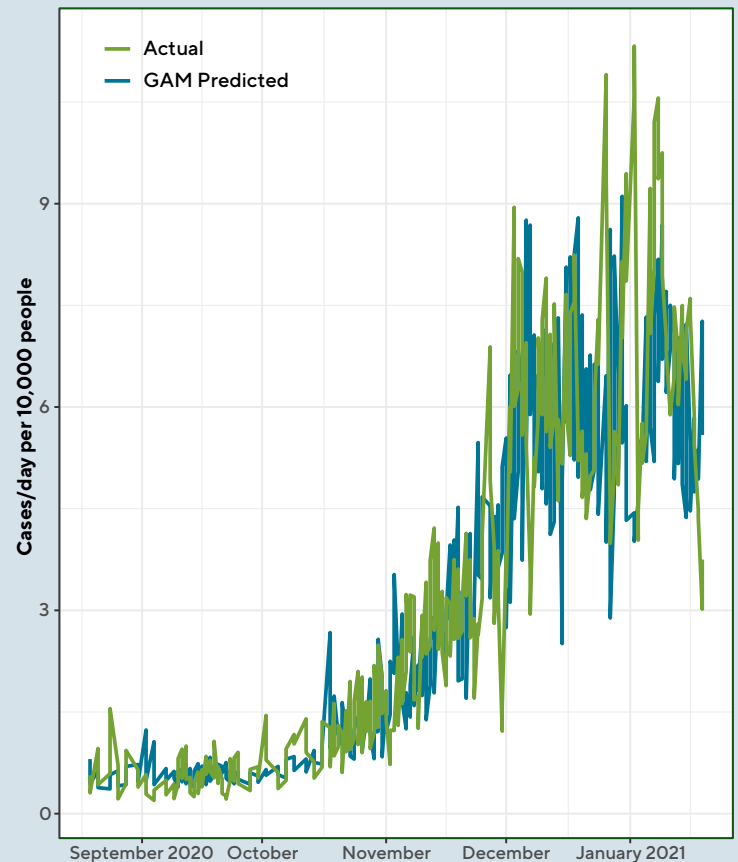
More About the Data

Anneser and Riseberg's graphs show the actual number of COVID-19 cases reported in Boston, Portland, and New Haven over time, and the number of cases the generalized additive regression predicted based on the SARS-CoV-2 wastewater data.

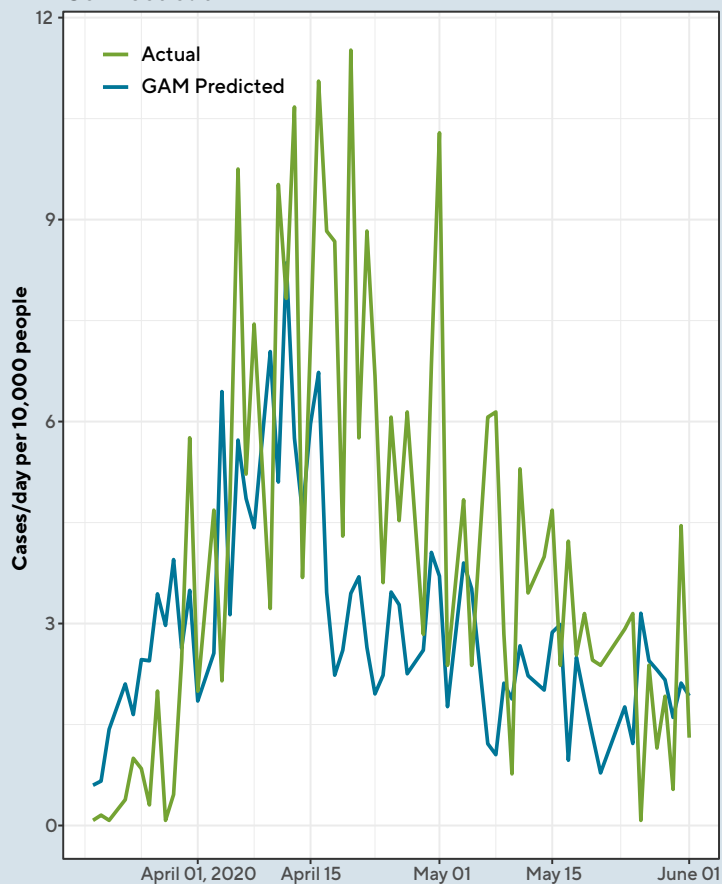
The treatment facilities in these areas serve populations of varying size: from about 17,000 in Gorham and Westbrook, Maine to 2 million people in Boston. Sampling also varied in each location. The Maine and Massachusetts facilities collected one-liter, 24-hour composite samples of influent. In the Massachusetts system, these samples were collected three to seven times per week. In Maine, they were collected weekly. The Connecticut facility collected 40-milliliter primary sludge samples daily.

