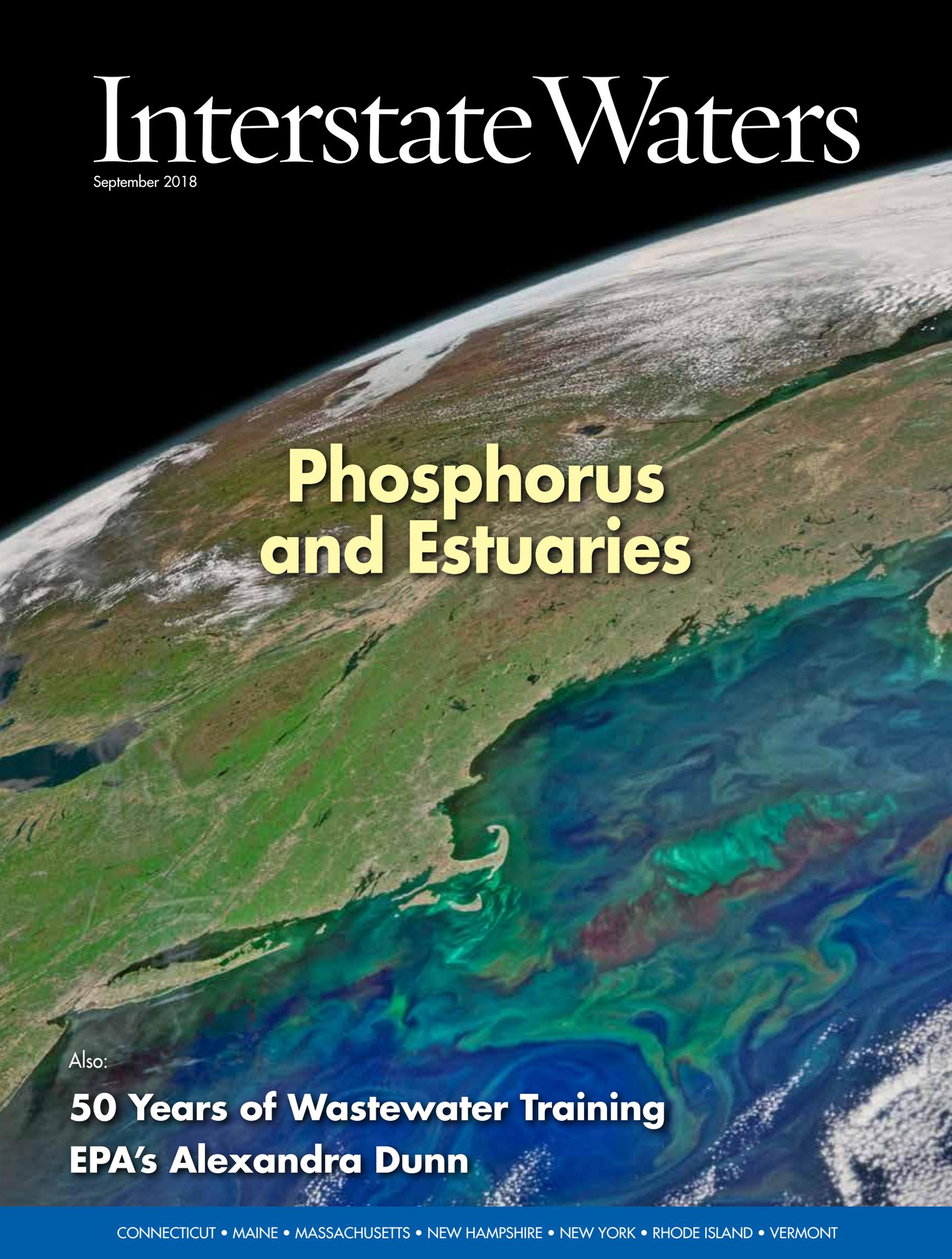


Interstate Waters

An aerial photograph of a coastal estuary, showing a mix of green and blue water patterns. The land is visible in the upper left, and the water extends towards the bottom right. The overall scene is a natural landscape with a focus on water bodies.

September 2018

Phosphorus and Estuaries

Also:

**50 Years of Wastewater Training
EPA's Alexandra Dunn**

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Executive Director: Susan Sullivan

Established by an Act of Congress in 1947, the New England Interstate Water Pollution Control Commission is a not-for-profit interstate agency that meets the water-related needs of our member states: Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The NEIWPCC Commissioners from each member state are appointed by their state governors.

Interstate Waters

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From the Executive Director

Careers in Water

ON JUNE 21, I HAD THE PRIVILEGE OF joining a group of young wastewater professionals for a networking event in Portland, Maine. It was a wonderful way for young engineers, operators, and other industry professionals to get together for an event called "poo and brew": a tour of a wastewater facility followed by a tour of a local microbrewery.



What struck me was how engaged and enthusiastic the folks who attended were, and how diverse their entry into the wastewater field was.

I find that is often true. When you ask water professionals how they got "into the field," it is often by accident or in some obscure roundabout way. Yet, according to a study by the Brookings Institution, "in 2016, nearly 1.7 million workers were directly involved in designing, constructing, operating and governing U.S. water infrastructure."

The study asks, "Why then does it seem as though the workers capable of carrying out these efforts are in short supply and why do we not have a strong pipeline to this new talent?"

As the Executive Director of NEIWPCC, which is in the business of training and educating water professionals, I consider the shortage of interested workers routinely. What do we need to do to raise the level of awareness that working in the water industry is a rewarding career?

These jobs are opportunities to improve the quality of our lives and communities while working side-by-side with other dedicated, committed individuals.

With our state partners, NEIWPCC trains and certifies many of the wastewater operators in the Northeast. These workers tend to be older and the workforce lacks gender and racial diversity, though the industry is working very hard to change this.

Many water workers can enter the field at the age of eighteen with a high school diploma. They earn their additional credentials through training contact hours that they must take to maintain their licenses. Few professions offer this opportunity for consistent, meaningful work conveniently located in an employee's hometown.

Join the industry and become a leader in protecting human health and the environment for our families and our country.

Sincerely,



Susan Sullivan

NEIWPCC Executive Director

Training the Wastewater Workforce

THE COMMISSION SUPPORTS U.S. **Senate Bill 2346**, which would provide a new form of federal backing for wastewater operator training.

On behalf of NEIWPCC, Executive Director Susan Sullivan wrote to Senators Cory Booker (D-N.J.) and Shelly Capito (R-W.Va.) thanking them for their sponsorship of the proposal. The bill would provide grants to promote “innovative activities relating to workforce development in the water utility sector.”

Sullivan expressed interest in using the program to create a new path to wastewater careers for veterans, among other ideas.

The sponsors introduced the measure into the Senate in January. It has been referred to the Committee on Environment and Public Works. The committee had taken no action on the bill as this issue of *Interstate Waters* was going to press.

Resolved: Invasives

A proposal to strip states of their ability to regulate the discharge of ballast water failed in the face of a filibuster in the U.S. Senate in May. In December, NEIWPCC had expressed concern that the proposal would “leave states more susceptible to harmful aquatic invasive species” that are sometimes transported in ballast water.

The proposal had been included in **U.S. Senate Bill 1129**, the Coast Guard Authorization Act of 2017. The act received a majority of votes cast but failed to win the sixty votes needed for cloture of a filibuster mounted over the ballast issue.

Resolved: Chelmsford Lab

The EPA may still close its regional laboratory in Chelmsford, Mass., but favors having a regional lab in the Northeast. The Commission opposed the closure, which it said in comments to the EPA would have “financial consequences” for the New England states and would “delay the rapid response” needed to “safeguard human health and the environment” in this region.

The Chelmsford lab may have to move at some point, however, because of issues related to the facility’s lease.

Pending: Assessment Methods

The Commission is still awaiting a reply to comments on a draft of field-based meth-



ods for developing aquatic-life criteria for specific conductivity, a measure of salinity. The methods, still in draft, were proposed in **Docket No. EPA-HQ-OW-2016-0353**.

The Commission requested assurances that the methods would be optional for states and tribes to use at their discretion. Comments also conveyed particular concerns of Massachusetts and of Rhode Island about the proposed methods.

