

New York Water Environment Association, Inc.

# ClearWaters

## **St. Lawrence River – Managing Water Resources on an International Trade Route**

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# Clear Waters

New York Water Environment Association, Inc.

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Cover: The Thousand Islands region stretches from Lake Ontario north about 50 miles along the St. Lawrence River to Lake Champlain. Along that stretch lays dozens of communities ranging from small cities to tiny villages and four-corner hamlets. The region is a popular tourist destination along the international border between Canada and the United States, offering many opportunities to explore historic sites and enjoy outdoor recreational activities. *iStockphoto.com*

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As I begin my year serving as NYWEA's president, I wish to thank Geoff Baldwin for his leadership this past year. I also wish to thank the Program Committee for their continued efforts to develop and deliver quality programs. This is truly evident with the success of the annual meeting. The annual meeting continues to grow each year, as shown through the quality of the presentations and new efforts like the mobile sessions in the Exhibit Hall.

## Developing a Sustainable Operator Workforce

My theme for the coming year is "Developing a Sustainable Operator Workforce". As I noted during my message at the annual meeting, the aging of the operator workforce has been a topic of discussion among state regulatory agencies, WEF, WEF member associations and everyone involved in New York's clean water community. The idea of an aging workforce has moved beyond the discussion phase and is becoming a real-world problem. Municipalities across New York are experiencing difficulties finding qualified operators to replace those who are retiring.

### Civil Service Pilot Test

One factor compounding this problem is the dual-testing requirement that many operators must meet. One test allows the operator to obtain a level of certification, while another civil service test is required to hold a position. We are all watching with interest a pilot program that the New York State Civil Service is undertaking with Albany and Saratoga counties. In this pilot, Grade 4A operators applying for Chief and Assistant Operator positions are using their active Grade 4A certification plus work experience to receive a test score, rather than taking the civil service test. If successful, this approach has the potential to expand the pool of qualified operators by providing certified operators the flexibility to accept new challenges without fear of failing a challenging civil service exam sometimes required to keep their jobs.

### Workforce Recruitment

Changes in civil service testing requirements may help certified operators but will not address the need for more people to enter

the operations field. Operators across the state take immense pride in the operation of their wastewater resource recovery facilities. My goal for the coming year is to begin developing a program that allows operators to use their enthusiasm to encourage prospective operators to enter the field. Current operators can share their enthusiasm through internships and apprenticeships and exchange their knowledge during the development of future operators. In addition to hands-on training, future operators will need access to educational programs on modern wastewater operations; the technological advancements in operations will require new operators to possess a more diverse skill set than the retiring operators. These technological skills will be necessary to juggle nutrient removal requirements, infrastructure repairs and upgrades, and budget constraints.

There are a few examples of operator workforce development programs currently underway. In South Carolina, for example, Central Carolina Technical College's PathWAY program recruits younger operators and educates high school students about the wastewater industry. Students participate in a U.S. Department of Labor registered youth apprenticeship program and gain real-world experience. The PathWAY program transfers institutional knowledge from experienced operators to develop a new generation of operators. This operator-focused program provides one year of work experience that counts toward operator certification, provides online courses, follows ABC's Need-to-Know Criteria and provides a path to an associate degree.

WEF's *Water Environment & Technology* magazine (January 2019) recently highlighted additional programs underway that encourage staff recruitment from other sources:

- Atlanta's Department of Watershed Management works with the Georgia Department of Corrections, Atlanta Urban League and others to provide deserving candidates with the training and skills for a fresh start as an operator.
- Our neighbor, the New England Water Environment Association, developed the Water Warriors program to recruit military veterans with skill sets and experience for work in the water field.

The WEF article states that these workforce development strategies have shown greater success on a regional basis. To implement similar programs in New York will require partnering on a regional and state level with the Department of Labor and Civil Service; regional education institutions like BOCES and SUNY; regulatory agencies; and local municipalities.

I believe NYWEA has the tools to lead an effort to create programs that focus on developing a sustainable operator workforce. I am looking forward to the coming year and tackling this important workforce issue. I firmly believe the members of NYWEA can provide the leadership to make this happen.



Are you a Certified Operator? If so did you get your patch? Contact Tanya Jennings at [tmj@nywea.org](mailto:tmj@nywea.org).

A handwritten signature in black ink that reads "Robert Wither". The signature is fluid and cursive, with a large initial "R" and "W".

Robert Wither, PE, NYWEA President



We all get inspired differently. Sometimes we seek it out, other times it arrives unexpectedly. You know the feeling: it stimulates creativity and motivation. From my perspective, as I witness the clean water work you all do, I see where pride is evident. Every once in a while I see an unusual spark. The photo of the baseball cap below came through on Instagram and was taken by Daniel O'Sullivan. Dan works at the Buffalo Sewer Authority and, based on his posts and initiatives, the pride he feels is palpable! Dan saw an opportunity, so he applied for – and won – the Lucy Grassano Memorial Scholarship for the Western Chapter and got to attend NYWEA's 91st Annual Meeting. And because that's not enough – again, through Instagram, we found out that Dan applied for and was accepted to the Water Environment Federation's Leadership Institute. Congratulations, Dan! It is wonderful to see operators taking advantage of the opportunities both NYWEA and WEF have available!

Simple gestures demonstrate pride in our work. Dan O'Sullivan also posted an image of his uniform on Instagram. Uniforms become the standard clothing that represents the organization, creating a sense of belonging and a feeling of connectedness to a common clean water mission. Uniforms can also help foster confident attitudes and assist in positive self-esteem. Please consider this an invitation to send us your photos that demonstrate the pride you feel at your utility (send to [tmj@nywea.org](mailto:tmj@nywea.org)) or post them on Instagram, Facebook, LinkedIn or Twitter. Water resource recovery jobs are not easy, but the rewards are great! Help us raise awareness with the general public to appreciate the hard work performed at water resource recovery utilities.

Immediate Past President Geoff Baldwin coined the term "Water Super Heroes". The term of course applies to people like Dan O'Sullivan, for the work he carries out at the Buffalo Sewer Authority, but also describes the work that is carried out by NYWEA's amazing volunteers. We have a responsibility to our predecessors, the men and women who created this great organization, to build a strong foundation for the future. Combined with the support of our staff, it is each and every one of our volunteers who are building that foundation! We thank you wholeheartedly!



Here's a preview of a few of the items that volunteers on the Government Affairs Committee and Board of Directors have been working on.

## Infrastructure Funding and Team Work with the Water Coalition

On the state level, NYWEA has once again teamed up with over 20 environmental nonprofit organizations and sent a letter to Governor Cuomo requesting additional investment of at least \$2.5 billion in the 2019-20 budget. On a national level, we have collaborated with over 89 different organizations to send a letter to congressional leaders urging them to include funding and financing for drinking water, wastewater, water reuse and stormwater as a major component to any infrastructure package considered during the 116th Congress.

## Bottle Bill

NYWEA went on record to support expanding the Bottle Deposit Law that, according to the Association of Counties, will increase recycling rates. This will make communities cleaner, preserve natural resources and protect the health of New Yorkers. Over its 30-year history, New York's Bottle Bill has been the state's most effective recycling and litter prevention program, and NYWEA endorsed the program from its inception.

To make an even greater emphasis, NYWEA went on record to further recommend that the additional funds created by any deposit levied on wine, spirits or hard cider be sent exclusively to the Environmental Protection Fund (EPF). By having a continual flow of revenue, the EPF can continue to be a source of funding for many different environmental projects into the foreseeable future. In addition, it may also alleviate some constraints in the state budget in funding this account.

## Tax Cap Letter

Many thanks to the leadership of NYWEA's new Government Affairs Chair, Matthew Millea. Through the work of Government Affairs Committee, NYWEA has advocated enactment of a permanent property tax cap in the 2019-20 state budget that includes a narrowly tailored exemption for critical water/wastewater infrastructure projects deemed necessary to protect public health and the environment.

## Spring is in the Air!

As the spring season arrives, and we celebrate Water Week and Earth Day, remember to make a strong connection in the community you live in! This is the time for tours and public outreach regarding the good work our clean water community does 24/7! Grow your roots with your ratepayers and watch the relationship blossom and flourish!

Patricia Cerro-Reehil, [pcr@nywea.org](mailto:pcr@nywea.org)

*Correction: In Clear Waters Winter 2018 issue, President Baldwin's message stated the New York City Challenge Team, the Jamaica Sludge Hustlers, was the first New York team to compete in Division 1. Actually, the Long Island Brown Tide was the first New York team to compete in Division 1. The Brown Tide placed second in Division 2 at WEFTEC San Diego in 2007, moving them into Division 1. They competed at WEFTEC Chicago in 2008 as a Division 1 team and remained a Division 1 team for several years.*



New York Marriott Marquis, February 4-6, 2019

Over 1,800 people attended New York state's largest Environmental Water Quality Conference!

**NYWEA's 91st Annual Meeting: Enhancing Perception of the Water Environment Through Outreach, Engagement and Stewardship**



NYWEA President Geoff Baldwin addresses members during the Opening Session.



Keynote speaker, Majora Carter of the Majora Carter Group.



NYCDEP Commissioner Vincent Sapienza.



Ifetayo Venner of WEF.



Oluwole McFoy, General Manager of the Buffalo Sewer Authority.



John Mancini from the NY Conference of Mayors speaks to the NYWEA members on Ethics.



Above: Steve Wood of NYSDEC opened the Regulatory Potpourri Session.



Rick Kenealy from the City of Rome.



Julia Zhu of Brentwood Industries speaks on a pilot study to achieve BNR.



Left: Lauren Livermore speaks on Asset Management.

Below: Pinar Balci, NYCDEP, on left, and Sana Barakat, ARCADIS, talk during a break.



Madison Quinn of NYWEA's Executive Office.



Left: Newly elected NYWEA President Robert Wither and scholarship winner Mallory DeLanoy.



Right: Lauren and Jamie Howard.



Photos by Trent Wellott Photography





The YP Reception attracted a large gathering to the 9th floor of the New York Marriott Marquis.



Incoming President Robert Wither.



Buffalo Mayor Byron W. Brown receives the 2018 Nelson A. Rockefeller Award.



Monroe County Executive Cheryl Dinolfo receives the Frank E. VanLare Award.



Briana Fitzgerald of SUNY-ESF receives the Student Chapter Service Award from President Geoff Baldwin.



(L-r:) Shane Holmes, David Stahl and David Railsback.



Anthony Coppola receives the Robert M. MacCrea Award.



Howard Robinson receives the Uhl T. Mann Award.



Antonio Ho receives the Lewis Van Carpenter Memorial Award.



Chris Navitsky receives the Linn H. Enslow Memorial Award.

Well Done, All!



Keith Kelly receives the Environmental Engineer Award.



Megan Messman receives the Public Education Award.



Right: Clarkson students at Times Square.



Manhattan College Student Chapter members.

*continued on page 51*





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## Water Views | Spring 2019



### Great Lakes Watershed Program

This spring 2019 issue of *Clear Waters* focuses on the St. Lawrence River and its watershed. The St. Lawrence serves as the outlet for Great Lakes water as it leaves behind eight states and two Canadian provinces, flowing eastward to the Atlantic Ocean. The New York State Department of Environmental Conservation (NYSDEC) shares management responsibility for Lake Erie, Lake Ontario and St. Lawrence River.

The Great Lakes/St. Lawrence watershed comprises fully 42 percent of New York's land area.

NYSDEC's Great Lakes Watershed Program has been leading the charge to protect, restore and enhance the water quality and natural resources of New York's Great Lakes watershed. In just seven years, the program has grown from a staff of one to a team of over 13 NYSDEC professionals deployed throughout the region.

Through collaboration with partners, NYSDEC has developed an excellent Great Lakes Action Agenda (Action Agenda) (<https://www.dec.ny.gov/lands/25562.html#Action>). As they say, "today's progress was yesterday's plan." With the Action Agenda as our guide, NYSDEC has: cleaned up contaminated sediments; restored important coastal wetland habitats and shorelines; controlled polluted runoff; cleaned beaches; and helped communities become more resilient in the face of on-coming climate change.

Consistent with an ecosystem-based approach, four regional work groups have been established to identify and implement

projects that further Action Agenda goals. Through these work groups, partnerships have been developed and strengthened to truly move us forward on restoration. This initiative has also helped create and empower new local leaders to carry this work forward into the future. Clean water work is so vast that effective partnerships are essential.

NYSDEC's Great Lakes Watershed Program has spearheaded efforts to clean up federally designated contaminated waterbodies known as Areas of Concern (AOC). Management studies and remedial actions are underway to remove impairments associated with beach closings, eutrophication (low oxygen), aesthetics and contaminated fish and wildlife. The Buffalo River cleanup and revival, for example, is just one of our major AOC remediation successes.

Another success story is the nearly completed Braddock Bay coastal wetland restoration project, which will restore 340 acres of marsh lands along Lake Ontario near Rochester.

Through the federal Great Lakes Restoration Initiative, New York has secured over \$188 million to implement over 400 projects since 2010. Governor Cuomo has also established an annual \$15 million Ocean and Great Lakes budget allocation within the New York State Environmental Protection Fund that supports actions to implement our Action Agenda.