This study uses Massachusetts data from Aug. 19, 2020, to Jan. 19, 2021; Maine data from Sept. 1, 2020, to March 2, 2021; and Connecticut data from March 1, 2020, to June 1, 2020. The incidence of daily COVID-19 cases was calculated using public health and population records in these communities. Both the COVID-19 incident cases and the SARS-CoV-2 concentrations, measured in copies per milliliter, were log-transformed (a widely used method to address skewed data).

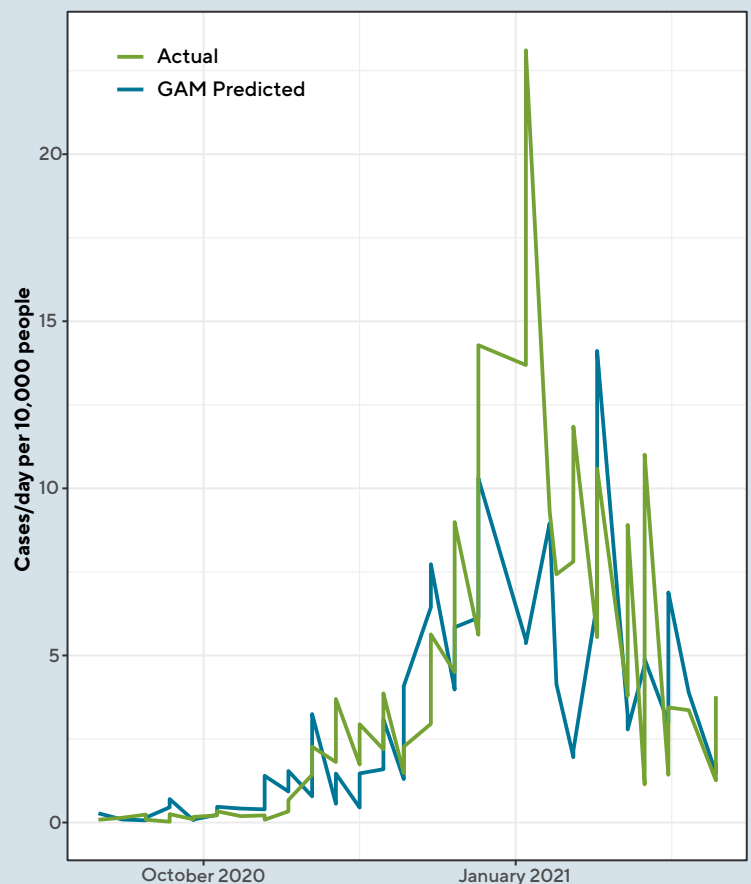
Massachusetts



Connecticut



Maine



Combating Our Aging Wastewater Workforce

BY PATRICIA L. CHESEBROUGH

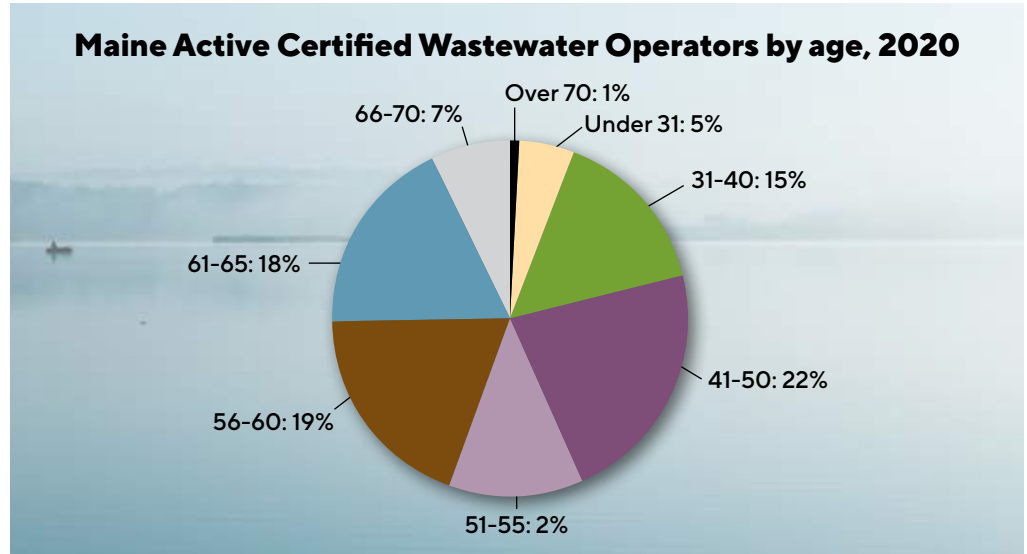
As the United States' wastewater workforce ages, the need for new operators entering the industry is becoming critical. In its document, "America's Water Sector Workforce Initiative: A Call to Action," the EPA Office of Water highlights the issue:

"One of the major challenges facing our nation is the critical and unprecedented staff shortage in the water workforce that operates and maintains our essential drinking water and wastewater infrastructure. In the next five to 10 years, water sector workers will be eligible to retire at levels that will stress our ability to operate this critical infrastructure. The clean and safe water and the way of life we have come to enjoy in this country cannot be sustained without our water protection specialists. We must address this pending shortage with focused engagement at all levels of government and our public and private water sector partners."

According to EPA estimates, approximately one-third of all operators in the U.S. will be eligible for retirement in the next 10 years. As just one example, based on a 2020 review NEIWPCC conducted of our license records (see figure to right), 53% of all wastewater operators in Maine were over the age of 50, making them all eligible for retirement in 10 years or less. There is a significant need for new wastewater operators to fill the positions being vacated by these retirements.

Further exacerbating the impending workforce shortage is the fact that the wastewater industry is comprised almost entirely of men, many of whom ended up in their jobs through non-traditional paths. It is rare to find operators who actively chose and trained in advance

Patricia L. Chesebrough is a program manager in NEIWPCC's Wastewater and Onsite Systems Division.



for a career in wastewater, and fewer and fewer of these mechanically inclined professionals are entering the field.

As indicated in the table below, women currently make up only 4.5% of active licensed wastewater operators in New England and New York (NEIWPCC's compact states). Increasing the percentage of women entering the wastewater industry is a logical way to help address the wastewater workforce shortage as a whole.

Although NEIWPCC has not historically collected demographic

statistics for licensees, it is apparent that the workforce also lacks racial diversity. Focusing recruitment efforts on minority populations could lead to increased hiring and building of diversity in the industry.

One significant way to tackle these workforce development issues across the Northeast (and beyond) is by making wastewater a career of choice. NEIWPCC's seasoned wastewater staff suggests this can be accomplished through focusing on four essential efforts:

Active Licensed Operators in the Northeast*

State	Total Licensed Operators	Female Operators	Percent
Connecticut	823	30	3.6%
Maine	631	49	7.8%
Massachusetts	3,612	192	5.3%
New Hampshire	543	35	6.4%
New York	3,257	82	2.5%
Rhode Island	495	20	4.0%
Vermont	446	35	7.8%
Total	9,807	443	4.5%

**Data from state licensing records maintained by NEIWPCC and our member states.*

► **Outreach and Recruiting:** Perhaps the most critical need for the wastewater workforce is an outreach and recruiting campaign to increase overall awareness of wastewater; and showcase wastewater as a rewarding career with good wages, benefits, and growth opportunity. Outreach and recruiting must also be targeted toward appropriate demographic and socioeconomic populations that have the greatest potential to become operators and will benefit the most from a career in wastewater.

► **Education:** Expand our existing operator training programs to ensure they are accessible and affordable for everyone, as well as offered in a wide variety of formats to meet the schedules and learning needs of everyone.

► **Internship/Apprenticeship/Mentorship Programs:** Develop and implement internship, apprenticeship, and/or mentorship programs at wastewater facilities throughout the Northeast to provide essential hands-on experience to those new to the industry, as well as create networking



The Youth and the Environment Program in Lowell, Massachusetts exposes teens to the wastewater industry and other environmental fields. You can read about the program in the September 2020 issue of "Interstate Waters."

relationships to provide the support needed to ensure candidates complete training, licensing, and employment goals.

► **Opportunity:** Through networking and partnerships with a variety of job-assistance organizations, help connect interested candidates with employment opportunities. These organizations can assist candidates with resume writing, job-search tools, and interview preparation, among other skills.