Pending: Clean Water Rule

The retirement last July of Supreme Court Justice Anthony Kennedy may have sealed the fate of a dispute about federal authority over water bodies. It was a controversy that Kennedy helped create.

Since 2005, the federal government has asserted limited jurisdiction over seasonal water bodies, including many wetlands, based on a standard articulated by Kennedy in *Rapanos v. U.S.* A 2015 rule to clarify the scope of that jurisdiction has been mired in legal conflict and delay since the rule was made final.

The 2015 Clean Water Rule merely codifies the ad-hoc application of Kennedy’s “significant nexus” standard that had been the practice since the Bush administration in 2005. However, the Trump administration has not only proposed repealing the rule, but has announced plans to replace it with a more-restrictive one based on the non-majority opinion of the late Justice Antonin Scalia in *Rapanos*.

The Commission has only commented on some of the many dockets and informal proposals that comprise the repeal-and-re-

place effort. NEIWPCC’s initial comments on the controversy last summer focused on the need to consult states and the importance of basing rules on the best available science.

The second set of comments, directly in response to the proposed repeal of the Clean Water Rule in **Docket No. EPA-HQ-OW-2017-0203**, express regret at the proposal. The Commission recommended that the EPA look to its own 2014 literature review on hydraulic connectivity as the basis for determining jurisdiction.

The Commission also asked that the EPA and U.S. Army Corps of Engineers engage with the states throughout any rulemaking process.

On July 12, the EPA and Corps reopened comments in the repeal docket until August 13. The Trump administration is drafting a new rule to bar the agencies from applying the Clean Water Act to seasonal water bodies. However, as this issue of *Interstate Waters* was going to press, there was no formal docket for the new rule.

For more background, see “The Meaning of ‘Waters’” in the March, 2018, issue of this magazine.

Kennedy’s resignation from the Court, coupled with the Trump administration’s hostility to the standard that Kennedy articulated in *Rapanos*, make it more likely that both the Obama-era rule and the Bush-era practice will yield to a more-limited version of federal jurisdiction.

Pending: Aluminum

The EPA is still studying the comments of NEIWPCC and others in **Docket No. EPA-HQ-OW-2017-0260**, proposed draft criteria for freshwater aluminum.

The Commission staff provided several pages of technical information, including information about the range of aluminum concentrations found in water bodies in the region.

Comments also noted an apparent contradiction in the way different parts of the draft appraise the potential bioavailability of aluminum.



The status of these methods, rules, bills, and other matters was as reported as this issue of *Interstate Waters* was going to press in mid August. 💧

Next Steps, from Long Island to Maine

NONPOINT SOURCES OF NITROGEN are emerging as key targets in the long-term effort to reduce nutrient pollution in the Long Island Sound watershed. This phase may reach well into the upper Connecticut River basin in Massachusetts, Vermont, and New Hampshire.

Representatives of the heads of environmental agencies from New York and Connecticut met with their upper-basin counterparts on August 2 to discuss next steps after the EPA completes a technical assessment of nitrogen loading into the Sound.

The report will establish nitrogen-reduction targets sufficient to protect such uses as swimming and fishing that states have designated for specific embayments and water bodies under the Clean Water Act. EPA staff members told the gathering that the agency was on track to release

the draft targets for public comments in a matter of weeks.

The meeting was the first high-level regional discussion of Long Island Sound and its watersheds since early 2015, when NEIWPCC's Executive Committee held a special joint meeting with the Commission's Long Island Sound Total Maximum Daily Load Workgroup.

Progress in reducing nutrient loading into Long Island Sound over the past several decades has been considerable. Most of this reduction has come from improvements to wastewater treatment plants in Connecticut and New York costing billions of dollars.

The frequency in the Sound of incidents of hypoxia, or low dissolved oxygen, are tracking this progress as well. The Sound's 2017 hypoxia event was the shortest since the Connecticut Department of Energy and Environmental Protection started

collecting data in 1991. (2017 data are the most recent available at press time.)

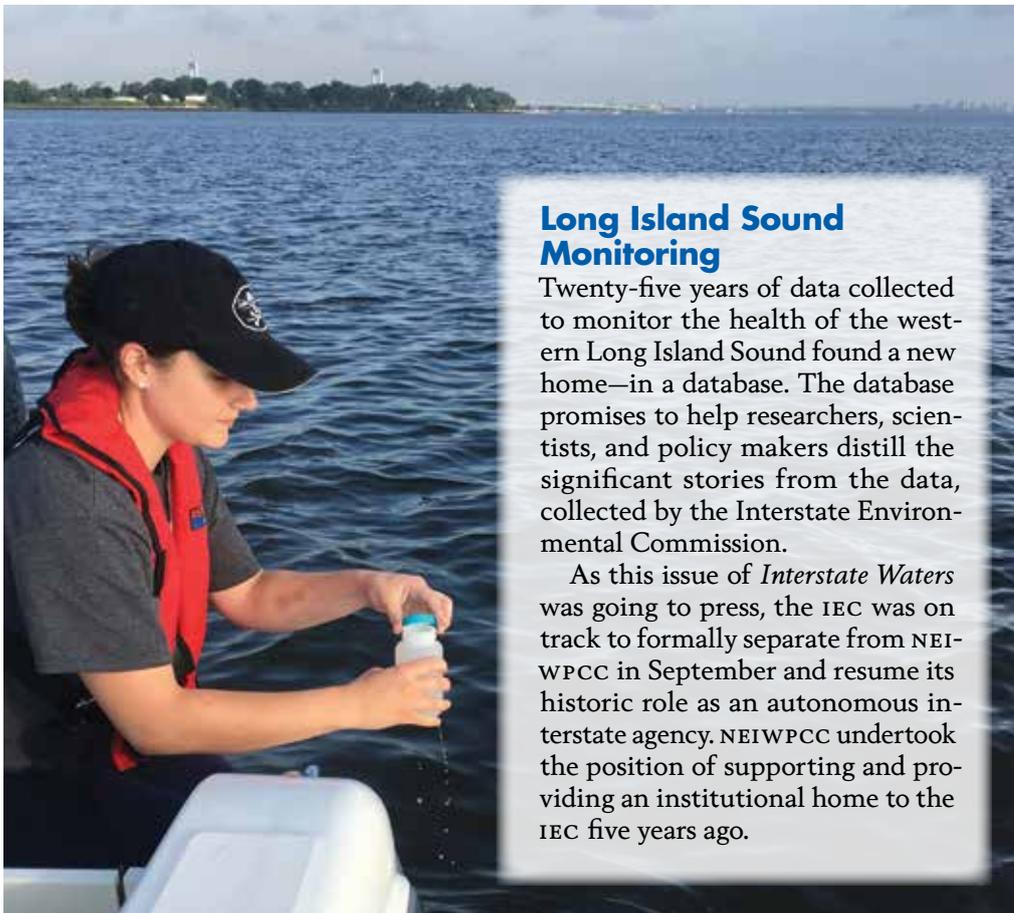
Connecticut also has a year-old municipal separate storm sewer system general permit that includes provisions to keep nitrogen out of water bodies that flow into the Sound.

Today, there is interest in coordinated planning to address the problem, and in innovative remedies such as bioextraction to remove nutrients from the Sound.

In addition, the Long Island Sound Futures Fund has started offering grants to nitrogen-reduction projects in the upper basin, including funding to develop a comprehensive watershed monitoring blueprint to support the EPA's Long Island Sound Nitrogen Strategy.

On Long Island itself,

- The Peconic Estuary Program is revising its comprehensive conservation and management plan (CCMP) for the first time since 2001. The program, which hired a new program director in May, held CCMP meetings with the public and stakeholder groups over the summer. The plan is on track to be finished by late 2019.
- The Commission last March hired the Long Island Sound Study's first bioextraction coordinator, to explore the feasibility of turning excess nutrients into commercial crops. The strategy entails growing and harvesting such crops as seaweed or oysters. Seaweed absorbs nutrients and shellfish feed on phytoplankton that have already taken up nutrients.
- The Peconic Estuary Program and Long Island Sound Study have joined with the South Shore Estuary Reserve to plan Estuary Day on Saturday, September 15, 2018. The day will feature presentations, workshops, nature hikes, arts and crafts, beach cleanup, and seining. It coincides with National Estuaries Week (Sept. 15–22) and is the first time the three groups have banded together to offer an educational event.