Join in! NYSDEC welcomes the active involvement and guidance of those living along New York's "north coast" in the highly successful Great Lakes revitalization initiative!

—James Tierney, Deputy Commissioner for Water Resources  
NYS Department of Environmental Conservation

## Focus on Safety | Spring 2019



### Respect the Power of Water

Water is a temptress. It is inviting, alluring, mysterious and, like all great temptresses, has more than a little bit of danger. Who could resist? Millions vacation on its shores. Many make their living either in it or on it. Songs are written about it. But for every logical reason to be near water, there are more reasons to be aware of its hidden dangers.

I grew up downstream of an earthen dam. When it rained, we watched the markings on the side of the bridge to gauge the water's rise. At some point, a couple of us would travel miles up the dirt road just to take a look at the dam and talk to the keeper. How was the dam holding up? Would he need to release water? Had he heard anything about the big dam further downstream? Life downstream of a dam could be anxious at times.

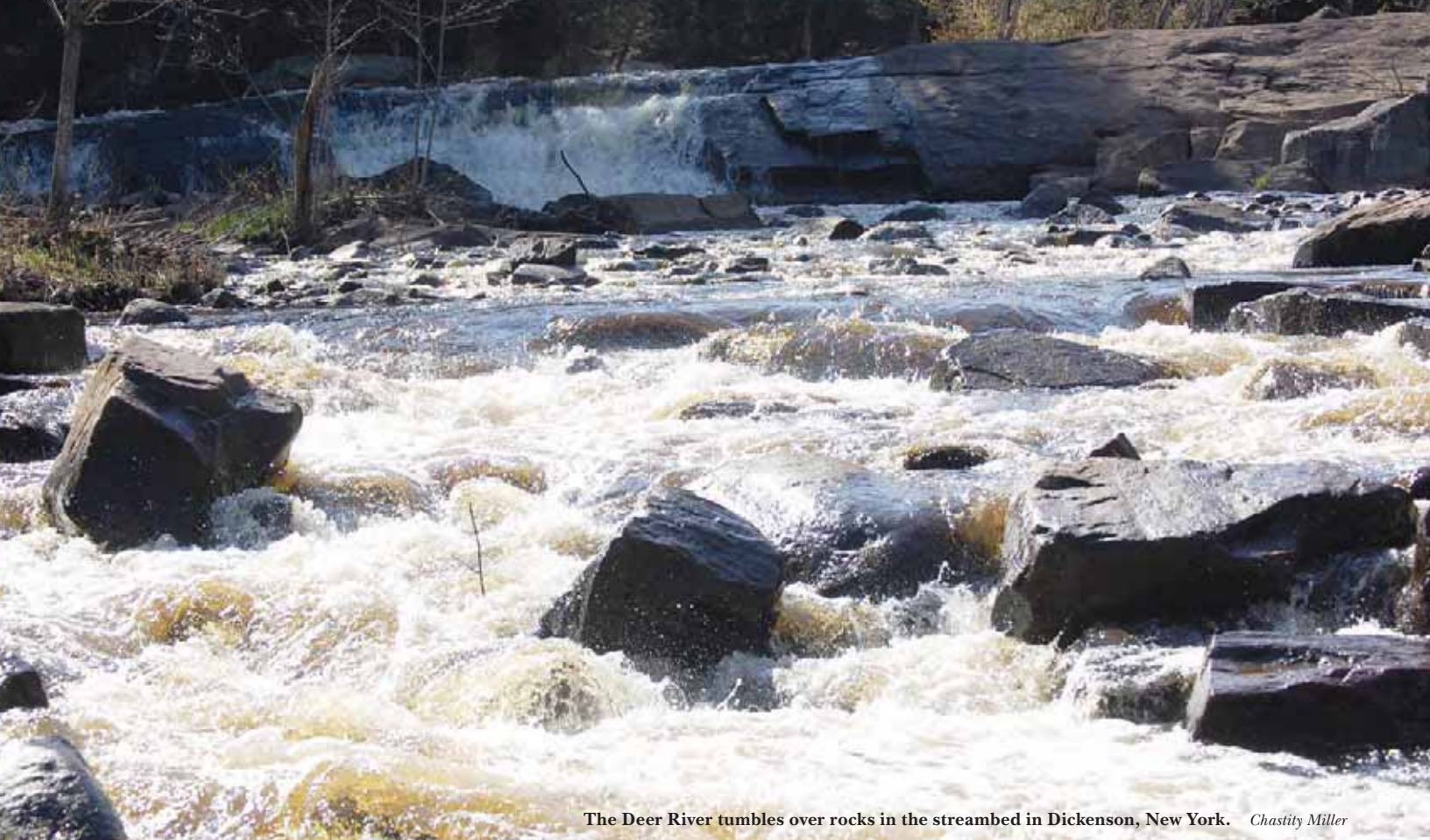
Later, I worked for a utility company that operated hydroelectric plants. While I embraced the water, I also had my safety hat screwed on. I looked downstream once again. Fishermen! Sunbathers! Boaters! Why are all these people here? Why do they still come when we advertise the date and time of a water release and tell them to stay away? Don't they know that the water level can change in a quick minute? Why don't they leave when they hear the

alarm siren? Why do so many of them trespass onto private property when fully accessible areas are close by? Why do they take the risk? Ah, yes, the seductive power of water.

And now the mighty St. Lawrence River. The water draws you into its edges, tempting you further into the current, closer to a channel, onto thinner ice. The sheer scale of the river adds to the allure. Eddies and currents mesmerize. Huge commercial vessels from distant lands intrigue. The workings of locks and races rivet. Even the sounds of the water lapping along shore seem different.

The St. Lawrence is a temptress. Long ago, its siren's call lured my immigrant ancestors from across the Atlantic. It continues to lure inland vacationers, who have a week to experience scenic watery vistas. Well-intentioned sporting enthusiasts, looking to experience the challenge of a larger waterway, are drawn to it like a moth to a flame. Be forewarned. Like any relationship with a temptress, the emotional and instinctual highs need to be balanced by awareness of the dangers, an abundance of caution and — always — respect.

—Eileen M. Reynolds, Certified Safety Professional  
Owner, Coracle Safety Management



The Deer River tumbles over rocks in the streambed in Dickenson, New York. *Chastity Miller*

## Developing Partnerships and Plans Across the Watershed

by *Chastity Miller*

In 2010 I was having a conversation with Dawn Howard, District Manager for the St. Lawrence County Soil and Water Conservation District (SWCD). We observed that so many watersheds have watershed groups that receive funding for projects in those watersheds. We wondered why the St. Lawrence River didn't have a watershed group to pursue project funding? I said, "Well, then, let's start a watershed group and get some funding!"

So, the eight Northern New York SWCDs banded together to form the St. Lawrence River Watershed Project, Inc. (SLRWP).

### The St. Lawrence River Watershed Project

The St. Lawrence River serves as a critical recreation, shipping, transportation, infrastructure, tourism, community and hydro-power resource for the North Country region. The St. Lawrence River watershed extends nearly 300,000 square miles across northern New York and Canada. Of that, about 5,600 square miles lie within eight New York counties: St. Lawrence County; most of Franklin County; northern Jefferson, Lewis, Herkimer and Hamilton counties; and small portions of western Essex and Clinton counties.

SLRWP is made up of two voting representatives from each of the eight counties: one from the SWCD; and the other from either the SWCD or from the county's Water Quality Coordinating Committee. Another voting member, from the St. Regis Mohawk Tribe, rounds out the list of 17 voting members. There are also nonvoting members that participate and assist. These include but are not limited to: county planning departments; universities and

colleges; sportsman clubs; lake groups; land trusts; Save The River; New York State Department of Conservation (NYSDEC); New York State Department of Agriculture and Markets; Adirondack Park Agency; Adirondack Park Invasive Plant Program; and Adirondack Watershed Institute.

Once everyone came together, we held a planning meeting to determine our mission, purpose and priorities:

- The mission of the SLRWP is to encourage watershed partnerships and the implementation of conservation projects that promote, enhance and protect natural resources and water quality.
- The purpose of the SLRWP is to promote the sharing of information, data, ideas and resources to foster a dynamic and collaborative watershed management program with an ecosystem-based approach to water quality improvement and protection.
- The priorities of SLRWP are: invasive species; agricultural practice management; land use planning; forest and flood plain management; recreation; development and stormwater management; and creating partnerships to promote collaboration and education.

Once our mission, purpose and priorities were identified, we filed for 501(c)(3) nonprofit organization status, for which we were approved in 2012.

### The St. Lawrence River Watershed Revitalization Plan

Knowing that planning is the key to all good projects, we needed to pull together a roadmap to determine where to focus our energies. So, our first step was to develop a plan to begin addressing the watershed priorities we had identified. We applied for fund-





Canada and snow geese congregate on the Malone Recreational Park Pond in Malone, New York. *Chastity Miller*

ing to develop a watershed management plan from the New York State Department of State under Title 11 of the Environmental Protection Fund. Although for several years our applications were not successful, in 2015 Franklin County, in partnership with SLRWP and the Franklin County SWCD, was awarded a grant to develop the St. Lawrence River Watershed Revitalization Plan.

This plan will cover nearly 5,600 square miles of the watershed in New York, including: 11,371 miles of rivers and streams; 376 lakes, ponds and reservoirs; 185 miles of St. Lawrence River shoreline; over 180 towns, hamlets, villages and cities; eight counties; and two NYSDEC regions.

The Watershed Revitalization Plan will:

- Describe the St. Lawrence River watershed and summarize baseline conditions.
- Identify key problems and watershed goals.
- Offer watershed management recommendations, including an implementation strategy that will identify projects, plans, programs and organizations that will benefit the watershed's municipalities with economic investment, natural resource protection, regional sustain-

ability and community revitalization.

Development of the Watershed Revitalization Plan will begin with assessing the baseline conditions. According to the NYSDEC (Figure 1), approximately 60 percent of the rivers and 32 percent of the lakes in the watershed have not been assessed for their water quality (NYSDEC 2018).

Water quality in the St. Lawrence watershed is predominantly affected by atmospheric deposition of pollutants that originate largely outside of the river basin. Acid rain limits the fish community and affects aquatic ecosystems, while atmospheric deposition of mercury restricts human consumption of fish due to food chain bioaccumulation. In this rural, agriculturally intensive area, impacts from agricultural activities on water quality are also important considerations. Agricultural activities and associated runoff contribute nutrients and sediments to waters. Hazardous wastes and other industrial impacts associated with resource extraction are of concern in specific areas of the watershed. For example, there are hazardous wastes and legacy industrial impacts in the Massena Area of Concern (NYSDEC 2018).

When it is completed, the final Watershed Revitalization Plan will be a consolidated document that will include:

- Formation of a watershed advisory committee.
- Preparation of a community outreach plan.
- Development of a watershed vision and goals.
- A watershed characterization report, which will include:
  - Description and assessment of St. Lawrence River Watershed resources.
  - Description and assessment of the ability of local laws and programs to implement best management practices to protect water quality.
- A summary of public meetings and public input.
- Watershed management recommendations to achieve goals and objectives.
- An implementation strategy and schedule.
- A tracking and monitoring plan.

*continued on page 12*

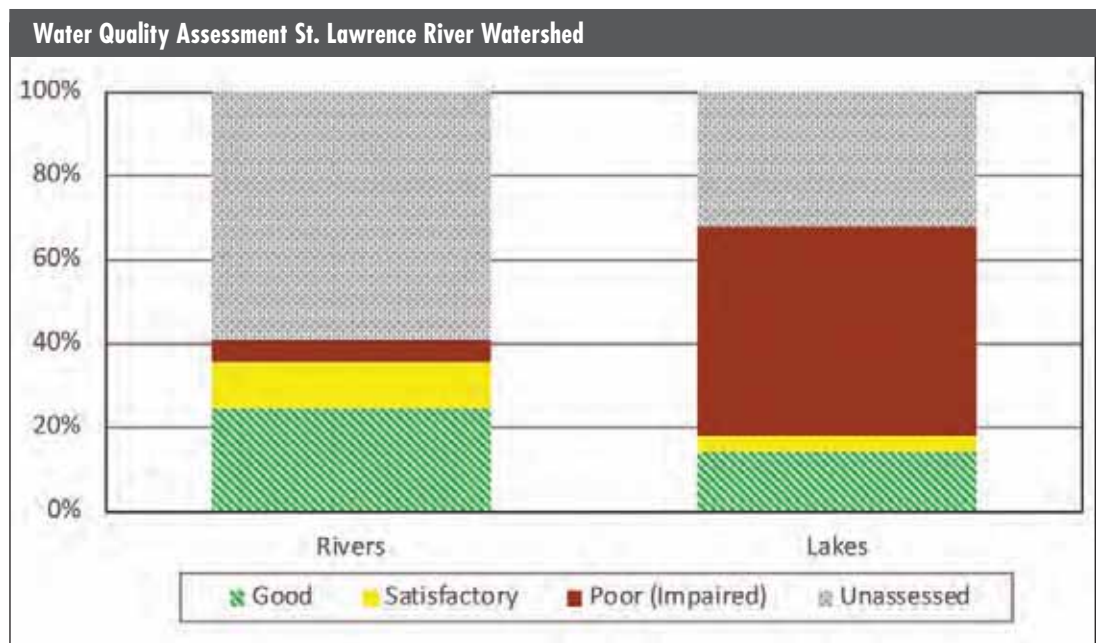


Figure 1. Water quality assessment based on most current Waterbody Inventory/Priority Waterbodies List (WI/PWL) water quality assessment information for the waters of the St. Lawrence River Basin. The four categories are defined as: "Good" = fully supports designated activities and uses; "Satisfactory" = fully supports designated activities and uses, but with minor impacts; "Poor (Impaired)" = does not support designated uses and activities; "Unassessed" = Insufficient data available. *NYSDEC*



continued from page 11

Currently SLRWP, in partnership with Franklin County SWCD and Franklin County, has hired a consultant to develop this plan. This document will be the framework for funding for future projects and a guide to identify projects or areas that need attention right away. Watershed communities will be involved in identifying additional local and regional priorities.