Through active outreach and recruiting, and providing a clear and manageable path to education, licensing, experience, and long-term career opportunities, the industry can increase the number of operators entering wastewater. Targeting historically under-represented populations, such as minorities and women, can make a truly impactful difference for these people and the wastewater workforce as whole. This will ensure a sustainable and well-educated wastewater workforce well into the future, thereby perpetually protecting our nation's waters. 🌊

Addressing the Shortage of Wastewater Operators

A Q&A with Jeffrey A. Murawski, P.E., Fitchburg, MA DPW deputy commissioner of wastewater

Why is there a shortage of wastewater operators?

As more operators are leaving than are coming in, there also seems to be a tougher supply/demand issue for higher licensure level operators. I think this is a multi-faceted problem, with the heart of it being the at-large workforce doesn't know about these jobs: what we do, the importance of the jobs and the work, and the job security, through workforce demand and need for these jobs continuing into the foreseeable future.

What do you think needs to be done to retain existing and encourage new operators?

Jobs and job opportunities that are unknown to the workforce require more effort and staffing creativity by hiring managers. In my seven years of experience as a wastewater utility head for a Massachusetts municipality, the hiring process for filling vacated positions has been through a passive approach, advertising job vacancies in appropriate places and hoping that respondents will answer.

We haven't yet engaged with public middle or high schools' guidance and career counselors or participated in job fairs. However, Fitchburg has begun to see positive outcomes from networking with trade school programs, training organizations, and working with our local public school system, which has an "Advanced Manufacturing Pathway" program, and is interested in developing an

additional one focused on environmental science. These programs help facilitate workforce readiness of high school graduates with intentions to pursue careers after graduation instead of post-secondary college enrollments.

We also welcome wastewater treatment plant tours from schools and youth group organizations. We have provided tours to Montachusett Regional Vocational Technical School, Boys and Girls Club of Fitchburg and Leominster, Minuteman Regional Vocational Technical School, Oakmont Regional High School, Leominster's Center for Technical Education Innovation school, X-Cel Conservation Corps, and Fitchburg State University.

Any final thoughts you have related to the wastewater workforce and/or its development?

We need continued networking engagement among wastewater utilities, professional organizations, licensure authorities among regulators, and training organizations and schools, whose mission is to develop workforce candidates for the needs of workforce demands.

A key to success in filling vacancies will be openness to non-traditional recruiting strategies (non-traditional for our industry, and for municipalities), to seek out workforce candidates. Also, a willingness to engage with the public for general educational outreach, and for targeted engagement with schools' curricula related to wastewater STEM career areas.

Daniel Miller: Restoring Hudson River Estuary Habitats

BY AMY MAGIN

Twenty years ago, when Daniel Miller first joined NEIWPCC as an environmental analyst, he was tasked with an ambitious endeavor: develop a plan for restoring Hudson River estuary habitats — severely impacted by industrial development, transportation systems, navigational improvements, and a host of local landscape issues — back into a healthy ecosystem.

After working with multiple stakeholders over the course of many years to gather information and recommendations, Miller produced a comprehensive guide in 2011 for restoring the river's tidal wetlands and natural shorelines and facilitating fish passage up the Hudson's tributaries.

The "Hudson River Estuary Program Habitat Restoration Plan," published by the New York State Department of Environmental Conservation, identified several priority habitats vital to the health and resiliency of the estuary and presented recommendations for action. The plan sets priorities for government agencies, scientists, conservation and environmental organizations and research institutions throughout the region to plan, implement and evaluate habitat restoration projects.

Miller now collaborates with a variety of partners — from local municipalities to federal agencies — to facilitate the plan's implementation, coordinating funding sources with research and science capacities, and moving projects from preliminary stages to design and then eventually to construction. He tries to involve as many stakeholders as possible, working closely with the decision-makers while ensuring community input and support. He acknowledges that it can be difficult sometimes to get so many people to move in the same direction,



but eventually they are able to come to a consensus.

"It can be a challenge when so many interested parties are involved but it is also a blessing that allows us to make progress on the Hudson," Miller said. "There are many different ambitious and energetic groups out there doing great things for the river and the environment, and they make wonderful partners."

In his work on shorelines, Miller also communicates extensively with communities to understand how they interact with the river. This feedback is then incorporated into shoreline designs that allow for human uses such as water access and scenic views, while still creating healthy, resilient ecosystems.