Long Island Sound Monitoring

Twenty-five years of data collected to monitor the health of the western Long Island Sound found a new home—in a database. The database promises to help researchers, scientists, and policy makers distill the significant stories from the data, collected by the Interstate Environmental Commission.

As this issue of *Interstate Waters* was going to press, the IEC was on track to formally separate from NEIWPCC in September and resume its historic role as an autonomous interstate agency. NEIWPCC undertook the position of supporting and providing an institutional home to the IEC five years ago.

Narragansett Bay

By October of this year, the Narragansett Bay Estuary Program will have completed its comprehensive program assessment by

IEC

the EPA, which the agency requires every four years. The Narragansett program is one of twenty-eight recognized with national status.

The assessment teams for these evaluations comprise members of the EPA regional and national staffs and one director of another national estuary program. Curtis Bohlen, director of the Casco Bay Estuary Program, is participating in Narragansett's appraisal.

The Narragansett Bay Estuary Program continues to develop technical-transfer and other programs based on its comprehensive assessment of the status of and trends in the Narragansett Bay estuary, which it completed nearly a year ago. The program has scheduled a daylong event in October presenting the results of the study as they pertain to the Taunton River part of the watershed. The program plans a similar event in the Blackstone River watershed in 2019.

Maine Wastewater Training

The Commission's Joint Environmental Training Coordinating Committee (JETCC), which trains and certifies wastewater operators in Maine, has a new class that is proving popular with real estate professionals.

The new course explains the effect of lake water quality on property values. This spring, 244 real estate professionals attended the three-hour course, which was cosponsored by the Maine Department of Environmental Protection. Nearly one hundred real estate professionals attended the class in Augusta, Maine. The course, which has been offered three times, includes a review of environmental laws affecting lakefront property.

Maine has more than six thousand lakes, and together they generate \$3.5 billion a year for the state's economy. Eroded soil is the biggest source of pollution to the state's lakes.

Real estate professionals registered in droves for all three dates the course was offered. The first class, in Portland in March, had to be moved from a venue with a capacity of forty people to that city's Clarion Hotel. Eighty-seven attended that day.

Ninety-seven people attended on another day in Augusta, and sixty came to the course when it was offered in Brewer.

At the workshop, Maine DEP's Bill Laflamme taught attendees about the underlying causes of water quality problems, the correlation between water quality and property values, and related environmental laws and regulations.

Hudson River

Rushing water overtopping bridges and culverts threatens not only property and wildlife habitats, but also public safety.

More than 1,900 publicly owned road stream crossings in the Hudson River estuary watershed are too small to accommodate floodwaters of a five-year storm. The Hudson River Estuary Program is likely to identify more undersized crossings as it continues to assess bridges and culverts in the watershed.

On June 1, New York State's Department of Environmental Conservation awarded \$206,000 to two flood-related endeavors. These two projects will provide public works departments with site-specific recommendations and designs for right-sized replacement bridges and culverts. One of the two grants will fund work with two neighboring towns in the watershed of the Roeliff Jansen Kill, which is a major tributary of the Hudson River.

The other grant will evaluate culverts under town and county jurisdiction in the town of Esopus.

The DEC also announced a third, \$110,000, grant on June 1, for a project that will identify and prioritize flood risks and make recommendations in the watershed of another Hudson River tributary, the Poesten Kill. The watershed includes both rural and urban areas, including environmental-justice areas in the City of Troy.

The recommendations may include natural approaches such as stream, floodplain, and wetland restoration, as well as green infrastructure projects and improvements to traditional infrastructure.

The DEC's Hudson River Estuary Program and NEIWPC are administering all three grants.

Lake Champlain

"Never before has there been so much support from lake users, resource managers, and government entities to improve Lake Champlain and its watershed."

That is the upbeat introduction to the 2018 *State of the Lake* report from the Lake Champlain Basin Program.

The thirty-two-page report describes Lake Champlain in terms of the four main goals of the Basin Program's strategic plan, *Opportunities for Action*. These are:

- Clean water
- Healthy ecosystems
- Thriving communities
- Informed and involved public.

The report's maps and graphics share facts about everything from phosphorus

pollution to recreation. Other topics include toxins, fish health, cyanobacteria, invasive species, and citizen engagement.

Building on the program's more than twenty-five years of lake stewardship, the report also indicates trends over time. It concludes with a scorecard showing status and trends for nine key indicators by lake segment.

The report has its own website that reproduces all the sections of the report. The printed version is available from the Basin Program, and online for download.

The program assesses the state of the lake every three years, and has revised *Opportunities for Action* three times since 1996. Officials from New York, Vermont, and Quebec ratified the current version of *Opportunities for Action* at a signing ceremony at Crown Point on Lake Champlain last year. 



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Professionalizing Clean Water

Fifty Years of Wastewater Training

By MICHELLE ST. JOHN

IT HAS BEEN FIFTY YEARS SINCE some thirty-three wastewater operators attended NEIWPC's first training class. The five-day course began at Bradley Parker State Park in Topsfield, Massachusetts, on March 11, 1968.

Training, the Commission said at the time, would help to elevate the field of wastewater "renovation," and could forestall a looming shortage of skilled wastewater operators.

In the twelve months that followed, NEIWPC hosted seven additional classes, all for existing operators. Seven sessions featured either basic or intermediate-level topics, and one session provided advanced-level training. In total, 233 operators and technicians participated in NEIWPC's first foray into wastewater training.

Today, NEIWPC is a leader in environmental training. It offers a catalog of courses across the Northeast geared to all skill levels, and manages training and certification of operators for Maine and Massachusetts. In these two states, NEIWPC also offers management-training programs in the wastewater field. Across the region, the Commission provides the

Michelle St. John is an information officer at NEIWPC.

training that environmental professionals need to succeed in the wastewater industry.

A Dirty Job

Throughout history, the cleaning of human waste has been viewed as a dirty and undesirable job. Before municipal sewer systems, individuals in urban areas relied on "night soil" collectors, men who traveled through cities collecting human excrement and waste in buckets. Much of the waste was transported by horse and cart to the designated piers on major rivers or harbors.

With the onset of the municipal sewer systems, human (and industrial) waste traveled through sewer pipes to rivers. As the technology developed to clean the wastewater prior to discharging water, treatment plants for wastewater began to appear on the urban landscape, and a new profession was born.

It wasn't easy being an operator in the early part of the twentieth century. Environmental concerns were the last thing on the public's mind. Most did not care to know what happened when a toilet flushed or where drinking water came from.

The stigma of the work, low pay, and lack of recognition that plagued the profession led to a chronically weak labor pool and operators who were poorly prepared. Nonetheless, wastewater treatment plants (and skilled employees to run them) were

paramount to cleaner water.

The Commission Acts

The 1960s activism that brought environmental awareness to the forefront pushed the government to respond to the public's demand for clean water. Federal grants to build wastewater treatment plants would soon flow into the region. In its annual report for 1967, the Commission anticipated that "by 1977, an additional 1,800 plant operators and technical staff would be needed to operate the more than 600 plants proposed or in the process of being constructed across the region."

The promise of new treatment plants would be a boon for future water quality. Yet, it worried the Commission. Finding qualified candidates to run these facilities would soon be impossible if action were not taken. Low pay and lack of recognition and respect were barriers afflicting the profession that all needed to be broken. A solution was required and fast.

In 1967, the Commission took the lead, with help from its Technical Advisory Board. A subcommittee on training found that "approximately 70% of wastewater treatment plants were being operated by staff with little to no technical training." Based on its work, including a survey of wastewater plants and numerous discussions with representatives of state and local



The Commission's inaugural wastewater class poses at Bradley Palmer State Park in Topsfield, Massachusetts, in March of 1968. Alfred Peloquin, who served the Commission as executive secretary from 1967 to 1983, stands in the front row second from right. Enrollments by wastewater operators in the eight training classes held between March of 1968 and March of 1969 totaled 233.

water-pollution-control associations, the subcommittee recommended establishing a training program for operators currently employed at treatment plants.