## We Need You

So how can you help? Get involved! We are looking for public input on the contents of the Watershed Revitalization Plan. This is an opportunity for the community members to weigh in on the issues and concerns that are important to them. Anyone who is interested and is located in the watershed can comment and assist us to identify and prioritize projects.

Contact SLRWP and Current Chairperson Chastity Miller at [cmiller@fcswcd.org](mailto:cmiller@fcswcd.org) or by phone at (518) 651-2097.

I would like to take this opportunity to thank everyone who has assisted thus far with the process, project and plan. It seems easy, but it is not! A lot of factors go into putting together a project like this and establishing our group. Sometimes the hardest part is making sure everyone who needs to be involved is included. With your help, we can make this the best watershed project there is!

---

*Chastity Miller is the District Manager of the Franklin County Soil and Water Conservation District, and Chairperson of the St. Lawrence River Watershed Project, Inc. She may be reached at [cmiller@fcswcd.org](mailto:cmiller@fcswcd.org).*

## References

NYSDEC, 2018, <https://www.dec.ny.gov/lands/48021.html>.



A waterlily blooms on the surface of Mountain View Lake in Franklin County, New York.  
*Chastity Miller*



Water flows over the Whittelsey Dam in Malone, New York.

*Chastity Miller*





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# Save The River Promotes Water Quality Improvement Projects, Practices and Programs to Support a Healthy St. Lawrence River

by Patricia Shulenburg

Save The River was formed in 1978 to protect and preserve the ecological integrity of the upper St. Lawrence River through advocacy, education and research. We remain a strong and effective advocate for policies and practices that protect freshwater resources, support water quality monitoring, educate our community, engage the public with citizen science opportunities and advance research throughout the St. Lawrence River watershed. A healthy St. Lawrence River is critical to ecosystem health, resilient communities, recreation and tourism industries, and to millions of people that rely on source water protection.

## Advocacy

Our organization, comprised of over 1,100 members, supports water quality advocacy initiatives and regulations that protect freshwater resources. In recent months we have initiated a campaign by working with citizen groups to reduce single-use plastic bags in Cape Vincent, Clayton and Alexandria Bay. Our Sustainability Committee is expanding this initiative by partnering with additional municipalities and expanding outreach efforts to Ontario, Canada. We focus on fostering community outreach with interpretive materials and signage; supporting legislation that eliminates plastic bags; partnering with local leaders and businesses; and educating the next generation of environmental stewards with K-12 programming.

We are also at the forefront to prevent the expansion of invasive Asian carp species into the Great Lakes. Expensive to eradicate, Asian carp decimate fish and sportfish populations, alter ecosystems, and threaten our recreation and tourism industries. As the U.S. Army Corps of Engineers unfolds their plan for the Brandon Road Lock and Dam in Illinois, we will push our membership to engage our policymakers by encouraging them to support the project and cost share with the Great Lakes states.

In addition, we work collaboratively to prevent new introductions of invasive species from ship ballast; restrict St. Lawrence Seaway expansion; limit winter shipping and navigation; increase spill response planning and public communication transparency; oppose water diversions and promote variable water levels management. We advocate for research to inform best management practices, education and outreach initiatives, and policy positions. Although we have seen successful legislation enacted to restore, preserve and protect our freshwater resources, these successes have also led to new challenges. Educating our community and furthering our partnerships is integral to our shared success for implementing policies and practices that support healthy water quality.

## Community Partnerships

Community partnerships are essential to our success. Save The River supports our coastal municipalities and advocates for wastewater infrastructure improvement projects. For example, we have provided support for the Town of Clayton and City of Ogdensburg for water quality improvement projects. We have provided commentary on waterfront revitalization plans and river sediment dredging projects, as well as providing opportunities for community engagement. For example, we encouraged the city of Longueuil near Montreal, in the province of Quebec, Canada, to update their

wastewater infrastructure and decrease sewage pipeline outflows during maintenance.

Wastewater infrastructure projects are not only a municipal concern but are also important to homeowners. Save The River created the Kingfisher Water Quality Program in 1984 to provide assistance for homeowners to test septic leaks and make best management decisions regarding their wastewater systems. This spring, we plan to release an updated version of our Homeowner Wastewater Handbook with financial resources, demonstration projects, information on regulations and technology alternatives for updating septic systems.

## Citizen Science

We further engage our community through citizen science opportunities. Now in our 10th year, Save The River's Beach Watch Program trains volunteers to monitor water quality by collecting water samples that are tested for *Escherichia coli* (*E. coli*). For nine weeks during busy summer months, volunteers collect water samples at six popular swimming sites throughout the Thousand Islands region. For 2018, each water sample passed New York State Department of Health water quality standards with less than 235 colonies of *E. coli* per 100 ml water sample. These results are published weekly on our website, in the app Swim Guide, and through media outlets.

Save The River is a local coordinator for the New York State Department of Environmental Conservation Water Assessment by Volunteer Evaluators Program (WAVE) and hosted a workshop in the Indian River Lakes watershed. Volunteers were trained to sample streams for macroinvertebrates and identify indicators of

*continued on page 16*



Isabella Colello, 2018 Save The River Intern, coordinates volunteers for the Beach Watch Program and collects a 100-ml sample at Frink Park in Clayton, New York, to test for *E. coli* bacteria.

Patricia Shulenburg

stream health.

Save The River delivers iMapInvasives workshops that engage our community with invasive species identification, mapping, and assessment of our riparian areas for existing and emerging invasive species that threaten water quality.

Save The River has additional opportunities for our river community to participate in citizen science programs. Since 1999 volunteers have been out on the water monitoring colonies of common terns, a New York state threatened species. Shorebirds are an indicator species for water quality and ecosystem health. Each week from April to August, Save The River coordinates volunteers to restore natural and artificial nesting sites. Staff and volunteers also monitor nest productivity by counting eggs and chicks in partnership with Dr. Lee Harper, Riveredge Associates researchers, and the Thousand Islands Land Trust. We rely on volunteers to deploy shoal markers each spring to keep the river safe for recreational boaters and free from chemical spills. Save The River promotes a healthy river muskellunge and bass fishery by providing angler education and furthering angler best fishing practices through our Catch and Release Program.

We have trained over 1,000 Riverkeeper volunteers since 2008 to monitor and report pollution, invasive species, wildlife die-offs, threatened and endangered species and harmful algal blooms. The Riverkeeper Volunteer Program offers a one-hour presentation and an interpretive hike or kayak paddle. Participants are provided with a Riverkeeper guidebook. Volunteers are trained to monitor for subtle changes in river ecosystem health and learn how to submit their observations using Save The River's online reporting system. Engaging volunteers with citizen science opportunities promotes a healthy watershed and nurtures stewardship of our river for future generations.

### Youth Engagement



During the 2018 season, 340 common tern chicks, a threatened species in New York, were banded and fledged from six nesting sites monitored by Save The River's dedicated partners and volunteers. Shorebirds are a great indicator species for water quality.

*Save The River*

Save The River has engaged over 10,000 students through our K-12 In the Schools and On the Water programs, which are now in their 10th year. We offer three educational programs to engage our K-12 community in river education and environmental stewardship. The Junior Riverkeeper Program takes material included in the adult Riverkeeper Volunteer training and tailors the information for classroom curriculum. Each program, developed with Common Core and Next Generation Science Standards to be grade and topic specific, works with individual teachers to bring place-based education into the classroom. Students learn about watersheds, pollution and plastics, invasive species, and threatened and endangered species. We also offer educator workshops throughout the school year integrating Save The River curriculum with watershed education resources. Save The River is partnering with Girl Scouts of NYPENN Pathways, Inc., to expand watershed education for Girl Scouts earning their Wonders of Water, Animal Habitats and Water Ambassador badges.

Critical to our mission is engaging students with On the Water programming. Each year Save The River brings hundreds of students on the water for field trips and engages them with watershed stewardship projects. We tailor our field trips to our educator's curriculum needs. For example, 33 sixth-graders from Lafargeville Central School District read "World Without Fish" by Mark Kurlansky, then discussed human impacts to fisheries through interactive games at the Minna Anthony Common Nature Center. The sixth-graders toured the State University of New York College of Environmental Science and Forestry's Thousand Islands Biological Station, where they asked researchers about water quality impacts to fish health. This year, we are expanding our On the Water programs to include funding for our K-12 educators to implement watershed stewardship projects. These may include but are not limited to: coastal cleanups; invasive species projects; tree plantings; and rain gardens. Educating the next generation of environmental stewards through project-based learning opportunities is critical to our mission to preserve and protect our freshwater resources for now and for generations to come.

### Annual Winter Environmental Conference

We continue to engage our greater river community with advocacy, education and research through our annual Winter Environmental Conference. On February 2, 2019, in Clayton, New York, we gathered with national and regional policymakers, scientists, opinion leaders, students and educators to discuss topics of critical importance to water quality and the health of the St. Lawrence River. Now in our 30th year, our annual conference showcased expert research on water diversions, Asian carp policy, American eel conservation, microplastic pollution and mercury cycling. We also premiered our short film, "It's Hard to be a Tern." Email [info@savetheriver.org](mailto:info@savetheriver.org) or call (315) 686-2010 for more information about next year's Winter Environmental Conference. We hope that you can join us in 2020 and partner to protect our important freshwater resources.

### Get Involved

As the St. Lawrence River evolves, so do the needs of our coastal communities. Save The River is committed to being at the forefront of environmental advocacy, education and research initiatives for our shared water resources. We will continue to work with policymakers and collaborate with partner organizations, promote academic research, engage our community with citizen science



opportunities, support water quality improvement projects and practices, and educate the next generation of environmental stewards.

There are many ways to become involved with Save The River from attending an educational program or workshop, exploring volunteer opportunities, or partnering on water quality improvement projects. We can protect and preserve the ecological integrity of St. Lawrence River together. Visit [www.savetheriver.org](http://www.savetheriver.org) to learn more about our organization and consider becoming a part of our membership.

*Patricia Shulenburg is the Program Manager for Save The River, with over eight years of experience in stream, wetland and dune restoration; conserving threatened and endangered species; community education; and engaging the public in citizen science opportunities. She serves on the Education Committee for SLELO PRISM, the Jefferson County Water Quality Coordinating Committee, and is an Executive Member of the Eastern Lake Ontario Dune Coalition. She may be reached at [patricia@savetheriver.org](mailto:patricia@savetheriver.org).*



Riverkeeper volunteers paddle Gray's Creek Conservation Area in Cornwall, Ontario, and in partnership with the St. Lawrence River Institute, identify and report indicators of river health including threatened and endangered species, invasive species, pollution, harmful algal blooms and wildlife die-offs.

*Tara MacDonald*



Students and teachers from Wiley Intermediate School in Watertown, New York, volunteer their time for the 2018 international Coastal Cleanup Day. They pulled over 176 pounds of trash and debris from the St. Lawrence River in Clayton, New York. They also learned about human impacts to watersheds and plastic pollution.

*Save The River*





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# Protecting Where the Land Meets the River: Wetlands Conservation and the Thousand Islands Land Trust

by *Alaina Young*

**T**he mission of the Thousand Islands Land Trust (TILT) is to conserve the natural beauty, diverse wildlife habitats, water quality and outdoor recreation opportunities of the Thousand Islands region, for present and future generations. While most land trusts focus on protecting trees and forests, our geographic location puts us in the unique position of stewarding lands fundamentally linked to the freshwater system of the St. Lawrence River.

The Thousand Islands consist of a mosaic of habitats supporting a great diversity of wildlife, from forests and aquatic systems to coastal wetlands and grasslands, scattered along the United States/Canada border. So, the impact we have on the land here in the United States also affects another country that we can see from our office across the beautiful expanse of river. And with over 4 million people in the United States and Canada relying on the St. Lawrence for drinking water, it is critical that conservation organizations work together to protect this vital freshwater source.

Thousand Islands are also located at the center of the Frontenac Arch, a geological ridge which connects the Canadian boreal forest to the forests of the Adirondacks and Appalachian Mountains. Also referred to as the Algonquin to Adirondack (A2A) corridor, this landform serves as a natural migration route across the Great Lakes system. The Thousand Islands region is the point where these forest systems meet, an area of unparalleled biodiversity.