"Our primary goal is to maintain or improve the environment for the plants and animals of the Hudson River," Miller said. "But we also have a very big component of human use that needs to be addressed. So, in working with a community we need to be really creative about what they want to experience at the river, and with a few compromises we are able to achieve a project that respects the river while satisfying those needs."

Many of these projects are on public parklands, where visitors are constantly interacting with the river.

"We recently finished a shoreline stabilization and access project in Stuyvesant, that I'm very proud of," Miller said. "A big priority for us was to include a large fishing platform — it's a popular striped spot — on a section of the river where there really isn't that much access. At the same time, we were able to build a tidal pool with tidal vegetation, and put in some shoreline features that were stable, incorporating a lot of plant matter for aquatic, terrestrial and bird life."

Miller's dedication to the habitat restoration came from his upbringing on the Hudson. He began working on the river when he was 18, returning to the area to raise his family after receiving his master's in biology from Florida Atlantic University, and then working as a marine biologist in Florida and Maine. He now has his 50-ton, U.S. Coast Guard commercial captain's license for inland waters.

In his two decades at NEIWPCC, Miller has seen many colleagues come and go, as new people are hired to replace those who have retired. "I've come to appreciate the mix of long-term experienced people bringing their wisdom to the table with this constant renewal of young, ambitious, creative minds," he said. "I love it when we bring in new people, because it injects some great energy and creativity into the process, which is a necessary part of being an effective and dynamic organization."

Miller believes that it is essential to inspire people to appreciate the environment. He enjoys any opportunity to join people for a walk in the woods, or a canoe trip on the Hudson, passing on his knowledge of the river he loves.

"The hardest thing for me to see is the continued disconnect and erosion of our relationship from the environment. At best, it is seen as a novelty to a lot of kids. The more that I can get involved with people outdoors, the better." 🌈

Amy Magin is director of NEIWPCC's Communications Division. Daniel Miller is an environmental analyst with NEIWPCC and coordinator with the Hudson River Estuary Program Habitat Restoration.

Beavers, TACos, and Lightning Talks

Scenes From NEIWPCC's Virtual Nonpoint Source Conference

BY JAMES PLUMMER

Old film footage of state officials tagging wriggling beavers, locking them into wooden crates, strapping the crates to parachutes, and dropping them out of planes into the remote backwoods of Idaho isn't the usual type of content featured in presentations at NEIWPCC's Nonpoint Source (NPS) Conference.

The footage was part of a 1950s era conservation effort, unearthed by the Idaho Department of Fish and Game, and shared by Julie Busa of Fuss & O'Neill, during this year's virtual NPS Conference in May. Busa, presenting on her own work in Massachusetts stimulating beaver activity to create habitat, increase flood resilience, and manage nonpoint source pollution, referenced the successful beaver drop, which relocated the animals away from residential development and into the wilderness.

Originally scheduled for 2020 at the Woodstock Inn in Vermont, NEIWPCC had to postpone the 31st Annual Nonpoint Source Conference due to the pandemic, holding it virtually instead in 2021. Since its inception, the conference has been an opportunity for environmental officials and researchers in the Northeast to discuss NPS water pollution management strategies.

The projects shared at the NPS conference, like cultivated, strategic beaver activity, are a reminder that environmental conservation isn't about leaving nature untouched by humans. Humans have always had a hand in shaping their environments.

Nonpoint source management issues

James Plummer is an environmental analyst in NEIWPCC's Wastewater and Onsite Systems Division. He planned this year's NPS conference with NEIWPCC Events and Operations Coordinator Vivian Frausto. Plummer coordinates NEIWPCC's NPS management programs and co-leads NEIWPCC's Tracking and Accounting Collaborative.



are quite diverse. With guidance from a planning team, NEIWPCC staff strategize how to best arrange content to meet the interests and needs of the region's NPS community. NEIWPCC has historically held the event over two consecutive days in one of our member states. For the 2021 virtual conference, the team decided to spread the sessions out over three five-hour days during two weeks in May.

For one session, three scientists — Nick Nelson, Inter-Fluve; Kristen Andersen, University of Alberta; and Peter Slovinsky, Maine Geological Survey — participated in lightning talks, describing riverbank stabilization, lake shore stabilization, and living shoreline projects. From there, the audience had the opportunity to join one of three breakout sessions. This structure was important for a virtual conference, facilitating deeper discussions between colleagues who had been disconnected for almost two years.