Within six months, these first “short courses” were offered to current operators. The classes covered much of the same core content NEIWPC offers today—basic math, hydraulics, and laboratory procedures.

New Operators

While the initial training program supported those already employed at treatment plants, the Commission’s training subcommittee sought to address the impending shortage with a vocational program designed to train new operators. This, they said, would be offered concurrent with the “short courses” to provide a “pool of trained personnel to staff new treatment facilities as they become available.”

They envisioned a forty-week training program that would “combine both academic, vocational, and on-the-job training for newcomers interested in the wastewater renovation field as a career.”

Together, these two training opportunities would “enable the industry to elevate the profession, instituting a certification program for operators, giving incentive to workers for low job turnover, high performance, and continuing education.”

The Commission was aided by two \$25,000 planning grants from the New England Regional Commission. One grant was used to create a twelve-week pilot program. The first classes were held in an old fire station on the edge of the campus of what is now the Southern Maine Community College (then the Southern Maine Vocational Technical Institute) in South Portland. The second grant paid to convert existing buildings on that campus to accommodate NEIWPC’s New England Regional Wastewater Institute.

The pilot program in the spring of 1969 enrolled just eight students, four of whom completed the program and graduated in June. NEIWPC contracted with the Waste and Wastewater Technical School in Neosho, Missouri, hiring one of its faculty members, Arthur Baker, to help design, teach, and coordinate the pilot.

Though small, the pilot was a success. The Commission moved forward with creating a nine-month residential program on the South Portland campus. Other permanent locations were considered, including a former oil depot in Casco Bay, Maine, an unused medical facility in southern Massachusetts, and a closed military airfield in Manchester, New Hampshire.

A Survey of Operators

In late 1967, a Commission subcommittee developed its first training program for wastewater plant operators.

The subcommittee sent questionnaires to wastewater treatment plant operators in the six New England States (New York had its own training) to learn about the extent of formal training each operator had received, their level of interest in a training program, and subject matter for training classes.

Of the 286 replies received,

- 42% participated in training
- 32% did not participate in training
- 9% did not indicate if they received training
- 7% felt that years of experience constituted training.

Additionally, 20% indicated they had no interest in training programs.

The Commission extended its contract with the Missouri institute to develop the complete curriculum, and hired Baker to serve as the first New England Regional Wastewater Institute instructor and coordinator. Baker went on to direct the program until his retirement in 1975.

Future Operators

Forty-one operator candidates enrolled in the inaugural thirty-six-week certificate program. The rigorous program included a thousand hours of instruction, both in the classroom and on the job at a nearby treatment plant.

Who were these students? At the time, all were considered “chronically” unemployed or underemployed. Students were recruited with funding from the U.S. Manpower Development and Training Act. Enrollment requirements included little more than a “high school education or its equivalent,” “some mechanical aptitude,” and “interest in wastewater treatment and plant operation.”

Approximately half graduated, some with the promise of a position at a municipal treatment plant in the region. Most of the remaining graduates secured employment after graduation. Subsequent years yielded similar class sizes and higher graduation rates.

Training Hits the Road

As the nation adopted the Clean Water Act of 1972, NEIWPC expanded its training program to include a mobile training facility (MTF). The first of these was a twenty-five-foot recreational vehicle reconfigured to include a laboratory, technical library, and demonstration wastewater treatment equipment. The MTF traveled to wastewater facilities around the region, providing 21 hours of instruction at each site.

This ambitious effort was a precursor to today’s robust regional training program. In its first year, the MTF visited facilities in six out of the seven NEIWPC member states. 205 operators received training, either at the treatment plant where they worked or at one nearby.

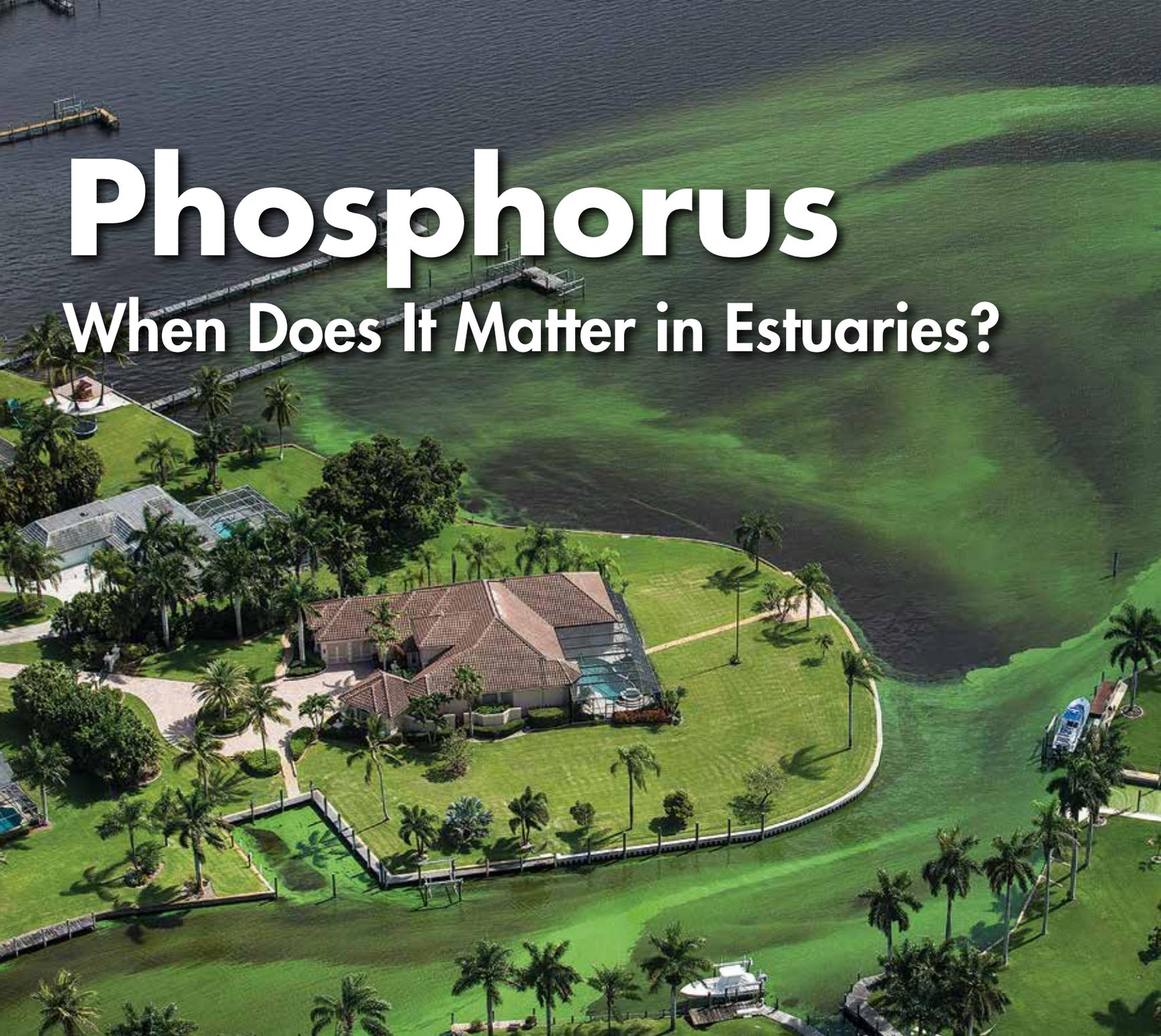
Fifty Years of Training

In 1981, after years of fundraising efforts and support from the Environmental Protection Agency, NEIWPC opened a new facility to house its growing training operation on the Southern Maine campus. Throughout the 80s, the training program fell into a natural rhythm: nine months of training for new operators, followed by technical short courses during summer months, when the nine-month program was not in session.

Nineteen eighty five was the year when the State of Maine asked NEIWPC to coordinate training efforts for its wastewater operators. This relationship, through the Joint Environmental Training Coordinating Committee, is today both longstanding and successful. NEIWPC entered in to a similar relationship with Massachusetts in 2003.