Part of the Atlantic Flyway, the St. Lawrence is a migratory bird hot spot where over 400 species of birds have been identified.

But the region faces many problems resulting from development and human impact, including the proliferation of invasive species, pollution and habitat fragmentation. Development threatens to shift the balance of the river's ecosystem. For future generations to see and appreciate the beauty of the Thousand Islands, sensitive, undeveloped habitat must be conserved.

Coastal wetlands provide countless ecosystem services, from water filtration and flood mitigation to slowing runoff and preserving water quality. Development of land upstream from these important wildlife habitats can threaten the integrity of the system altogether, throwing off the delicate balance of plants, animals, microbes and sediment that make these services possible. Without

Sunset over the Thousand Islands. *Thousand Islands Land Trust*

wetlands, we would not have seafood to eat, fish to catch, birds to watch or even waters to paddle. Wetlands serve as vital nursery areas and spawning grounds for commercially important fish species, like muskellunge and northern pike, on which the tourism of the Thousand Islands region relies heavily.

Land and water are intrinsically linked, and this connection is most pronounced in wetlands. The role of TILT is to conserve land and wildlife habitat that, in turn, protect the Thousand Islands region in perpetuity. Recent grant and donor-funded projects have focused on the important goal of protecting, restoring and enhancing wetland habitats, both on our fee-owned and easement-held lands, as a means of fulfilling our mission.



Coastal wetlands, such as these by Crooked Creek, provide key ecosystem services, including flood mitigation and water filtration.

*Alex MacLean*



## Safeguarding Biodiversity

In June 2017, TILT purchased over 300 acres of wetlands and forest in Goose Bay from Berne and Kate Broudy, members of the Weisberg family who stewarded the land for more than 50 years. During their ownership, the family consistently prioritized conservation. The purchase was made possible by a North American Wetlands Conservation Act (NAWCA) grant and donations from generous community members. This land, adjacent to TILT's Crooked Creek Preserve, will now be conserved in perpetuity.

The Broudy Property is deemed a Significant Coastal Fish and Wildlife Habitat due to its ecosystem rarity, species vulnerability and irreplaceability. Composed of a variety of habitats, including coastal emergent wetlands, forested uplands, rocky outcrops and open water, the property provides habitat for a diverse variety of plant and animal species. It is the home of species listed as threatened or endangered in New York, like the Blanding's turtle, pugnose shiner, common tern, black tern and northern harrier, as well as more common species like northern pike, whitetail deer and painted turtle.

Coastal wetlands like those at Goose Bay act as water filters, slowing down runoff. They serve as a buffer for pollution, preventing it from entering waterways and threatening a vital source of fresh water for both sides of the St. Lawrence River. Conserving the Broudy Property strengthens the viability of this system and ensures that water quality and diverse wildlife habitats in the region are protected for future generations.

## Protecting Migratory Birds

In August 2017, TILT was awarded \$211,800 of grant funding from the U.S. Fish and Wildlife Service (USFWS) through the Great Lakes Restoration Initiative (GLRI) for habitat protection in the St. Lawrence River and Great Lakes watershed. This grant was a part of the GLRI Joint Venture Habitat Restoration and Protection Program, which supports long-term habitat protection, restoration, or enhancement projects for the conservation of native Great Lakes fish and wildlife populations, with a focus on migratory birds.

Permanently protecting over 250 acres of forests, wetlands and riparian habitat, the funding covered the acquisition, appraisals, property surveys, legal fees and transaction costs needed to manage the land, including:



Views of Picton Island.

Feather in Flight Productions

- A fee-owned acquisition of a 180-acre tract on the Indian River in Rossie, New York.
- Implementation and management of two limited-development conservation easements on remaining unprotected lands on Picton Island, totaling approximately 49 acres and 4,200 linear feet of shoreline.

This project meets the habitat goals of the Lower Great Lakes/St. Lawrence Plain Bird Conservation Region (BCR-13) Plan as the land is home to priority bird species including the long-tailed duck, common goldeneye, American black duck, wood thrush, golden-wing warbler and the cerulean warbler, among others. Eighty percent of threatened and endangered bird species in the United States rely on wetlands for breeding, nesting, shelter, social interactions and rearing young, for either part of or the entire duration of their life cycle.

## Combating Invasive Cattails

The Otter Creek Wetland Restoration Project began in 2018 with funding through the USFWS Fish Enhancement, Mitigation and Research Fund (FEMRF). Wetlands on Otter Creek are important for St. Lawrence fisheries, as pike spawn here in the spring, and small panfish live in the Creek's sheltered waters. Once a diverse and important habitat, in recent years a hybrid cattail species *Typha x glauca* invaded the Creek and outcompeted other native aquatic plants. The monotypic stands of cattails formed dense mats that impacted the diversity and ecology of the system. *Typha x glauca* diminishes the functionality of wetlands and disrupts the key hydrological processes necessary for the ecosystem services they provide. The wetland restoration project was designed to restore open water habitat for northern pike, waterfowl, shorebirds and other riverine wildlife.

The restoration of Otter Creek involved excavating two pools, or potholes, in these dense mats, and digging connecting channels to provide connectivity to the main creek branch. The excavated



View of the Broudy Property.

Feather in Flight Productions

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cattail material was then piled as habitat mounds that support native biota. To determine the project's success, pre- and post-construction monitoring efforts are being conducted by the State University of New York College of Environmental Science and Forestry (SUNY ESF) Thousand Islands Biological Station (TIBS).

The potholes created by this project are depressional wetlands that serve three purposes:

- Attract migratory waterfowl.
- Mitigate flooding by slowing and storing floodwaters.
- Recharge groundwater supplies by slowing infiltration of water.



The Otter Creek Restoration Project involves digging up cattails to create potholes, which attract waterfowl and facilitate biodiversity.

*Thousand Islands Land Trust*



Payne Lake from above. The wetlands adjacent to Payne Lake reside along the A2A corridor and will be conserved by TILT in perpetuity.

*Thousand Islands Land Trust*

This project serves as a great example of converting an invaded, unproductive ecosystem back to its former state of biodiversity and functionality.

## Partnering for the Environment

In 2018 TILT, along with other local environmental organizations, was granted a NAWCA grant to protect and improve 2,698 acres of critical waterfowl, shorebird and upland bird habitat within the Thousand Islands region. A total of \$1 million was awarded to TILT and conservation partners Ducks Unlimited, Indian River Lakes Conservancy and the St. Lawrence Land Trust, which will jointly match this funding with \$2.3 million.

TILT's share of the grant funding is \$573,000, which will be used to protect 1,125 acres of land. This funding will help with the implementation of Picton Island Conservation Easements Phases III and IV, an easement on Grindstone Island, and the protection of over 900 acres within the A2A corridor. This includes 500 acres of wetlands adjacent to Payne Lake and Pulpit Rock State Forest, and the restoration and enhancement of 25 acres of emergent wetlands on the Blind Bay Preserve in Hammond, New York.

Blind Bay is a vital spawning habitat and key nursery area for muskellunge, an iconic St. Lawrence River species. Important both economically and ecologically, muskellunge were in notable decline due to lack of proper scientific management of the population. In addition, beginning in 2005 the muskellunge population suffered widespread mortality due to the fish disease viral hemorrhagic septicemia (VHS). This outbreak negatively impacted the fish community and the recreational muskellunge fishery. Community responses and new management strategies are now bringing this population toward recovery. Protecting habitat such as Blind Bay, which plays a key role in the success of the muskellunge population, is key to this endeavor.

The Blind Bay Preserve also contains undeveloped forested shoreline and serves as an important terrestrial habitat corridor. It remains ice-free due to the pattern of currents throughout the winter, so waterfowl remain prominent year-round and bald eagles can be spotted through the winter season. This joint conservation project will promote collaboration and ensure that best management practices are being used to restore and protect important wetland habitat throughout the Thousand Islands.

## TILT's Commitment to the Future

Wetland restoration and protection are vital in TILT's mission of conserving the Thousand Islands region for present and future generations. Wetlands lessen the impacts of flooding, provide us with clean water, and sustain the fish and game populations that we pursue. By protecting wetlands, TILT protects one of the most important and sensitive landscapes in the Thousand Islands, as well as the natural and human systems that rely on these wetlands to thrive. Moving forward, TILT will complete and continue to monitor these restoration projects, and search for more opportunities to work with conservation partners and our local communities to protect vital habitat in the place we love, the Thousand Islands region.

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*Alaina Young is the Education and Outreach Coordinator for the Thousand Islands Land Trust and may be reached at [ayoung@tilandtrust.org](mailto:ayoung@tilandtrust.org).*





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# A Comprehensive Approach to Developing a Regional WRRF

by Sarah Purdy, Andrea Smith, Scott Thornhill, Carrie Tuttle and Charles Prior

The City of Ogdensburg, located in the Northern New York Region, is undertaking a major project to upgrade its wastewater system. The project will be one of the most substantial investments in the city's history. The \$35 million Wastewater System Improvements Project will achieve many goals and put the city in a position to transform the water resource recovery facility (WRRF) into a valuable asset.

This article explains the steps taken by the City of Ogdensburg to achieve several critical goals so that it can realize the long-term vision of a regional water resource recovery system that will support the needs of the city and surrounding communities for decades to come.

## History and Background

The City of Ogdensburg is in northern St. Lawrence County, along the southern shore of the St. Lawrence River, and it is the only city in St. Lawrence County. The city includes a nearly 6-mile long shoreline along the river and is home to the confluence of the Oswegatchie and St. Lawrence rivers. According to the 2010 census, the city has a population of 11,128. In the last 10 years the City of Ogdensburg has experienced a 25 percent decline in its population and has lost several large industrial customers. The city has been working hard to rebuild its waterfront and reposition itself as a destination on the St. Lawrence River. As part of these efforts, it is investing capital to rebuild access and critical public infrastructure that is necessary to support existing and future business development.

The city owns a 6.5 million gallons per day (mgd) Grade 4A WRRF and the associated wastewater collection infrastructure. The facility serves residential, commercial and industrial users, and is permitted by the New York State Department of Environmental Conservation (NYSDEC). The WRRF and the wastewater collection infrastructure are maintained by the city's Department of Public Works. The city contracts with the Development Authority of the North Country to provide management support services at the WRRF.

The WRRF is in the eastern portion of the City of Ogdensburg near the St. Lawrence River and Port of Ogdensburg. Before the

WRRF was built, the site was utilized as a railroad depot station. The WRRF was initially constructed in 1965 to provide preliminary treatment, primary treatment, solids handling and disinfection. It was expanded in 1978 to include secondary treatment through the addition of aeration tanks, blowers and final clarifiers. The WRRF has a peak hourly primary treatment and disinfection capacity of 20 mgd and a peak hourly secondary treatment capacity of 13 mgd. Since the secondary treatment expansion, there have been limited upgrades at the WRRF; most recently in 2010 an aeration system rehabilitation project was completed. This project added fine-bubble diffusers in each of the two aeration tanks, several turbo blowers and a Programmable Logic Controller driven dissolved oxygen control system.

Along with the WRRF, the city's wastewater infrastructure consists of 87 miles of sewers, six wastewater pump stations, 17 permitted combined sewer overflows (CSOs) and the WRRF outfall. The city completed a Long-Term Control Plan (LTCP) in 2012 and has completed several of the recommended projects, except for the installation of an 800,000-gallon combined sewer overflow/equalization tank. Upon completion of the last LTCP project and after performing post-construction compliance monitoring, the city will comply with the federal CSO Control Policy, which mandates 85 percent capture of wet weather-induced combined sewer flow during the average precipitation year.

## Project Development and Drivers

The WRRF is a major public asset for the city, but in its deteriorated condition it was not able to serve as a regional resource and a tool to promote economic development. While previous projects to upgrade individual systems or components were beneficial, a new, progressive approach was necessary for a long-term, sustainable solution that would develop the WRRF from a city asset into a regional asset. With this goal in mind, a vision for the future began to take shape for the Wastewater System Improvements Project, which incorporated these four elements:

- Protect the St. Lawrence River.
- Create an asset that promotes growth for the city and neighboring communities.



The City of Ogdensburg WRRF is located along the St. Lawrence River in northern New York.

Charles Prior



- Perform wastewater system upgrades for a 20-year design life.
- Create a safe working environment for operating staff.

In conjunction with the goals and technical aspects of the project, the city's leadership made a commitment to be actively engaged with the project. Every two weeks, a meeting was held with representatives of the City Council, the City Manager, the Director of Planning and Development, the Director of Public Works, the Development Authority of the North Country (program manager and WRRF operator) and the project engineers. Given the scale of the project, its goals and necessary funding, it was critical for the team to be integrated and operating as a single unit. The meetings served primarily to communicate project status and progress, coordinate the design with operations and to strategize various funding approaches. In addition, regular updates were provided to the City Council to seek public input and to prepare the elected representatives for their action on various critical project matters (i.e., project scope and budget, State Environmental Quality Review, bonding, funding strategies and professional services).