The conference was also an opportunity for NEIWPCC to evaluate its new Tracking and Accounting Collaborative (TACo), comprised of members from NEIWPCC's Total Maximum Daily Load (TMDL) and

NPS work groups, as well as other environmental practitioners. The group promotes the tracking and accounting of pollution management practices to continually improve nonpoint source management strategies on a watershed and regional scale. Many of these members attended the event, using the web conferencing platform's chat function to share insights and resources throughout.

"It became clear that continuing to support and grow tracking and accounting systems will be a central part of NPS work in the coming years," said TACo Co-Coordinator and NEIWPCC Environmental Analyst Emma Gildesgame, "including for developing and implementing NPS TMDLs and alternative restoration plans."

Lessons From a Virtual Format

The ability to easily share links to other resources during a presentation is one of the advantages of virtual conferences and is a way for colleagues to further network and dive deeper into a subject. One of NEIWPCC's most valuable

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MAKING WAVES

Katie DeGoosh-DiMarzio, NEIWPCC environmental analyst at RI DEM, was interviewed on Resiliency Radio to speak about invasive species spread prevention and the new solar boat wash station on Chapman Pond in Rhode Island.

Maryann Dugan, NEIWPCC environmental analyst, was elected to join the Board of Directors for the New Hampshire Rivers Council for a three-year term.

Richard Friesner, NEIWPCC director of Water Quality Programs, moderated a session of the mid-year Association of Clean Water Administrators meeting, which discussed upcoming legislative priorities for the House and Senate for the environment, water quality, and infrastructure.

Friesner also presented "Progress in Water Quality...But Still More Work to Do" for the Climate Change Initiative, a research center at the University of Massachusetts, Lowell. Friesner's talk focused on the Clean Water Act's framework, water quality progress over its 50-year history, and current events related to our country's surface water quality.

Megan Lung, NEIWPCC environmental analyst with the Hudson River Estuary Program, completed the Pattern for Progress 2020-2021 fellowship on Environmental Racism in the Hudson Valley. She co-authored the group's final report, "Achieving Diversity, Equity, and Inclusion in the Hudson Valley."

Lung was also presented with a Recognition of Resilience and Distinctive Service Award by the town of Esopus, N.Y. for her service to the community during 2020, naming Lung as a "NYSDEC Friend of Esopus, Champion of Culverts and Knight of NEIWPCC."

Fred McNeill, P.E., chief engineer for the city of Manchester's (N.H.) Environmental Protection Division and NEIWPCC commissioner, was recently named as the next NEWEA president.

Dan Rearick, NEIWPCC environmental analyst and Hudson River Estuary Program - Hudson River Environmental Conditions Observing System

Congratulations

For more than 50 years, EPA New England has honored those who have made outstanding contributions to protect the region's environment. NEIWPCC congratulates the 2021 recipients of EPA New England's Environmental Merit Awards Program.

Former NEIWPCC Commissioner **Janet Coit** was presented with the Ira Leighton "In Service to States" Annual Award, for her leadership in addressing regional environmental challenges. Coit, assistant administrator for the National Oceanic and Atmospheric Administration Fisheries, was the director of the Rhode Island Department of Environmental Management for more than 10 years.



Janet Coit

Environmental Lifetime Achievement Merit Awards:

Yvonne Bolton, retiring NEIWPCC commissioner, and bureau chief, Bureau of Materials Management and Compliance Assurance for the Connecticut Department of Energy and Environmental Protection.



Yvonne Bolton

Angelo Liberti III, retiring administrator of the Surface Water Protection Programs in the Rhode Island Department of Environmental Management, and long-time NEIWPCC partner.



Angelo Liberti III

Chuck Schwer, retired division director of waste management and prevention with the Vermont Department of Environmental Conservation and long-time NEIWPCC partner.



Chuck Schwer

coordinator, co-authored a paper, "Pathway-Based Approaches for Assessing Biological Hazards of Complex Mixtures of Contaminants: A Case Study in the Maumee River," in the April 2021 issue of "Environmental Toxicology and Chemistry."

John Sullivan, NEIWPCC commissioner and chief engineer, Boston Water and Sewer Commission, testified as part of the U.S. Senate Environment and Public Works Committee hearing on infrastructure cybersecurity vulnerabilities.