In this way, the Commission’s foresight bore fruit over time. Classes held around the region gradually replaced the Southern Maine program, which ended in the 1990s. The Commission continues to innovate and experiment in response to the changing needs of operators, treatment facilities, and states.

During the 2017 fiscal year, from October 1, 2016 through September 30, 2017, NEIWPC awarded 27,310 training hours to 2,782 participants. Participants range from long-term operators to operator candidates just starting out, and everything in between. 💧



Phosphorus

When Does It Matter in Estuaries?

BY JAMES AMMERMAN

SHOULD WE WORRY ABOUT PHOSPHORUS in estuaries? For overworked estuary managers around the world, including the Northeast, the short answer is generally no. However, one answer does not fit all estuaries in all seasons.

Debates about nitrogen versus phosphorus as the most important (limiting)

James Ammerman, Ph.D., is the science coordinator for the Long Island Sound Study. His article is based in part on his remarks at NEIWP-CC's estuary research workshop held September 13, 2017, in Narragansett, Rhode Island, at the URI Coastal Institute, which hosted the event.

nutrient in freshwaters versus estuarine and coastal waters go back decades and continue today. While both nutrients are essential to growth, in estuaries nitrogen is more likely to be the critical, limiting factor.

Humans are conducting a great global experiment with our rapid acceleration of the nitrogen and phosphorus cycles. The current water-quality impacts of this acceleration are likely more apparent than the current effects of climate change. Runoff, and loading of excess nitrogen and phosphorus to rivers, lakes, and coastal waters, cause excessive algae growth and degrade water quality.

The resulting negative impacts include nearly five hundred coastal low-oxygen, or

hypoxic, zones around the world, sometimes known as “dead zones,” where bottom-water oxygen is very low. Excess nutrients also lead to global distributions of both marine and freshwater harmful algal blooms (HABs). Blooms may include the toxic freshwater cyanobacterium *Microcystis*. Additional impacts can include disruption of food chains and the loss of seagrass, fish, and shellfish.

Nitrogen fixation is the process that converts atmospheric nitrogen gas, which is largely inert, into ammonia or other chemical forms usable by living organisms. The Haber-Bosch process, developed in 1909, allowed the industrial fixation of nitrogen, a process previously limited to bacteria or



© Greg Lovett/The Palm Beach Post/ZUMA Wire

lightning strikes. Nitrogen fertilizer and explosives are two of the most important products from this process. The former enabled the “Green Revolution” and the expansion of global agriculture that feeds the 7.6 billion people on earth today.

Phosphorus, in contrast, is mined from ancient marine sediments. While phosphorus is also an essential component of fertilizer, its use has accelerated more slowly. There are serious concerns that global phosphorus deposits may eventually be depleted.

Nitrogen and phosphorus are released into fresh and marine waters from both point-source inputs, such as wastewater treatment plants or industrial facilities, and

From Freshwater to Salt: In this 2016 photo, the St. Lucie River estuary is inundated by blooms and nutrients from Lake Okeechobee.

nonpoint-source inputs, such as agriculture, stormwater, and atmospheric deposition. While there have been numerous successes in decreasing point source loads of both nitrogen and phosphorus to various water bodies, nonpoint-source load reductions have proven more challenging. That issue is discussed in the September 2017 *Interstate Waters* (“Pollution from Everywhere: States Confront Nonpoint Source Pollution”).

What’s Limiting?

The concept of a limiting nutrient has a long history in both the agricultural and aquatic sciences. The limiting nutrient is the first of the essential nutrients to disappear from the environment, usually due to plant use of that nutrient, thus limiting plant growth. Without the limiting nutrient, plants cannot use other nutrients even when those others are abundant. The plants of interest are either agricultural crops or the algae in aquatic environments. These algae can live either in the water or on the bottom of the water body.

For estuary and water body managers, the question of which nutrient is limiting to growth is critical. The answer will inform decisions about how to expend resources to limit nutrients in the environment.

Early studies, where entire Canadian lakes were doused with phosphorus in the 1960s and 1970s, suggested phosphorus was the limiting nutrient. Reductions in phosphorus loading in Lakes Erie and Washington (near Seattle) during the same period also greatly improved water quality. Studies that added nitrogen to samples of estuarine water on the South Shore of Long Island and elsewhere suggested that nitrogen was the limiting nutrient in marine waters. Therefore, phosphorus is generally seen as limiting in lakes and streams, and nitrogen in estuaries and coastal waters, though there are important exceptions.

A common metric used in evaluating nutrient limitation is the Redfield ratio, which is the ratio of the molar concentration of nitrogen to phosphorus in the water. (A mole of nitrogen and phosphorus each has the same number of molecules, regardless of the differences in molecular weight.) When the ratio exceeds 16 to 1, which is the typical balanced ratio of nitrogen to phosphorus in many plants, the system may be phosphorus-limited, depending on the overall nutrient concentrations and other

factors. The opposite situation, potential nitrogen limitation, may occur when the ratio is less than 16 to 1.

While there are still academic debates about nitrogen versus phosphorus limitation in estuaries and coastal waters, nitrogen is by far the most commonly limiting nutrient there. This includes estuaries in the Northeast. Coastal waters are naturally enriched in phosphorus relative to nitrogen, with a Redfield ratio of less than 16. Furthermore, in most experimental estuarine and coastal studies where water samples containing algae were incubated with added nutrients, the samples showed greater biological responses to nitrogen additions than phosphorus additions. As we succeed in reducing the nitrogen loading to many estuaries, the Redfield ratio in these estuaries declines further and nitrogen limitation becomes even stronger.

Some unfamiliar with the mechanism of a limiting nutrient express concerns that phosphorus will become more important as nitrogen loading is reduced, since phosphorus concentrations may remain high. In fact, the opposite is true: as nitrogen becomes more limiting, the likelihood of phosphorus limitation declines even more.

Phosphorus Still Matters

However, there are important examples of river-induced seasonal phosphorus limitation in some major estuaries and coastal regions. These occur largely where excessive nitrogen loading from rivers overwhelms any phosphorus enrichment. Two such examples occur in the two largest estuaries in the United States, the Chesapeake Bay and the Albemarle-Pamlico Sound (North Carolina). Examples also include the two largest dead zones in the world, in the Baltic Sea in Europe and the Louisiana coastal region of the Gulf of Mexico.

Neither the Baltic nor the Louisiana coast is a conventional estuary. The Baltic is a large inland sea with limited ocean exchange and is therefore brackish (with low salinity), and the Louisiana coast is a river-dominated coastal margin.

All four of these seasonally phosphorus-limited large aquatic ecosystems suffer significantly from excessive inputs of nitrogen and phosphorus, resulting in harmful algal blooms, hypoxia, and loss of fish and shellfish. In 2017, the Gulf of Mexico dead zone was the largest measured there since the beginning of monitoring in 1985. It was almost nine thousand square miles, about the area of New Jersey. The Baltic dead zone averages twice that size. Mathematical models suggest that significant re-

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On the Move with

Alexandra Dunn

The EPA's Region I Administrator Pushes Progress in Turbulent Times

BY ANNA MEYER

A MONTH INTO HER TERM AS ADMINISTRATOR of the EPA's Region I, Alexandra Dapolito Dunn traveled to Dover, New Hampshire, to meet with local officials whose wastewater treatment plants are sources of some of the nitrogen to Great Bay.

Environmental activists stood outside the building where the closed meeting was to take place. They held such signs as "Nitrogen Management Remains a High Priority" and "I ♥ Eelgrass + Oysters." According to *Seacoast Online*, Dunn met before the scheduled meeting with some of the assembled advocates, including staff members from the Conservation Law Foundation.