To gather information and identify those upgrades most critical to achieving the vision, as well as to position the city to secure the necessary approvals and project funding, the city commissioned a Preliminary Engineering Report. This document provided a comprehensive evaluation of the wastewater systems and identified repairs and critical upgrades to the wastewater infrastructure. The Preliminary Engineering Report was commissioned in the summer of 2016. The city set forth an aggressive schedule that would align the completion and regulatory approval of the report with the following year's funding opportunities.

### Regulatory Revisions and an Order on Consent

In parallel with the Preliminary Engineering Report development, the city was issued notice by NYSDEC that its State Pollutant Discharge Elimination System (SPDES) permit was being evaluated for renewal. At the same time, the city received a notice of violation for significant noncompliance of its existing permit. Based on discussions with NYSDEC, the city anticipated that the agency was considering issuance of an Order on Consent. The Preliminary Engineering Report was finalized and submitted for regulatory review in March 2017, while permit revisions and a consent order were forthcoming.

#### Draft SPDES Permit

Upon receipt of the draft SPDES permit in spring 2017, the city realized that several changes to the permit were proposed that could have significant impacts on the overall budget for the Wastewater System Improvements Project. After evaluating the permit changes, it became clear to the city that compliance with a revised, lower Total Residual Chlorine (TRC) limit would require additional chemical storage and new metering facilities, which would add to the overall cost of the project. Several discussions were held with the NYSDEC Regional and Central offices to review the proposed SPDES revisions. The city proposed an approach to implement disinfection technology for both primary and secondary effluent. Following a technical review of the mixing zone analysis and assessment of the proposed approach by the city, the TRC effluent parameter in the SPDES permit remained unchanged. Instead, NYSDEC added a new monitor-only requirement for periods of wet-weather flows.

The city was issued a new SPDES permit with revised limits. While the revised limits will increase administrative, operation and

maintenance costs, the permit did not require any new or additional treatment technologies. This helped to maintain the capital project budget within the previously approved bonding amount.

#### Order on Consent

Following submittal of the Preliminary Engineering Report and review of the SPDES permit revisions, the city received a draft Order on Consent. The order was issued due to several effluent exceedances from November 2016 through April 2017. These exceedances occurred due to multiple treatment processes and equipment reaching the end of their useful asset life and failing to perform properly.

The consent order considered the city's proactive approach to addressing the issues of noncompliance based on the recommendations described in the Preliminary Engineering Report. The recommendations also included a modified approach for compliance with the previously approved LTCP. The order's compliance schedule aligned with the report's recommended approach, and provides for interim limits for flow, biochemical oxygen demand, fecal coliform and TRC.

### The Wastewater Systems Improvement Project

The Preliminary Engineering Report refined the vision for the Wastewater Systems Improvement Project into these specific goals:

- Comply with new SPDES permit limits.
- Comply with an Order on Consent issued by the NYSDEC with respect to exceedances of the SPDES permit limits.
- Comply with LTCP requirements to mitigate CSO events.
- Implement critical upgrades to the WRRF liquid treatment and solids handling systems and five wastewater pumping stations for a 20-year design life.
- Create an operator-friendly, accessible and safe working environment.

To achieve these goals, the report evaluated several alternatives for many of the wastewater treatment processes. The final project, with an estimated cost of \$35 million, includes modifications and upgrades in these areas (*Figure 1, see next page*):

- WRRF liquid process.
- WRRF solids process.
- LTCP compliance.
- Pumping stations.
- Other project components.

### A Proactive City Executes a Funding Strategy

With a loss in local industry and a declining population over the last two decades, the City of Ogdensburg faces some challenging times to continue delivering safe and affordable wastewater treatment to its residents. The Wastewater Systems Improvement Project as proposed could have been separated into several phases; however, the city understood the long-term value in completing the work in a single-phase approach.

To mitigate the impact to the sewer users, the city has employed a comprehensive and extensive strategy to maximize grant funding and low interest loans to complete the project. Many different state and federal loan and grant funding programs were explored. A key strategic approach was to align the project with key funding program goals, whether it be for:

- Water quality improvement by reducing the number of CSOs.
- Economic development by providing a new septage receiving

*continued on page 26*

station for a neighboring community to discharge its sludge waste.

- Provide an option for a local industry to discharge its dairy waste.
- Establishing financial hardship due to a median household income below state average.
- Pursuing other opportunities such as the Water Infrastructure and Improvement Act or Community Development Block Grants.

The city was proactive by contacting their local economic leaders, state and federal representatives and the funding program representatives to get the word out and market the project. Several neighboring communities and local industry leaders provided their support for the project. This effort, compounded with a positive public outreach communicating the benefits and financial need, helped to shore up the support necessary for the project.

Through the collected effort of the project team, the required funding was secured through several sources:

- New York State Environmental Facilities Corporation.
  - Clean Water State Revolving Fund, 30-Year Interest-Free (i.e., hardship) Loan – \$20,000,000.
  - Infrastructure Improvement Grant – \$5,000,000.
- Water Quality Improvement Project Grant – \$5,000,000.
- U.S. Department of Agriculture Rural Development.
  - 38-Year Subsidized-Interest Loan – \$3,890,000.
  - Grant – \$1,001,000.

### When Does It Get Built?

The project design is complete and ready to be bid. By the time you read this article, we expect that the bid phase of the project should be underway. The construction will begin in mid-2019 and is expected to last 24 months.

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The spatial use within the WRRF Control Building will be reconfigured as part of the overall project. *Charles Prior*

Figure 1.

### WRRF Liquid Process

#### Replace:

- Influent mechanical bar screen, washer compactor and associated piping, valves, slide gates and manual bar rack.
- Raw sewage pumps and associated piping, valves and wet well slide gates.
- Primary and final settling tank sludge and scum collection equipment and weirs.
- Existing chlorine gas disinfection system with the following:
  - An ultraviolet (UV) system to disinfect secondary effluent flows up to a peak hourly flow of 13 mgd.
  - A liquid sodium hypochlorite storage and feed system to disinfect up to a peak hourly flow of 7 mgd of primary effluent flow.
  - Utilize one existing contact tank channel for UV and modify the other channel for disinfecting primary effluent flow, when necessary. Construct a new building to house UV system components and bulk storage of sodium hypochlorite and metering pumps.

#### Provide:

- A single-story building for new grit removal equipment including a grit removal unit, grit pumps. Washing and classifying units would be in same space as that existing in the adjacent building.
- New means of flow control to limit flow to the secondary process to a peak hourly flow of 13 mgd. This will be accomplished by a set of modulating weir gates.

#### Demolish:

- The existing storage building and construct a single-story building for new septage receiving system.

### WRRF Solids Process

#### Replace:

- Raw sludge pumps with associated piping and valves.
- Return-activated sludge, waste-activated sludge, thickened sludge transfer and thickener makeup pumps with associated piping and valves.
- Gravity thickener mechanical and electrical equipment.
- Existing plate-and-frame press with new centrifuge dewatering equipment.

#### Provide:

- New primary scum pumping equipment in the existing scum box.
- A polymer blending system, digested sludge pumps and discharge conveyor.

#### Rehabilitate:

- The three existing anaerobic digesters and replace cover, heat exchangers, pumps and the mixing system.

#### Repurpose:

- The gas scrubbing system and perform preventative maintenance.





Orthoimagery from the New York State GIS Clearinghouse shows the City of Ogdensburg WRRF and the St. Lawrence River. *New York State GIS Clearinghouse*

### **Pumping Stations**

#### **Upgrade:**

The South Water, Main Street, Psychiatric Center, East River and Heavy Industrial Park Pump Stations. Improvements will include new pumping and controls, electrical systems, heating and plumbing components. A new generator will be installed at the Psychiatric Center and the East River station will include components to mitigate impacts from a 100-year flood condition.

### **LTCP Compliance**

A modified approach to LTCP compliance was developed, since the previous approach limited access to the city's public boat launch area and would have required operation and maintenance of an underground storage tank. The modified approach is twofold:

- Construct a new 4-mgd CSO pump station at the intersection of Elizabeth Street and Riverside Drive.
- Install a 16-inch force main to pump CSO to an 800,000-gallon storage tank located on the WRRF site.

### **Other Project Components**

Along with the treatment and pumping system upgrades, other project components that will be addressed include:

- 480-volt power service for the WRRF, including new power distribution.
- Replacement of Variable Frequency Drives.
- Replacement of backup power system with natural gas-fired twin 500kW generators.
- New site, building and interior lighting.
- Provide required National Electric Code workspace clearances.
- Reconfigure the spatial use throughout the Control Building.
- Roof, window and door replacements.
- Brick repointing and concrete repair to buildings and tankage.
- Code compliant means of egress and railing systems.
- Create code compliant separation between classified and unclassified spaces.
- New heating systems including a dual fuel (i.e., methane and natural gas) boiler.
- New supply and exhaust fan ventilation systems.

- Relocating incoming water service to above grade and outside of a classified space.
- New water-efficient plumbing fixtures.
- New hose bibbs, deck and yard hydrants.
- Provide a central Ethernet-based, plant-wide monitoring and control system integrated with the major process equipment at the WRRF.
- Monitor and/or control new treatment process and pumping equipment at the new plant-wide monitoring and control system.
- Provide security surveillance system at the WRRF.
- Provide new communications from remote pump stations to the WRRF.



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# Leveraging Funds for Water Resources in St. Lawrence River Communities Through Local Planning

by Erica Tauzer

The St. Lawrence River is a critical waterway as the primary outflow for the vast freshwater reserves of the Great Lakes flowing into the Atlantic Ocean. This mighty and unique river system extends over 740 miles connecting northeast Lake Ontario with the Gulf of the St. Lawrence in Canada. In addition to the incredible biodiversity of the river, the St. Lawrence is home to an array of historic communities in New York such as Alexandria Bay, Clayton and Cape Vincent.

Natural resources are at the heart of local economies in St. Lawrence communities due to the abundance of tourism destinations and outdoor recreation opportunities. This reliance on the resources of the St. Lawrence provides a chance for creating diverse teams of community stakeholders to manage this vital water resource using innovative environmental management techniques.

Despite the riverine communities' strong ties to the environment, leveraging funds to protect water resources is a delicate, pressing process that requires strategic thinking and coordinated effort. The region faces an array of ecological challenges that manifest at the local level, including: the need to restore and protect habitat; to improve water quality; and to prevent and control negative impacts from invasive species. These challenging issues are often influenced by a complex combination of local, statewide, national, regional and international factors; therefore, their solutions require collaboration and coordinated actions at each of these jurisdictional levels. Furthermore, local officials in rural communities are often confronted by the need to establish project priorities based on limited staff and budgets, which can constrain resource planning and management. Fortunately, local planning mixed with the right combination of stakeholders and a bit of perseverance can help communities navigate these difficult challenges.

## Local Waterfront Revitalization Program

The Local Waterfront Revitalization Program (LWRP), administered by the New York State Department of State, is one of the

best programs to determine local waterfront priorities as well as to discover the opportunities and constraints for implementation. It provides local waterfront communities the resources necessary to improve their waterfront by protecting the natural, cultural and historic assets that contribute to their character. The LWRP links locally recommended priorities to matching funds from the state. In exchange, communities adopt a series of local laws aimed at protecting their natural, developed, public and working waterfronts. Guided by a local volunteer committee and then adopted by a local municipality, the LWRP is a tool that reflects community consensus and provides a clear direction for appropriate future development. It establishes a long-term partnership among local government, community-based organizations and the State of New York. Planning and stakeholder connections formed through the LWRP process can be leveraged for additional opportunities through non-LWRP programs.

As an example of how this process can work, take the case of the Town of Alexandria and Village of Alexandria Bay. Both municipalities have tremendous waterfront resources including exceptionally dynamic ecological and scenic waterfronts. As sister communities located in the Thousand Islands region along the St. Lawrence River, the Village of Alexandria Bay and Town of Alexandria worked together, with assistance from Environmental Design & Research, DPC (EDR) to revitalize their waterfronts through a joint LWRP. Through the LWRP planning process, the village and the town addressed the need to improve and maintain public access to the waterfront; protect key natural resources; and support the local economy through the enhancement of recreational opportunities. The program helped to increase local awareness of opportunities and challenges facing the local waterfront. In light of this increased awareness, the village and town developed rigorous implementation strategies to enhance economic opportunities while protecting water resources.



View looking west-northwest from the eastern side of Goose Bay near the town boat launch, September 2018. Patches of milfoil remain in areas untreated in 2018.

EDR



## Leveraging Funds to Control Eurasian Watermilfoil

Through the LWRP process, local volunteer organizations became involved and advocated for solutions to address the spread of Eurasian watermilfoil (*Myriophyllum spicatum*), a highly invasive, nonnative aquatic plant species and a key threat to the Town of Alexandria's water resources. This invasive species is known for its negative ecological impacts to native aquatic vegetation and fisheries. With its high growth rate, Eurasian watermilfoil can quickly reduce the light available for native vegetation and cause oxygen depletion in waterways. This results in decreased biodiversity, reduced availability of fish spawning areas and diminished fish growth. Eurasian watermilfoil also has negative impacts on outdoor recreation and tourism; the dense floating mats created by Eurasian watermilfoil are menacing for swimmers and impede boaters and other water-based recreationists.