Three NEIWPCC environmental analysts presented at the annual Northeast Aquatic Biologists Conference: **Megan Lung**, Hudson River Estuary Program, "A Look Back at the Action Agenda: Barrier Removal from 2015-2025 in the Hudson River Estuary;" **Charles Stoll**, New York State Department of Environmental Conservation, "Chloride Concentrations Across New York State Flowing Waters;" and **Matthew Vaughan**, Lake Champlain Basin Program, "Lessons Learned From Three Decades of Water Quality Monitoring on Lake Champlain." 🌊

Welcome to Our New Commissioners

Lori Mathieu

Connecticut

Mathieu is a public health branch chief with the Connecticut Department of Public Health's Environmental Health and Drinking Water branch and is also the president-elect to the Association of State Drinking Water Administrators.

Jennifer Perry

Connecticut

Perry is a licensed professional engineer with the Connecticut Department of Energy and Environmental Protection, with extensive experience in wastewater systems, ground water and surface water permitting, dam safety and infrastructure management.

Jan Sullivan

Massachusetts

Sullivan is the acting director of the Bureau of Environmental Health at the Massachusetts Department of Public Health. She oversees program areas that include toxicology, epidemiology, indoor air quality, childhood lead poisoning prevention, radiation and food protection, and community sanitation.

Rene Pelletier (acting)

New Hampshire

Pelletier is the assistant director, Water Division, New Hampshire Department of Environmental Services, providing program oversight related to subsurface systems, alteration of terrain, drinking water and groundwater bureau, wetlands bureau, dam bureau, wastewater engineering, watershed management and the Winnepesaukee River basin program.

Margret Cooke (acting)

Massachusetts

Cooke is the acting commissioner of the Massachusetts Department of Public Health (MA DPH), previously serving as deputy commissioner and general counsel.

Terrance Gray (acting)

Rhode Island

Terrance Gray is the acting director of the Rhode Island Department of Environmental Management. Gray has been the primary point person on the Rhode Island interagency team for the Transportation and Climate Initiative and has led several permitting and enforcement program initiatives and reforms at the department.

Thank you to our Retiring Commissioners

Yvonne Bolton

Connecticut

Chief of the Bureau of Materials, Management and Compliance Assurance with the Connecticut Department of Energy and Environmental Protection; NEIWPCC commissioner since 2003.

Tom O'Donovan

New Hampshire

More than 33 years of public service, including: commissioned officer in the U.S. Army Corps of Engineers, senior manager within the Department of Energy and project director in the construction industry; NEIWPCC commissioner since 2019.



Beavers, TACos, and Lightning Talks

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roles is engaging and convening water quality professionals to collaborate on environmental issues. Simulating the same kind of networking experience as an in-person event has been an important hurdle for NEIWPCC to overcome during the pandemic.

A benefit of virtual events: Attendees have better control over their environment and their time. Feedback from participants expressed approval of how the NPS conference was spread out over the course of two weeks. Attendees did not have to sacrifice full workdays, or experience any potential conference burnout at the end of several day-long sessions.

The conference usually attracts attendees who are almost exclusively from the Northeast states. However, the accessible nature of the virtual format opened the door to increased participation from locations far outside of the region, including Guam, Texas, South Carolina, Ohio, and Kentucky. And, registration increased from an average of 100-140 participants to 160, with a greater presence from EPA and tribal staff.

There are elements from the virtual conference that may inform the agenda for next year. Conference organizers discovered that holding more panels, lightning talks, and breakout sessions keep attendees engaged, both virtually and in-person. While this year was certainly a success, staff are crossing their fingers that NEIWPCC can host the NPS community at the Woodstock Inn in

Vermont for the 32nd Annual Nonpoint Source Conference in April 2022.

And those parachuting beavers? Not only did they survive their drop, they flourished in their new environment, establishing new colonies and improving the habitat for other animals, waterfowl, fish and plants. 🌈



Tim Newcomb

A Treasure Hunt for Healthy Streams

BY KALE CONNERTY

For the last two summers, volunteers have gone prospecting in Maine's streams for aquatic insects like those shown here, as part of an effort to better understand water quality in the state.

The Maine Stream Explorers is a new community science program, run through a collaboration between Maine Audubon, the Maine Department of Environmental Protection (DEP), the Lakes Environmental Association, Portland Water District, and a growing list of other partners invested in protecting the state's water resources. In 2020, Maine Audubon recorded an online training for volunteers, to help them find and collect aquatic insects in their local streams and to classify the bugs based on their tolerance to water pollution.