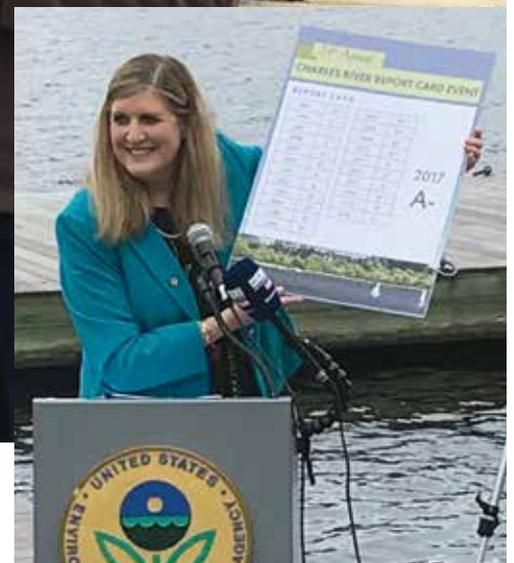
A video of the impromptu meeting shows Dunn addressing the advocates: "Our commitment is to following the

Anna Meyer is an environmental analyst at NEIWPC.

rule of law, making sure that what we do is scientifically justified, makes sense, and also allows communities to adapt to these upgrades that are costly," she said. "They may have other priorities in the communities. So we want to listen to the communities. You all are representatives of the communities affected, and others are too," she said. Dunn emphasized that the EPA is "open for conversation" and that she would welcome a meeting to discuss the advocates' concerns further.

A Role for States

Dunn, an environmental lawyer, taught environmental justice and community engagement at three different law schools. Her published work touches on urban sustainability, water quality, and the Clean Water Act. But when asked why she thinks she was tapped for her job, Dunn points to her work with all fifty states at two different national nonprofit organizations. She cites her advocacy of "cooperative federalism," the idea that the states and



Alexandra Dunn, the administrator of EPA Region I, at (top to bottom) the Woonasquatucket River cleanup in Providence, Rhode Island, on April 13, and speaking by the Charles River in Boston and in Wiscasset, Maine, on June 1 and May 24, respectively. In Providence, Dunn confers with Eric Beck, chief of groundwater and wetlands protection at the Rhode Island Department of Environmental Management.



the federal government have complementary roles in enforcing federal policies.

Dunn came to the EPA directly from the Environmental Council of the States (ECOS), where she served as executive director and general counsel. ECOS represents the heads of the state environmental

agencies across the country. Under Dunn's leadership in June of 2017, ECOS published and promoted "Cooperative Federalism: Achieving and Maintaining a Clean Environment and Protecting Public Health." Dunn spearheaded the white paper, which puts forth a plan for refining the relationships between the EPA and the states.

"We are convinced," the paper states, "a recalibration of state and federal roles can lead to more effective environmental management at lower cost." The paper calls for "elimination of redundancies across states and divisions of EPA" and "Cooperative Federalism 2.0."

On the subject of putting cooperative federalism into practice, Dunn said in July, "We ask our state partners which entity should be in the lead. Should it be EPA on this matter or should it be the state? If one of us is going to take the lead, how will we work together?"

Listening Across the Region

Dunn leaves the EPA's Boston office about one day a week to travel in the region. She meets with state and tribal officials, as well as municipal leaders on their home turf. She also meets with nonprofit organizations, business councils, personnel of other federal agencies, and New England's Congressional delegation.

- On March 22, Dunn visited New Hampshire for an oil-spill drill in Portsmouth with the New Hampshire Department of Environmental Services, the Maine Department of Environmental Protection, and the U.S. Coast Guard.

- On April 30, she joined Connecticut's governor and energy and environmental agency commissioner in celebrating the ground breaking for major updates to the City of Groton's drinking water facility.

- On May 15, she delivered remarks at the Rhode Island State House in Providence in honor of the state's gubernatorially designated Wastewater Treatment Appreciation Day.

- On June 4, she visited Burlington, Vermont, to join U.S. Senator Patrick Leahy, personnel from the Vermont Agency of

**In the Northeast,
it's rarely about
whether there
should be
environmental
protection.
It's just how.**

Natural Resources, and staff members from NEIWPCC's Lake Champlain Basin Program to celebrate new federal funding for the program.

- On June 18, Dunn went to Woods Hole, Massachusetts, to attend a U.S. Geological Survey conference on addressing nitro-

gen pollution in Cape Cod's waters.

- On June 29, she met with the Wampanoag Tribe of Gay Head on Martha's Vineyard.

- On June 21, she went out on Maine's Casco Bay to look at eel grass with staff members from Maine's Department of Environmental Protection.

The Commission also invited Dunn to its May meeting in Woodstock, Vermont. At the meeting she said that the new municipal stormwater sewer system permits for Massachusetts and New Hampshire would go into effect on July 1. The permits were delayed last year by litigation.

Conflict and Progress

Dunn said Region 1 is focusing on New England's many "iconic waters," including Cape Cod, the Great Bay, the Housatonic

River, Lake Champlain, and Long Island Sound. She hears many different views around those water bodies. "Where there is something beautiful to protect, there tends to be a lot of conflict as to how," she said. "I've spent a lot of my career thinking about community conflict resolution and community inclusion."

Here in the Northeast, she said, debates are seldom about whether there should be environmental protection. "Here, it's rarely whether. It's just how: in what context, over what timeframe, and with what tools." The central issues around the stormwater permits won't kick in for several years, and the parties to the litigation agreed to mediation. The promise that the mediation would resolve the conflict allowed the permits to go forward in the meantime. (See "Managing Stormwater" on page 15 of this issue.)

In May, Dunn told NEIWPCC's Commissioners that EPA Region 1 is pushing itself "to make decisions, especially where decisions have been delayed." Then she added, "Sometimes people come to cherish the complicated problem. They love the complicated problem so much that they forget that their job is actually to try to solve it." 💧

In Her Own Words

Alexandra Dunn made the following remarks to NEIWPCC's governing Commission at its May meeting in Woodstock, Vermont.

On New Hampshire's Great Bay: "I think the pressure on us is that the science is just not moving at the pace that we need. We have these municipalities with expired permits who are saying, 'Why can't you give us our permit? What's the hold up?' But if we do something without a full set of science, we could be setting precedent that makes it really hard for us to move forward more proactively in the future."

"We're trying really hard to bring the best science to bear on this, working with the Piscataqua Region Estuaries Partnership and the University of New Hampshire, having EPA not be the only source of science."

On the state of nutrients in the Long Island Sound: "That's another one where it's a scientific battle that's keeping us from making the progress that we need to make. We have the state doing research, we have the county doing research, we have the city doing research, we have EPA doing research, and everybody wants to sort of *not* put their research out because it could be perceived as jumping to the end game."

"One of the things that I'd like to see us do with Region 2—and I've talked with [Region 2 Administrator] Pete Lopez about this—is to have a Long Island Sound summit at some point."

"I think the way that EPA is going to have to navigate some of these really choppy waters is to bring a lot of partners to the table and see if we can build some sort of consensus around progress."

Phosphorus

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ductions in both nitrogen and phosphorus could decrease the area of hypoxia in the Gulf of Mexico by more than reductions in nitrogen or phosphorus alone.

In most of these systems, phosphorus limitation occurs in the late spring to early summer, when river nitrogen loading is highest, and in an intermediate region of salinity between freshwater and seawater, where the growth of algae is greatest.

Federal Assessments

Both the EPA and the National Oceanic and Atmospheric Administration conduct periodic coastal and estuarine assessments that have a significant focus on the degree of eutrophication, that is, excess nutrients linked to blooms and oxygen depletion. The EPA's National Coastal Condition Assessment, which is conducted every five years, is the broader of the two. The most recent report is the 2010 assessment, which was released in 2016. NOAA's is the more narrowly focused National Estuarine Eutrophication Update, which is sporadic. It was last published in 2007.

An important component of the EPA's assessment is its Water Quality Index,

which incorporates nitrogen and phosphorus concentrations along with other parameters. The assessment rates each parameter as Good, Fair, or Poor. For both the Northeast and the national water quality indices, the assessment rates phosphorus concentrations as Fair or Poor much more often than nitrogen concentrations. This assessment implies, contrary to most research, that phosphorus is a greater threat to coastal water quality than nitrogen. The EPA's phosphorus threshold needs to be re-evaluated. The agency has considered this issue, but so far has deferred change in order to maintain consistency with prior assessments.

In contrast, the NOAA update, which focuses on specific estuaries, dismisses nitrogen and phosphorus concentrations as unreliable eutrophication indicators. It includes only nitrogen loads, not concentrations, in its analyses. The rationale is that nitrogen is the primary limiting nutrient in estuaries.