Outside of the LWRP process, local lake associations in Goose Bay and Mud Lake had begun investigating methods and implementing small-scale treatments for managing Eurasian watermilfoil. Lake association volunteers gained an important understanding of the pros and cons between various treatment methods (e.g., targeted chemical treatment using Renovate® OTF versus non-targeted herbicides versus biological agents versus hand-pulling techniques). This localized knowledge catalyzed the development of a multi-jurisdictional grant application through the U.S. Environmental Protection Agency's Great Lakes Restoration Initiative (GLRI) for the control of Eurasian watermilfoil. Eventually local volunteers and the town partnered in a strategic management approach for the control of Eurasian watermilfoil.

In 2017, the Town of Alexandria was awarded the GLRI grant to utilize a variety of Eurasian watermilfoil control and removal methods, including Renovate® OTF and physical removal efforts such as hand-pulling and mechanical removal. These funds have been and will continue for the next year to be an excellent resource to purchase materials and initiate steps toward an integrated management strategy. However, in the future, the town will have to sustain long-term costs to cover staff time and to purchase additional Renovate® OTF, to file permits, to hire contractors, to conduct observational surveys and to maintain equipment. The necessary funds could come from local sources, state grant programs or other innovative resources.

### Benefits of Building Relationships

Although the path toward leveraging local funds is not easy, the effort in building knowledge and institutional capacity for managing water resources at a local level is one that can pay off for years to come. To successfully leverage funds through these outside sources, it is typically advantageous to start with a base of diverse stakeholders that can address multiple components of water resource management issues. It is also helpful to maintain an asset-based approach that builds from existing local relationships and collectively utilizes shared knowledge. For example, developing a shared understanding of grant programs and their specific requirements can assist in the brainstorming necessary to both create winning project proposals and meet matching requirements by combining various funding sources. By creating building blocks for community-based solutions, funds can incrementally be used to tackle broad-scale challenges.

*Erica Tauzer, AICP, is a Senior Community Planner with EDR and may be reached at [etauzer@edrdpc.com](mailto:etauzer@edrdpc.com).*

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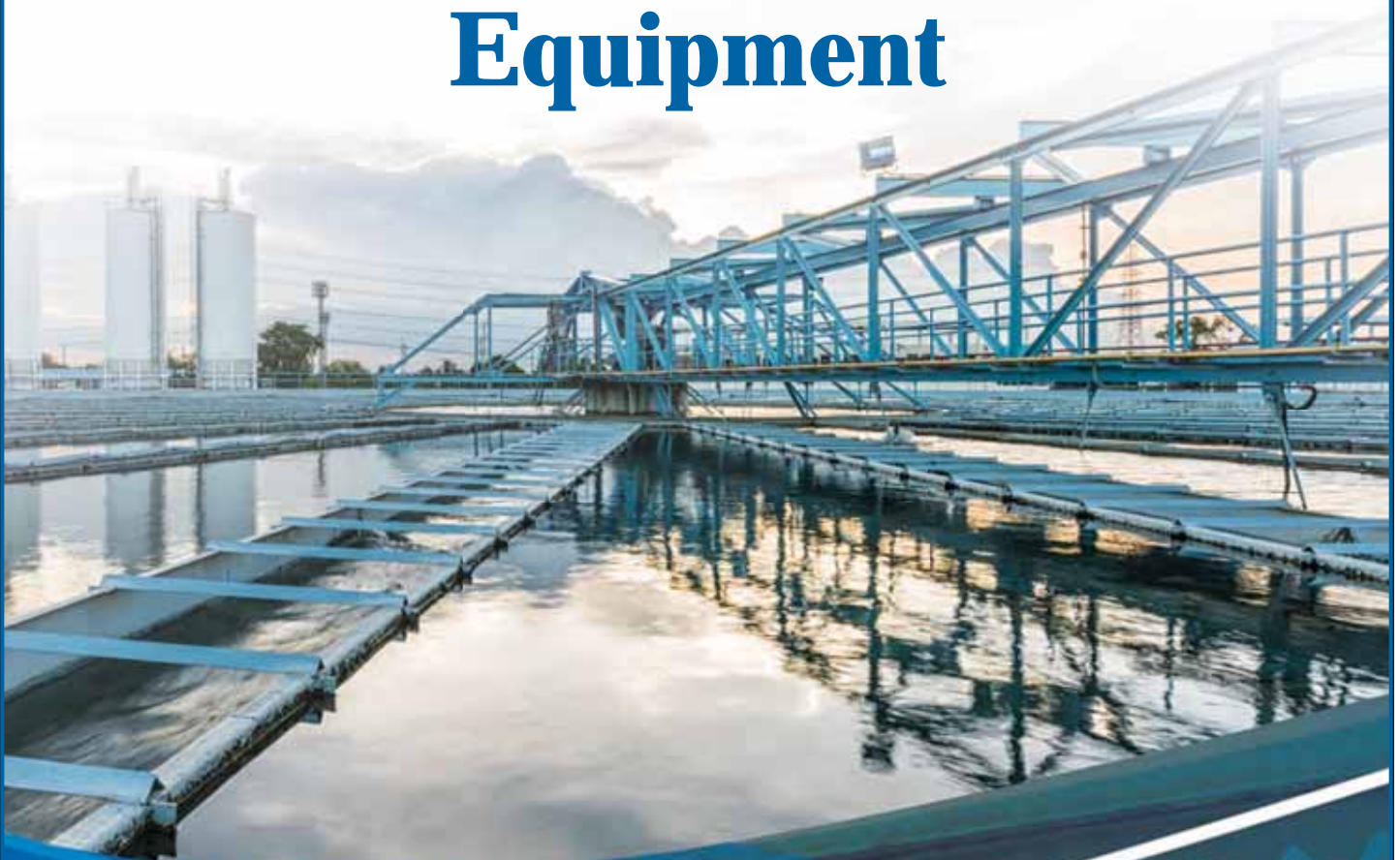
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## WEF's Operator Ingenuity Contest – Enter to Win by June 7, 2019!

The Operator Ingenuity Contest is back for 2019. This contest seeks to recognize the simple, everyday fixes that operators and other water professionals invent to make work easier and safer. Entries are judged on solution safety, resourcefulness and transferability.

In its first seven years, the contest discovered about 40 award-winning fixes. Past winners have included painting buildings different colors to make deliveries easier; building a replica manhole, lateral, and cleanout cap to show customers how smoke inspections work; and a device to safely and easily lift the clarifier skimmer in the winter to prevent it from freezing to the grease box.

### Brag about Your Best Fixes

Not all innovations come from a research lab. Sometimes, you need to tackle a persistent problem using just what's at hand and a big shot of ingenuity. The competition is open to all clever ideas related to:

- Treatment processes.
- Maintenance practice.
- Safety measures.
- Collection systems.
- Laboratory practices.

- Stormwater.
- Administration.
- Human resources.
- Anything else associated with the water sector.

### Have a Fix to Share?

To help capture and share more of these ingenious solutions, the 2019 contest is now open to all clever ideas related to any aspect of the water sector. All it takes to enter is:

- A short description of the problem you faced and the fix you found.
- A few photos of your invention or improvement.
- The three answers:
  - How transferable is it?
  - How safe is it?
  - Where did the materials and money come from?

The bottom line: Even if you're not sure that your innovation qualifies, send it in. Entries will be accepted until June 7, 2019. Visit [www.weftec.org/ingenuity](http://www.weftec.org/ingenuity) to see all past winners and start your entry.



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# Hogansburg Dam Removal Restores More Than Fish Passage

by Tony David

**O**n the United States-Canada border of northern New York, straddling the banks of the St. Lawrence River, is the sovereign Mohawk Territory of Akwesasne. Akwesasne is also located at the confluence of four river tributaries to the St. Lawrence including the St. Regis River. Just 3 miles upstream on the St. Regis River was the site of the Hogansburg Dam, a small but impassible barrier to fish on an 852 square-mile watershed. The decision by the Saint Regis Mohawk Tribe (SRMT) to remove the Hogansburg Dam was the result of years of work and the commitment of the tribal community to restore our shared waterways.



*Saint Regis Mohawk Tribe*

For the SRMT, the Hogansburg Dam removal was part of a much broader historical context including illegal sales of tribal lands, basinwide ecological changes and neighboring industrial hazardous waste sites. For over 200 years, the Mohawks have witnessed widespread changes to the natural resources upon which their culture and subsistence lifeways are founded. The removal of the dam fit the Tribe's strategy for improving the health and welfare of the tribal community for generations to come.

## A Retrospective

Historically, Akwesasne was used seasonally by the Mohawks until permanently settled in the 1750s. Rapid expansion of settler economies in the region during the 19th century involved clear-cutting the landscape, various mining operations, establishing an agricultural base and the building of dams. Remote hamlets like Hogansburg, which was named after the politician and land speculator Michael Hogan (1765-1833), played a role in the growth of the North Country. By 1900 the environment that had supported rich and diverse fish and wildlife populations was severely degraded. As the supply of timber and mineral resources dwindled, profitability dropped. In 1929, the Hogansburg mills and timber crib dam were replaced with a concrete dam and a pre-cast, concrete-block powerhouse to meet the modest power needs of the town.

During the 1950s the shift from natural resources extraction to heavy industry commenced with the construction of the St. Lawrence Seaway and binational Moses-Saunders hydropower dam. The ecological consequences of these works were profound: loss of wetlands; loss of fish populations; invasive species; and foreign aquatic diseases. Inexpensive hydropower supported expansive local manufacturing but these too, like the once abundant timber mills, have declined to a fraction of their peak. The legacy of nearby hazardous waste sites and contamination of the fishery will require monitoring for decades to come.

In 1985, the Federal Energy Regulatory Commission (FERC) issued a 30-year license for the Hogansburg Dam project. The expiration of this license in 2015 presented a rare opportunity to evaluate project decommissioning and determine if that outcome was in the best interests of the public. For the Tribe, restoring the river and reclaiming the land became a priority.

## The Decommissioning Process

The Tribe's approach to decommissioning and removing the Hogansburg Dam would face two major policy challenges. First, licensed hydro owners are responsible for the safe and lawful existence of the project facility from "cradle to grave." The FERC was cautious about the implications of permitting a licensee to sever its responsibilities onto a potentially unqualified third party such as a town, non-governmental organization or Indian tribe. While SRMT had no experience in running a hydro dam, the Tribe does have a nationally recognized environmental department. Second, capability of the Tribe notwithstanding, would the federal govern-



**The former timber dam and primitive crib dam at Hogansburg, New York. This dam was eventually breached by ice floes in 1905 during the spring freshet.**

*Francis San Jule (Courtesy of the Akwesasne Museum and Cultural Center)*



**The Hogansburg concrete dam with the pre-cast, concrete-block powerhouse as it appeared in March 2011. Ice cover is visible on the impoundment side of the dam.**

*Tony David, SRMT*





**The dam spillway and powerhouse during drawdown. Water is visible flowing through the gates near the powerhouse.** *Tony David, SRMT*

ment want to put itself in a position where it would need to make enforcement actions against a tribe should things go wrong?

The Tribe's initial application to become owner and licensee was rejected by the FERC and nearly ended all hope. When the SRMT demonstrated to the FERC that it had the resources to complete the project, a compromise was reached. The Tribe and previous owner became co-licensees of the project, with the Tribe serving as the lead on all decommissioning aspects.

The physical removal of the dam was no simple matter. The Tribe had to thoroughly examine all the sources of risks and evaluate the management outcomes. Removal of the Hogansburg Dam would have no effect on critical infrastructure such as bridges and water distribution, and flood risks for private land owners upstream would actually decrease. While the dam did provide some benefit for growing stable ice cover, this modest benefit was neutralized in extreme events, because the dam had no capacity to allow for actively managing ice during breakup. All these positive, or at least neutral, outcomes minimized potential complications for dam removal.

#### ***Sediment Management***

Of the many challenges to removing a dam, the management of sediments tops the list. Sediments within the Hogansburg impoundment were determined to be free of contaminants of concern, thereby avoiding a requirement for costly landfill disposal. A systematic assessment of impoundment sediment volume enabled SRMT to develop an appropriate strategy:

- First, drawdown of the impoundment flushed sediments months ahead of construction.
- Second, the early drawdown allowed for the revegetation and stabilization of exposed banks.
- Third, the limited volume of sediment could be flushed in the same calendar year and not overwhelm downstream habitat.

Without the knowledge of sediment volume, SRMT would have been blind to the potential risks that have hampered other dam removals in the United States.

#### ***Wetland Impacts***

The removal of the Hogansburg Dam did change the hydrology of a two-acre wetland in a remnant oxbow off the impoundment.



**The impoundment with minimal change in water surface elevation. The dam was downstream of a natural bedrock formation, so it only slightly increased the ponding effect. Post-removal depth in the former impoundment revealed a natural pool with depths greater than 6 feet.** *Tony David, SRMT*

*Tony David, SRMT*

The Army Corps of Engineers authorized the project under the auspices of a nationwide permit; however, it required post-removal monitoring and left open the possibility of compensatory mitigation. Fortunately, required monitoring has since shown this wetland has not reduced in size. Future dam removal projects should be fully aware of the wetland obligations and work with the Army Corps of Engineers ahead of time to understand regulatory implications.