Tom Danielson, an aquatic biologist

with the DEP, presented on the program last March at NEIWPCC's virtual Northeast Aquatic Biologists Conference. Danielson was responsible for creating the guidebook, macroinvertebrate identification keys, and data forms that volunteers use out in the field. He enlisted the help of two AmeriCorps environmental stewards and his teenage daughter, who used her photo-editing skills to enhance the images shown here. These photos were sourced from "The Atlas of Common Freshwater Macroinvertebrates of Eastern North America," an online community science resource.

The guidebook describes volunteers' objective as "a treasure hunt for healthy streams in Maine." The materials walk volunteers through finding and identifying these macroinvertebrates, and rate the bugs as sensitive, moderately sensitive, or tolerant to water pollution. At each stream, volunteers tally up how many of each kind of bug they find in each of those sensitivity categories.

Kale Connerty is an information officer in NEIWPCC's Communications Division.





According to the Maine Audubon, while the DEP's biomonitoring team can only survey about 50 of the state's 5,000 rivers and streams each year, in 2020, the Maine Stream Explorers sampled bugs in about 30 streams, many of which had never been sampled for macroinvertebrates before. The information volunteers collect can help the DEP prioritize where to collect its samples. Danielson presented the Maine Stream Explorers, which was inspired by other successful monitoring programs in the country, as an example of how states can gather important water quality data while involving community members in the protection of their watersheds.

The program is growing in popularity. In 2020, Maine Stream Explorers had 24 volunteers — retired scientists, students, families, and other community members — surveying in the Sebago Lake Watershed. According to Hannah Young, who coordinates the Stream Explorers for Maine Audubon, they'd had about 80 volunteers sign up this season at the start of August, and she is still getting

inquiries. She can send them the link to the online trainings, which has made the program more accessible.

"It can be so much fun for folks," Young said. "We're having people from all across the state participate. This year we expanded more into Southern Maine, and up to Lewiston/Auburn as well. We do have a few volunteers going out to streams in Northern Maine, and even a volunteer from New Hampshire, checking out our survey kits or even putting their own together."

She added, "We've also had a lot more kids going out. At first the bugs might scare them a little bit, but they get over that pretty quickly and then they just love it."

Maine Stream Explorers have surveyed 15 streams so far in 2021 and Young said volunteers will be out sampling until October.

Many of the insect taxa shown here should be familiar to other stream monitors in the Northeast. How many of them can you identify? 🦋





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Photos on pages two to four courtesy of the New York State Department of Environmental Conservation.
Photos of wastewater treatment operators on the cover and page eight courtesy of the Portland (Maine) Water District.
Photos of laboratory scientists on the cover and page six by Christina Wnek.

EVENTS

2021

Oct. 1, **NHWPCA Annual Wastewater Trade Fair**, Manchester, N.H., www.nhwPCA.org

Oct. 16-20, **WEFTEC Conference and Exhibition**, Chicago, Ill., www.weftec.org

Oct. 17-20, **National Onsite Wastewater Recycling Association Onsite Wastewater Mega-Conference**, San Marcos, Texas, www.nowra.org

Oct. 19-20, **Living Shorelines and Nature-Based Methods Tech Transfer Workshop**, Cape May, N.J., www.estuaries.org

Oct. 28, **Green Mountain Water Environment Association Fall Tradeshow**, Burlington, Vt., <https://gmwea.org/>

Nov. 7-11, **American Water Works Association Water Quality Technology Conference and Exposition**, Tacoma, Wash., www.awwa.org

2022

Jan. 10-11, **Lake Champlain Research Conference**, Burlington, Vt., www.lcbp.org

Jan. 23-26, **New England Water Environment Association, Annual Conference and Exhibit**, Boston, Mass., www.newea.org

Jan. 28-29, **International Conference on Nonpoint Source Pollution**, Sydney, Australia, www.waset.org

Feb. 7-9, **Water Environment Association 94th Annual Meeting and Exhibition**, New York, N.Y., www.weftec.org

March 1-4, 2022 **Northeast Aquatic Biologists (NAB) Conference**, Portland, Maine, www.neiwpcc.org

April 27-28, **Nonpoint Source Pollution Conference**, Woodstock, Vt., www.neiwpcc.org

Sept. 13-15, **National Tanks Conference**, Pittsburgh, Pa., www.neiwpcc.org

On the cover, Chris Cogan of the Portland (Maine) Water District collects composite wastewater samples for analysis. Below, Yolanda Brooks, Ph.D., and Bailey Gryskwicz of St. Joseph's College (Maine) prepare wastewater samples to analyze for the presence of SARS-CoV-2.