Conclusions

So, what is the bottom line for estuary managers in the Northeast whose estuary has excess nitrogen and phosphorus? How should they spend limited funds available for nutrient control?

Study the Estuary: Nitrogen is probably the limiting nutrient in virtually all Northeast estuaries, unless there is extreme nitrogen loading from rivers. In that case, phosphorus limitation may occur. In many Northeast estuaries, nitrogen is declining or stable. As nitrogen declines, the possibility of phosphorus limitation becomes less likely.

Nonetheless, the nitrogen or phosphorus limitation in an estuary of interest should be demonstrated by research studies in that specific estuary. Investigation will establish the best cleanup needs and methods. This is particularly important where wastewater is a major source of nitrogen and phosphorus to an estuary. Wastewater treatment plants can more readily remove phosphorus, which is mostly in solids and sediments. Nitrogen is generally dissolved and requires extra treatment and expense to remove.

Phosphorus Reductions: Though every system is different and one size does not fit all, both the EPA and the European Union recommend both nitrogen and phosphorus reductions, or dual nutrient control, in many aquatic environments. This is particularly important when considering the entire freshwater-marine continuum of an aquatic ecosystem, since



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the limiting nutrient often shifts from phosphorus to nitrogen along the salinity gradient.

A good example is the Neuse River Estuary, which is a tributary of the Albemarle-Pamlico Sound. In the late 1980s, a ban on phosphorus detergents, combined with better wastewater treatment, improved the upstream water quality of the Neuse. However, the absence of phosphorus in the river also meant that nitrogen no longer fed aquatic plants there but instead flowed downstream to the higher-salinity region. There the nitrogen caused algal blooms and other problems. More recent nitrogen controls in this region may resolve the problems.

Similarly, phosphorus controls on the Seine and Scheldt Rivers in Europe, which drain to the English Channel and North Sea, respectively, have greatly reduced phosphorus concentrations in the rivers and improved their water quality. However, the phosphorus controls have done nothing to limit the algal blooms in the coastal waters, which are still nitrogen-limited.

In extreme cases of a heavily modified freshwater-marine continuum, such as the Florida Everglades, freshwater cyanobacterial blooms fed largely by excess phosphorus can flow downstream and directly invade

coastal estuaries. In 2016 (and again this year), phosphorus- and nitrogen-laden Lake Okeechobee waters in Florida spawned massive cyanobacterial blooms that, due to heavy rains, were diverted to prevent flooding into rivers flowing both east and west to the coasts. Significant additional nitrogen and phosphorus added by septic systems in some urbanized downstream watersheds further intensified these blooms.

A photo (page 8) shows the impact of the 2016 bloom on the St. Lucie River estuary on Florida's east coast, though the bloom originated in fresh water. Unlike other systems described above, the major modification of the hydraulic flow regime in the Everglades exported the freshwater blooms themselves, and not just the excess nutrients, directly to the coast. This clearly demonstrates the need for dual nutrient control of both nitrogen and phosphorus at the freshwater source and downstream.

Keep Monitoring: Finally, estuary managers need to continue diligent monitoring and oversight efforts even in environments where nitrogen and phosphorus are declining. Phosphorus reductions and other improvements cleaned up Lake Erie in the 1960s and 1970s. However, inattention in later years has resulted in both increased

bottom water hypoxia and major blooms of toxic cyanobacteria (*Microcystis*) from 2000 to the present.

Lake Erie is the drinking water source for eleven million people. Toledo, Ohio, a city at the western end of Lake Erie, shut down its drinking water intake for three days in 2014 in response to a cyanobacteria bloom. It was not the first Lake Erie community to do so. Though both total and point-source phosphorus loading to Lake Erie have remained within the target range, a highly bioavailable form of phosphorus has increased in the nonpoint source loads, probably due to changing agricultural practices in the Maumee River basin to the west of Lake Erie. Climate-change-induced warming of the lake may have also intensified these toxic blooms.

Ongoing Science: Nitrogen remains the major limiting nutrient and, therefore, the primary nutrient of concern in most estuaries. However, as our global experiment with the nitrogen and phosphorus cycles continues, with loading increases in some locations and declines in others, the best nutrient-control policies will continue to depend on current and robust research and monitoring efforts focused on each local estuary of concern. 💧

Spotlight

CONGRATULATIONS to **Marla Stelk**, the incoming executive director of the **Association of State Wetland Managers**. Stelk, a former policy analyst for the organization, is working with the current executive director, **Jeanne Christie**, on a prolonged transition plan that will last for the rest of the year.

The Commission staff welcomes **Joyce Novak**, the new program director for the **Peconic Estuary Program**. Novak is a coastal oceanographer whose experience spans projects and teaching appointments in New York and Europe. She joined the staff in May. The previous director, **Alison Branco**, currently directs coastal programs for the **Nature Conservancy** at its Long Island office.

Katie DeGoosh-DiMarzio was honored earlier this summer by **Save the Lakes**, with that group's 2018 **Champion of Freshwater Award**. DeGoosh-DiMarzio is a NEIWPCC employee who works at the Rhode Island Department of Environmental Management. RIDEM's **Susan Kiernan** was similarly honored. Congratulations!

We were pleased to learn that the **Gowanus Sponge Park**, in Brooklyn, won the **2018 Masterworks Award** for best

urban landscape. The juried award is presented in several categories by the **Municipal Art Society of New York**. The green-infrastructure park was the subject

of a March, 2017, story in this magazine. A grant from NEIWPCC helped make the park possible. Congratulations to park designer **DLANDstudio!** 💧



James LaLiberte, a NEIWPCC instructor who retired at the end of June, checks in with his students as they apply math concepts to the world of water. The scene was a mathematics class for wastewater operators at NEIWPCC's Lowell office on May 17, 2018. Of all of our photos of LaLiberte, this one shows what he does best. He will continue to teach select wastewater classes for NEIWPCC on a part-time consulting basis.

Workgroup Roundup

CONVERSATIONS AT MEETINGS of the Commission's workgroups run in all directions: feedback from seven states to two EPA regions, explanation from the EPA to the states, and sharing of information and stories among state officials. Some of these conversations are described below. NEIWPCC workgroups also plan events and prepare publications.

Monitoring: Water quality data collected by volunteers, and ways of ensuring the integrity and usability of that data, will be the topics of a September 17, 2018, workshop coordinated by NEIWPCC and EPA Region I. Members of the Commission's Monitoring Workgroup helped to plan the workshop.

State personnel who use monitoring data collected by volunteers will learn quality-assurance and quality-control techniques from their counterparts in Connecticut and the EPA New England Regional Laboratory. The workshop will be held at the lab in Chelmsford, Massachusetts.

February

Onsite Wastewater: During a conference call in February, a workgroup member from Connecticut said the state added passive nitrogen-reduction (PNR) technology to its technical standards. PNR uses such low-cost materials as sawdust or wood chips to promote biochemical removal of nitrogen. The new language provides a mechanism for local health officials to approve the use of PNR in conjunction with conventional septic systems.

Wastewater Certification: The workgroup comprises state personnel who oversee operator-certification programs. During a conference call in February, the group talked about operator exchange programs, in which treatment-plant operators work in a different plant for a few days to a week. The workgroup discussed the possibility of allowing operators to count this kind of experiential learning toward certification renewal requirements.

Total Maximum Daily Load (TMDL): Bringing the 2007 Northeast Regional Mercury TMDL up to date would be a significant effort. NEIWPCC staff members are looking into the scope and cost of such a project, in response to potential

interest expressed by member states. The Regional Mercury TMDL was discussed at the TMDL Workgroup's meeting on February 28. The group also talked about potential regional efforts that NEIWPCC could coordinate related to chloride pollution, such as training in road-salt-application techniques that are effective and minimize pollution.

March

Residuals: Participants in the group's March 13 conference call discussed how states are addressing the potential presence of per- and polyfluorinated alkyl substances (PFAS) in the by-products of wastewater treatment. NEIWPCC staff members shared these reports from state personnel at a training that the Commission offered in Portsmouth, New Hampshire, on March 29 called "PFAS and Other Current Topics in Biosolids."