#### ***Flow Management***

The removal of the concrete spillway within a large river is an intrusive process and required an appropriately sized coffer dam

*continued on page 37*



**The banks within the impoundment, exposed after drawdown, were revegetated to stabilize the sediments left behind.** *Tony David, SRMT*



In 2010, the Monroe County VanLare Water Resource Recovery Facility began researching replacements for the 16 progressing cavity pumps they were using for their thickened sludge. Increased downtime and associated maintenance costs, as well as safety issues, all drove the decision to move to rotary lobe style pumps.



The Monroe County Department of Environmental Services performed a year-long extensive performance test of four different rotary lobe pump manufacturers to determine how each pump operated under typical conditions. Pumping performance, rate of wear, reliability, ease of maintenance, parts cost and local and factory customer service were all considerations in the test. At the end of the test period, it was determined the Boerger rotary lobe pump performed best.

All 16 PC pumps have been replaced with the Boerger rotary lobe pumps, and all are running great!



*Testimonial courtesy of David Tuccio, Assistant Supervisor of Mechanical Maintenance*



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**During the demolition phase of dam removal, a coffer dam placed upstream redirected flow around the work area.** *Kingsburg Companies, LLC*

containment. The coffer dam enabled flows to be diverted through a section of opened gates and bypass the work area. The result prevented concrete dust and debris from contaminating the river in the form of turbidity.

The construction had to be completed within a strict work window: after the annual fish spawn and before seasonally high flows

return in the fall. The St. Regis River is highly susceptible to sudden increases in flow and contingencies needed to be in place should the work area be inundated or damaged. The dam was removed in time and avoided these costly delays and damages.

### **Serving the Public Interest**

From a management perspective the removal of the Hogansburg Dam was the best all-around outcome in consideration of public interests. Hydro dams exist on waterways that belong to the public, and dams that have outlived their purpose should be evaluated for removal feasibility. The Hogansburg Dam was the first impassible barrier to migratory fish from the St. Lawrence River. Its removal reconnected up to 555 miles of river and stream historical habitat. SRMT became the first Tribe in the United States to remove a licensed hydro dam and the first decommission/removal in New York.

The risk management approach taken by SRMT can help to inform prospective dam removals in the region and serve as a model for how tribes and First Nations can be partners in accomplishing mutual ecological restoration goals.

---

*Tony David is the Director of the Environment Division of the Saint Regis Mohawk Tribe, and may be reached at [tony.david@srmt-nsn.gov](mailto:tony.david@srmt-nsn.gov). He also serves as a member of the U.S. Section of the International Lake Ontario-St. Lawrence River Board. In 2017 Mr. David received the Environmental Champion Award from the U.S. Environmental Protection Agency for his work as project manager of the decommission and removal of the Hogansburg Dam.*



The impoundment after dewatering. The limited volume of sediments was naturally distributed. The flow and sound of cascading water was restored.

*Dakota Tarbell, SRMT*



# Water Regulation: Preparing for Tomorrow by Learning from the Past

by Andrew Kornacki

The high-water event of 2017 on Lake Ontario and the St. Lawrence River, while extreme, was a replay of history. Engaging the public over the past two years, the event has led to a better understanding of water regulation and highlighted the need for shoreline resiliency plans to prepare the public for future events. It will also help inform a process that seeks to build resilient facilities and mitigate disruptions of public services.

To understand the high-water event of 2017 and why water regulation through Plan 2014 did not cause or meaningfully exacerbate the flooding and associated damages, it is important to understand the physical and hydrological characteristics of Lake Ontario and the St. Lawrence River, the role and limits of outflow regulation, and the influence these factors have on flows and water level fluctuations throughout the system.

## Hydrologic Characteristics

The primary factors affecting Lake Ontario water levels are the uncontrolled, naturally occurring water supplies, which include both the water received from the upper Great Lakes and from

precipitation on and around Lake Ontario itself. Lake Erie, the most downstream of the upper Great Lakes, receives water from upstream lakes Superior, Michigan and Huron. The flow from Lake Erie is eventually released through the Niagara River to Lake Ontario. On average, Lake Erie supplies 85 percent of the net total inflow to Lake Ontario. The rest of the net inflow to Lake Ontario comes from its own drainage basin (*Figure 1*), in the form of precipitation falling directly on the lake's surface plus runoff from the surrounding drainage basin, minus evaporation from the lake's surface.

The outlet of Lake Ontario is the St. Lawrence River. As water flows east out of the lake, water levels in the river reflect the level of Lake Ontario. Levels decline gradually as the river flows through the Thousand Islands area. As water flows further downstream, the levels become less dependent on the level of Lake Ontario and more dependent on the rate of outflow released through the hydro-power project, the Moses-Saunders Dam.

The area immediately upstream of Moses-Saunders Dam is known as Lake St. Lawrence. Lake St. Lawrence was created when the Moses-Saunders Dam went into operation in 1958 and serves as



Figure 1. Lake Ontario and St. Lawrence River drainage basins.

Environment Canada





**Moses-Saunders Dam located near Cornwall, Ontario and Massena, New York, is the main control structure on the St. Lawrence River used to regulate outflows from Lake Ontario.** *Environment Canada*

a forebay, or pool of water, in front of the dam. Large increases in outflows from the dam cause large and rapid drops in water levels upstream on Lake St. Lawrence. Conversely, large reductions in outflows from the dam result in large and rapid water level rises upstream on Lake St. Lawrence. The effects of hydropower operations and wind events can also result in significant, short-term (hourly basis) water level fluctuations on Lake St. Lawrence.

After water passes through the Moses-Saunders Dam, it combines with a bit less than half the water entering the St. Lawrence from the massive Ottawa River basin at Lake St. Louis, just upstream of Montreal. Finally, just past Montreal, the remainder of the Ottawa River discharges into the St. Lawrence River. Areas downstream of Montreal receive the full discharge of both the Great Lakes and Ottawa River systems, before the flow reaches Lake St. Peter where the tides from the Atlantic Ocean takes precedence on water regulation effect.

The physical constraints and the differing effects that outflows have on water levels throughout the system are a constant and critical consideration when regulating the outflow of Lake Ontario through the St. Lawrence River. While Lake Ontario has the smallest surface area of all the Great Lakes, its capacity to hold a tremendous amount of water exceeds the capacity of the St. Lawrence River, which receives the full discharge out of the lake. As a result, changes in outflow from the lake have considerably more rapid and larger impacts on the water levels of the St. Lawrence River than they do on the levels in Lake Ontario. For example, the release of a volume of water sufficient to change the level of Lake Ontario will, in comparison, have an almost immediate greater effect on water levels at critical areas across the St. Lawrence River. Moreover, the effects of such changes on river water levels differ upstream and downstream of the Moses-Saunders Dam.

## **Water Level Regulation Plans**

The International Joint Commission (IJC) was created as part of the 1909 Boundary Waters Treaty between the United States and Canada to regulate the outflows of Lake Ontario and to resolve transboundary water conflicts.

The International Lake Ontario-St. Lawrence River Board (the Board) has been appointed by the IJC for the purpose of ensuring that outflows from Lake Ontario meet the requirements of the IJC's December 8, 2016, Supplementary Order effective January 2017 concerning releases at the Moses-Saunders Dam. The Board also has responsibilities to communicate with the public about water levels and flow regulation, and to work with the Great Lakes-St. Lawrence River Adaptive Management (GLAM) Committee to monitor and assess the performance of the regulation plan.

“[Plan 2014] retains, essentially unchanged, the environmental conditions and coastal protections on the lower St. Lawrence River, below the Moses-Saunders Dam. Allowing for more natural variations of water levels, the plan aims to foster the conditions needed to restore Lake Ontario and upper St. Lawrence River coastal wetlands and improve habitat for fish and wildlife. The plan will also frequently extend the Lake Ontario recreational boating season in the fall, better maintain system-wide levels for navigation and allow for a modest increase in hydropower production compared to the previous plan.”

Source: <https://ijc.org/en/loslrb/who/regulation>.

The current regulation plan, Lake Ontario-St. Lawrence River Plan 2014 (Plan 2014), was implemented in January 2017. This plan replaced the former regulation plan, known as Plan 1958-D, which had been in use since 1963.

As the Board regulates outflows from Lake Ontario through the Moses-Saunders Dam, consideration is given to the effects on water levels throughout the entire system, the limited physical capacity of the control structures and the St. Lawrence river bed water conveyance capacity. The regulation of outflows also needs to balance multiple, sometimes conflicting objectives for a range of users that might be affected by changing water levels and flows. The Board uses rules outlined by Plan 2014 to determine the outflows from Lake Ontario.

It was around the same time Plan 2014 was implemented that an unprecedented amount of persistent precipitation fell across the Lake Ontario, St. Lawrence River and Ottawa River drainage basins.

## **What Happened in 2017?**

From January through May 2017, many locations recorded more precipitation than during the same five-month period of any previous years dating back to at least 1916, including the cities of Rochester in New York, Toronto and Ottawa in Ontario and Montreal in Quebec. The wet weather also extended upstream to the Lake Erie basin, where Buffalo, New York, recorded its second highest January to May precipitation total since 1938. Due to the increased flow from upstream into Lake Ontario and the precipitation in the Lake Ontario basin itself, water levels in Lake Ontario rose rapidly. Record highs were set by the end of May, exceeding the highest levels recorded since at least 1918, the earliest reliable water level records.

As this was occurring upstream around Lake Ontario, the Ottawa and St. Lawrence rivers downstream were experiencing similar conditions. Record precipitation in April, combined with snow melt, caused flow to rapidly increase in the Ottawa River. By late April, flows in the Ottawa River reached a record peak and were the

*continued on page 41*



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**Shoreline erosion inspections along Lake Ontario during the 2017 high water event.**  
*U.S. Army Corps of Engineers*

highest flows since 1998. But it was not over yet. At the start of May snow melt and two back-to-back storms further inundated the system, resulting in the highest peak flow in the Ottawa River in over 100 years. Because the Ottawa River flows into the St. Lawrence River near Montreal, in May 2017 the Board found itself in the position of releasing water from a flooding Lake Ontario into a flooded St. Lawrence River.

## A History of Root Causes

With a complete understanding of water regulation and outflows, the 2017 precipitation events and the cumulative flow among the three drainage basins, the evidence supports the assertion that nature, not Plan 2014, was the root cause of 2017 flooding, just as nature was the root cause of previous high-water events. While the conditions seen in 2017 were unprecedented, similar periods of extremely wet weather and high-water levels have occurred in the past that resulted in similar impacts throughout the Lake Ontario-St. Lawrence River system.

Before 2017, the highest water levels recorded on Lake Ontario occurred in 1952, just before construction of the Moses-Saunders Dam and the St. Lawrence Seaway. An overlooked aspect of the Seaway project is the extensive dredging that took place in the St. Lawrence River, which allowed for higher outflows from Lake Ontario today than was possible before construction. As a result, regulation of Lake Ontario typically reduces the risk of high-water conditions, though it cannot eliminate such conditions from occurring during extreme wet periods.

The limitation of regulation to fully-protect against high water has been seen several times since Seaway construction. For example, the next highest levels on Lake Ontario occurred not long afterward, in 1973, which resulted in extensive damages similar to those seen in 2017. High-water conditions occurred again in 1993 and 1998.

The full history of extreme water levels in the Lake Ontario-St. Lawrence River systems demonstrates how these events cannot be eliminated and will certainly occur again in the future. Combined with the increased frequency of extreme weather events due to climate change, there is greater potential in the future for

water levels to disrupt businesses, damage property and increased impacts on all users if we are not prepared.

## Looking Ahead

The Board accounts for current conditions, weather forecasts, historical data and other variables to regulate outflows, taking into consideration water levels and impacts on various interests throughout the system. However, Lake Ontario and the St. Lawrence River are still largely natural waterbodies subject to natural variations in weather and water supply conditions. While regulation of Lake Ontario outflows may reduce natural flood levels, it cannot fully reduce the risk associated with extreme events. Regulating Lake Ontario has not prevented flooding and damages in the past and will not prevent flooding and damages in the future.

The most effective way to reduce long-term damages will require an informed and adaptive process, a difficult but achievable goal. It will require cooperation and innovation with state, provincial, local and federal governments, academia and landowners. The silver lining to the 2017 high water event is that the public is now engaged, and this energy can be directed toward achieving results.

The benefits of acting before the next high-water event occurs include:

- Less adverse economic impacts.
- Property retaining more of its value.
- Preventing the disruption of key public services.

Simply put, resiliency planning can result in a cost savings versus spending to repair future damages.

The Board fully supports and encourages resiliency and actively planning for future events and can support these initiatives by providing relevant and timely data. Planning for resiliency begins with having conversations that discuss problems, along with reviewing current and proposed policies, so that a direction can be charted to address topics like shoreline protection design standards, flood response plans, post-flood help applications, policies and communitywide strategic projects.

While no individual agency has the authority to command this effort, by working together the Lake Ontario and the St. Lawrence River municipal and industrial water users, the hydropower industry, commercial navigators, homeowners, environmental agencies and recreational users can create a resiliency plan to better prepare coastal communities for the next extreme weather event.