New England Biological Assessment of Wetlands: During a March 26 conference call, state personnel discussed how their wetland monitoring programs are or may be affected by decreased funding from the federal government and at the state level. The workgroup will meet with its mid-Atlantic counterpart in November.

April

Water Quality Standards: At the group's April 19 meeting, members were invited to tell the NEIWPCC staff of any changes to their states' water quality standards. The Commission shares water quality standards of its member states on its website.

Nonpoint Source: The workgroup held its most recent meeting in Glens Falls, New York, in April, because many workgroup members were there for NEIWPCC's An-

nual Nonpoint Source Conference. At the meeting, state personnel described success stories about nonpoint-source projects that measurably restored water quality enough to satisfy some requirements of the Clean Water Act.

May

National Pollution Discharge Elimination System (NPDES): Massachusetts is seeking, and New Hampshire is exploring, delegation of permitting authority from the EPA. Delegation was among the main discussion topics at workgroup's meeting in May.

In June, NEIWPCC hosted a weeklong, in-depth course for permit writers. EPA personnel from the agency's headquarters in Washington, D.C., traveled to Massachusetts to teach the course, which was last offered in this region five years ago. Thirty-five participants, including some members of NEIWPCC's NPDES Workgroup, came from around the region and beyond.

Stormwater: At the workgroup's May 22 meeting, personnel from Massachusetts and New Hampshire described municipal coalitions in their states that have formed in anticipation of a new general permit in each state for municipal separate storm sewer systems. The coalitions will help municipalities to share resources and comply cost-effectively with new stormwater-management requirements.

June

Massachusetts Wastewater Training Advisory Committee: At its meeting on June 26, the group decided to stop offering an exam-review class because of low registration for the course last spring. The group also reflected on the 2017-2018 Massachusetts Wastewater Management Training Program. The yearlong, cohort-based course will next run from February of 2019 to March of 2020.

Underground Storage Tanks: When the workgroup met on June 7, members discussed the factors that influence the percentage of inspected underground storage tanks that are in compliance with state regulations. Rules that are very stringent or that entail adopting new technology lead to lower compliance rates. A state's compliance-related outreach and education efforts can improve compliance. 



Participants practice writing permits during a week-long course in June in Lowell, Mass.

Managing Stormwater

New Permits for Massachusetts, New Hampshire



BY ALEXANDRA DUNN

CLEAN WATER IS VITAL TO THE health and prosperity of communities across New England. Healthy lakes, rivers, streams, ponds, and bays are integral to protecting public health and vibrant ecosystems and supporting our local economies, especially tourism and recreation now that summer is here. It's the time of year when so many New Englanders connect with our iconic waters, especially our beautiful beaches. And as the head of EPA's New England office, protecting clean water across the region is one of my top priorities.

One of the biggest challenges to protecting New England waters is pollution from stormwater. Stormwater is generated after rain and snowmelt. It flows over land, paved surfaces, and rooftops. In the process, stormwater picks up pollutants that can harm water quality in our lakes, rivers, and streams. After close consultation with Massachusetts, New Hampshire, and local officials, the EPA recently put into motion a framework to reduce polluted stormwater in those places through programs in close to three hundred cities and towns, which

Alexandra Dapolito Dunn is the Regional Administrator for EPA Region 1.

will help protect and restore water quality in hundreds of local waterways. Our plan enables municipalities to employ practical, commonsense approaches to address stormwater challenges.

I know that communities can face complex challenges when solving environmental problems, and this framework gives them the flexibility to do just that. It sets goals and targets, but allows communities to make their own choices about how to achieve those goals at the local level. With states and local communities now playing a more active role in developing solutions to critical environmental issues, we can better protect our waters.

Working closely with the Massachusetts Department of Environmental Protection and the New Hampshire Department of Environmental Services, and with extensive community input, we developed requirements for water system managers to find and eliminate illegal sewage discharges from stormwater systems, implement commonsense practices to keep pollution out of stormwater, and make sure that new development incorporates modern stormwater management. Many of the tools and techniques to control stormwater pollution are low-tech and cost-effective, like better street sweeping and cleaning of stormwater catch basins. These measures help prevent

and eliminate pollution that can have long-lasting impacts on public health and water quality, and local budgets.

Our plan to reduce stormwater pollution will improve water quality across Massachusetts and New Hampshire, and many local communities have already taken steps to manage their stormwater in a comprehensive manner. I'm encouraged to see cities are already working hard to protect clean water.

The EPA has tools and resources to help municipalities identify and implement the appropriate steps to address stormwater pollution in your area. We have a range of online tools, trainings, and webinars in place to give you technical assistance and enable you to connect with EPA experts and other water quality professionals from across the region. That information is available on our website at tinyurl.com/ne-ms4.

I've been coming to New England to spend time with my family for many years, so I know just how important clean water is for communities here. By reducing stormwater pollution at the local level, our lakes, rivers, and streams will be cleaner. That's good news for residents, our precious ecosystems, and the many iconic waterways that make New England a great place to live. 

Events

Sept. 11–13, Louisville, Ky.: *National Tanks Conference*. Cosponsored by NEIWPCC and the EPA. bit.ly/2pA7gFx

Sept. 14, Concord, N.H.: New Hampshire Water Pollution Control Association's fall meeting. bit.ly/2LV221m

Sept. 15, Islip, N.Y.: *Estuary Day*. Long Island Sound Study, Peconic Estuary Program, and South Shore Estuary Reserve. bit.ly/2LUEjq3

Sept. 16–19, Stowe, Vt.: New England Water Works Association's annual meeting. bit.ly/2hknlcG

Sept. 17–21, coordinated outreach: *SepticSmart Week*. epa.gov/septic/septic-smart-week

Sept. 20, research webinar: *State of Narragansett Bay and Its Watershed*. Narragansett Bay Estuary Program. bit.ly/2JZ8cMS

Sept. 20–21, Newry, Maine: Maine Water Environment Association's fall convention. bit.ly/2AdLv72

Sept. 25, research webinar: *Moodna Creek Watershed and Flood Mitigation Assessment*. Princeton Hydro. bit.ly/2O6gxjo

Sept. 27–28, Whitefield, N.H.: Fall meeting of NEIWPCC's governing Commission.

Sept. 29–Oct. 3, New Orleans: Water Environment Federation's technical exhibition and conference, *WEFTEC*. weftec.org

Oct. 1, Fall River, Mass.: *State of the Taunton Watershed Workshop*. Narragansett Bay Estuary Program and the Resilient Taunton Watershed Network. bit.ly/2LORjJK

Oct. 10, coordinated outreach: *Imagine a Day Without Water*. imagineadaywithoutwater.org

Oct. 15–18, Amherst, Mass.: Association for Environmental Health and Sciences Foundation's Annual International Conference on Soils, Sediments, Water, and Energy. bit.ly/2OnGADM

Oct. 16, Hudson Valley, N.Y.: *A Day in the Life of the Hudson River and Harbor*. NYSDEC's Hudson River Estuary Program. on.ny.gov/2AccXlH

Nov. 5–8, Colorado Springs, Colo.: *National Nonpoint Source Training Workshop*. Cosponsored by NEIWPCC and the EPA. bit.ly/2siy7un

Jan. 10–11, Lowell, Mass.: Winter Meeting of NEIWPCC's governing Commission.

Jan. 27–30, Boston, Mass.: New England Water Environment Association's annual conference and exhibit. bit.ly/1QsZiHu

Feb. 5–7, New York, N.Y.: New York Water Environment Association's annual meeting and exhibition. nywea.org

April 2–4, Groton, Conn.: *Annual Northeast Onsite Wastewater Treatment Short Course and Equipment Exhibition*. bit.ly/2vgFgvp

April 18–19, Portsmouth, N.H.: *Annual Nonpoint Source Pollution Conference*. bit.ly/2H5VjQp

Ongoing, various locations: Courses and workshops around the region for wastewater and drinking water professionals. tinyurl.com/neiwpcc-training

Our cover shows the Northeast and its waters. The image is a composite constructed from data acquired by the Visible Infrared Imaging Radiometer Suite sensor on the Suomi National Polar Orbiting Partnership satellite. The colors are enhanced to make the blooms more visible. NASA.