## Acknowledgments and Sources

For more information regarding the International Lake Ontario-St. Lawrence River Board visit the website at <https://ijc.org/en/loslr>.

Material referenced in this article may be found in the International Lake Ontario-St. Lawrence River Board's report titled "Observed Conditions & Regulated Outflows in 2017" ([https://ijc.org/sites/default/files/2018-08/ILOSLRB\\_FloodReport2017.pdf](https://ijc.org/sites/default/files/2018-08/ILOSLRB_FloodReport2017.pdf)).

Another reference of interest is the Great Lakes-St. Lawrence River Adaptive Management Committee report titled "Summary of 2017 Great Lakes Basin Conditions and Water Level Impacts to Support Ongoing Regulation Plan Evaluation" (<https://www.ijc.org/en/glam/summary-2017-great-lakes-basin-conditions-and-water-level-impacts-support-ongoing-regulation>).

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# Wetland Responses to Habitat Enhancements and Regulated Hydrology in the Upper St. Lawrence River

by John M. Farrell

## Background

Significant wetland studies in the Thousand Islands region of the St. Lawrence River at the State University of New York College of Environmental Science and Forestry (ESF) began in the 1970s. This early work on wetland plant communities by ESF professors Dr. James Geis and fishes by Dr. Robert G. Werner and their students helped create a foundation to facilitate later development of the Thousand Islands Biological Station (TIBS). TIBS is a long-term ecological research site with a broad aquatic focus. Wetland studies range from top predatory fish and their reproductive biology to investigations on wetland biogeochemistry and lower trophic levels at reference and excavated coastal wetlands as part of enhancement projects.

The influence of water level fluctuations and the effects of invasive species are major investigative themes in this growing body of research around this complex riverine ecosystem. Invasive plants and changes in the flow regime due to operation of the downstream Robert Moses-Saunders power dam were associated with ongoing wetland habitat alteration. International Joint Commission (IJC) regulators have recently changed the policy that guides management of water discharge of the upper St. Lawrence following an extensive research, modelling, and policy-driven effort involving numerous stakeholders and interest groups. Research is ongoing by many groups to evaluate effects of these changes and to assess efforts designed to enhance wetlands.

The purpose of this article is to highlight several TIBS research and monitoring efforts designed to better understand ecological effects of wetland enhancement projects under influence of regulated hydrology and a changing climate.

## Physiographic Setting

We focus on the Thousand Islands region of the upper St. Lawrence River, about 90 kilometers (km) of an international section of river extending about 185 km from Lake Ontario downstream through Lake St. Lawrence and Lake St. Francis, to where the river enters Quebec, Canada. This Great Lakes water enters the St. Lawrence estuary downstream of Quebec City, then flows through the Laurentian trough and finally into the Atlantic Ocean some 1600 km from its source.

The St. Lawrence River is the natural outlet of the Laurentian Great Lakes. Coastal wetlands of Lake Ontario and the upper St. Lawrence River exist in four primary geomorphic types including barrier wetlands, drowned river mouth tributary wetlands, and fringing wetlands in open and protected bays. These coastal bays are distributed along the mainland and throughout an archipelago of over 1,800 islands that range in size from small patches of hydrophytic vegetation to larger expanses of hundreds of hectares. With exception of some barrier wetlands, all the wetlands share something in common: the ubiquitous effect of water level fluctuation and its regulation.

## Introduction

The regulation of river discharge occurs at Massena, New York, and Cornwall, Ontario, at the Robert Moses-Saunders Power Dam. The dam is operated jointly by the New York Power Authority and

the Ontario Power Generation, under policy set by the IJC. The IJC led a multiyear study, the St. Lawrence River–Lake Ontario Water Levels Study, to develop a new regulation plan known as Plan 2014, which replaced the Army Corps of Engineers' Plan 1958-D that had been in effect since 1962. The most basic change was its attempt to balance a range of human interests with the environment through a shared-vision process and model (<https://ijc.org/en/loslr/b>; National Research Council 2006). Regulation restricts the natural range and seasonal variation of water levels in the upper St. Lawrence–Lake Ontario ecosystem. The process is governed by the International Lake Ontario–St. Lawrence River Board, with representatives from the United States and Canada.

## Hydrology and Wetland Processes

The upper St. Lawrence River's wetlands behave as nontidal freshwater estuaries where most of the water supply originates in the Great Lakes. Small to medium-sized tributaries contribute to localized effects with lateral transport of organic-rich, silty sediments and nutrients. Tributary inputs are important to receiving bays, but the main stem is high water clarity, low sediment water arising from oligotrophic Lake Ontario. Downstream flow promotes thermal mixing; no stable stratification exists and a hypolimnetic zone is absent.

## Nutrient Cycles

Wetlands depend on both allogenic (e.g., external) factors and autogenically derived organic matter deposition. Relative contributions of organic matter and nutrients are an active area of research. Water levels can drive moisture changes in wetland soils along elevation gradients and may play an important role in nutrient con-

*continued on page 44*



Figure 1. High dominance of invasive cattail is shown in the New York State Department of Environmental Conservation (NYSDEC) French Creek Wildlife Management Area in Clayton, New York.

*Thousand Islands Biological Station Archive*



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versions and releases, such as in sulphur, nitrogen and phosphorus cycles. Aerobic conditions predominate during water level draw-downs and lead to oxidative processes and organic molecule breakdown. Conversely, flooded conditions promote bacterial activity and anaerobiosis and, hence, reducing conditions. Organic matter accretion is high as dense cattail stands, *Typha x glauca*, accumulate litter each growing season and can facilitate self-maintenance of this invasive plant community in an alternate stable state (Figure 1).

Cattails block rivulets and side channels, impeding access to upslope remnant wet meadow habitats. Ramet densities can exceed 20 to 25 per square meter with numerous leaflets. This vegetation change has been associated with hybridization of native broad-leaved cattail (*Typha latifolia*) with the invasive narrow-leaved (*Typha angustifolia*) and water level stabilization is known to facilitate its encroachment on wet meadows and its ability to crowd out native plants.

Recent graduate research by Ceili Pestalozzi at the Thousand Islands Biological Station, led by Drs. Kimberly Schulz, Myron Mitchell and John Farrell, investigated wetland biogeochemistry of both surface waters and groundwater in relation to water level and site variations. Surface water and water from wells along an elevation gradient were sampled over two annual cycles. Anions and cations, phosphorus, nitrogen and sulfur were measured in addition to water level, temperature and dissolved oxygen. An experiment was also conducted where wetland soil cores were taken along the

same elevation gradient and a spring pulse hydrology was simulated while chemical parameters were measured. Both field and experimental data paint a similar picture that fluctuating hydrology had little influence on nutrient chemistry and wetlands appeared to stay in a continuous reducing environment. Further, surface and groundwater chemistry were not correlated, suggesting differing chemical environments existed or that there is low exchange among these pools in this system. Additional research is needed to better understand the role of river water influx (e.g., backflow into the marsh) as related to proximity of wetlands to the main stem versus local watershed contributions to nutrient pools.

### Vegetation Processes

A major role that fluctuating water levels play is in maintenance of plant assemblages through its effects on wetland zonation (Wilcox 2004). Wetland plants vary in their tolerance to flooding disturbances, magnitude, duration and frequency; hence, hydrology and its interplay with the topography determines plant community structure. Woody plants tend to grow in drier upslope zones relative to wet-meadows and robust emergent communities; floating-leaved and submerged aquatic plants are adapted to conditions further downslope along the littoral gradient. When a natural flooding regime is interrupted as by dam operations, this biophysical relationship is altered. This creates opportunity for invasive species such as hybrid cattail (*Typha x glauca*) and narrow-leaved cattail (*Typha angustifolia*), which can tolerate a greater range of conditions, to become established. Lake Ontario and St. Lawrence River wetlands are now dominated by invasive *Typha* species (Farrell et al. 2010; Wilcox and Bateman 2018).



Thousand Islands Biological Station Archive

**Ceili Pestalozzi** (MS graduate 2018 advised by Drs. Kimberly Schulz and Myron Mitchell) completed graduate research on groundwater and surface water nutrient dynamics in coastal wetlands of the upper St. Lawrence River (Pestalozzi 2018). Here she prepares a well for recharge prior to extracting a water sample. Ceili's work in the field and laboratory found no evidence of nutrient release from sediments despite considerable change in water levels during treatments. She also completed research on lower trophic levels (e.g., zooplankton) and stoichiometry.



**Figure 2.** Long-arm excavator works off mats to create potholes and channels to enhance connectivity in wetlands impacted by invasive species.

Kurt Warren





**Figure 3.** U.S. Fish and Wildlife Service operates an aquatic excavator with cutter head to create channels; side-casted material has been shown to contain viable native plant propagules that germinate following re-exposure.

*Thousand Islands Biological Station Archive*



**Figure 4.** Habitat restoration (note excavated side channels) conducted through the Fish Habitat Conservation Strategy at the NYSDEC Cranberry Creek Wildlife Management Area near Goose Bay, New York. Restoration was designed and completed by the U.S. Fish and Wildlife Service and NYSDEC through the Fish Enhancement Mitigation and Research Fund. Many additional projects have been completed by Ducks Unlimited and through partnerships with the Thousand Islands Land Trust. Thousand Islands Biological Station research is focused on evaluation of project outcomes.

*USEWS Cortland Field Office*



*Thousand Islands Biological Station Archive*

**Jessica Goretzke** (MS candidate advised by Dr. John Farrell) is conducting research centered on vegetative habitat quality and availability to early life stages of esocids (e.g., northern pike and muskellunge) in excavated wetlands. She is developing a novel technique for the restoration of submersed aquatic vegetation in coastal bays and wetlands to encourage the establishment of desirable macrophyte species. She is also evaluating the long-term dynamics of macrophyte communities in bays used as fish nursery habitat. Earlier research has shown that the side-casted material contains a diversity of native plants including sedges. Monitoring has demonstrated that this diversity element has been maintained for over five years since excavation but return of dominance by invasive cattail remains likely. Jessica is examining the effects of excavated potholes on both riparian and submersed aquatic vegetation. A diversity of plants rapidly colonized but dominance by Eurasian milfoil in many locations is a concern.

#### ***Wetland Enhancement***

Restoration via connectivity enhancement, to create greater interspersed of habitat types, has been a major focus to combat invasive hybrid cattail in Lake Ontario and St. Lawrence River coastal wetlands. Three methods designed to enhance wetlands have been employed:

- Long-arm excavator with bucket (*Figure 2*).
- Channel construction with an aquatic excavator with cutter head (*Figure 3*).
- Water control structures installed on specific wetlands to prevent fall drawdown (*Figure 4*).

Water-level control structures maintain higher water elevation through winter and spring to promote muskrat populations and northern pike spawning. Connecting channels incorporate potholes intended as fish and wildlife habitats with connections to upslope remnant wet meadows for access for biota along the wetland zonation gradient.

#### ***Indicators and Faunal Linkages***

Recent research compares excavation sites and water-controlled sites to a set of reference locations where natural connectivity remains. These studies encompass multiple levels from the biogeochemical work and lower trophic levels (e.g., zooplankton) described earlier to higher vertebrates such as muskrat, a species that can serve as an ecological engineer, marsh birds, herpetofauna and fish including a top predator, northern pike.

Northern pike serve as a useful indicator of the health of the coastal wetland habitat they use as spawning and nursery grounds. Optimal habitats are seasonally flooded wet meadows and diverse structural habitat along shorelines for broadcast spawning (*Figure 5*). The high productivity of these habitats can support invertebrate prey (e.g., zooplankton) and, coupled with early spring warming, can promote growth and survival (*Figure 6*). Fish emigration surveys revealed that excavated channels functioned as suitable

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**Figure 5. Flooded wet meadow habitat provides optimal spawning and early life habitat for northern pike that complete short migrations to reach these areas in early spring.** *Thousand Islands Biological Station Archive*

early-life habitat and had higher abundances of young-of-the-year northern pike than reference channels (*Figure 7*). An eight-year dataset (2011-2018) of northern pike outmigration at channel connectivity and pothole complexes shows consistent northern pike reproduction in excavated sites and indicates a relationship to water level conditions during the spawning and emigration period. The spring of 2017 stands out as having extraordinary numbers of juveniles emigrating and is attributed to flood conditions that promoted excellent spawning and nursery conditions for reproduction.

## Conclusion

Habitat enhancement by excavation within dense monotypic stands of invasive species, such as hybrid cattail, is being applied widely as a technique to increase connectivity and encourage greater overall diversity. Our research in the upper St. Lawrence River is intended to be holistic to evaluate this approach from different perspectives, from biochemistry to higher vertebrate reproductive function. Initial results are showing benefits, such as vegetation diversity in close proximity to excavated sites for target species such as northern pike and a host of other species, when compared to reference sites.

Also apparent is the importance of controlling variables including water levels and temperature. These and other physical variables maintain disturbance regimes important to maintaining habitat structure and ecological function. Flood pulse was not shown as a significant driver of nutrient release, but these events do play a large role in access to biota as well as lateral water exchange from highly productive wetlands to the oligotrophic main stem. Persistent drought and oxidizing conditions have not been experienced in decades; however, such conditions would be expected to have profound impacts on these wetlands when they occur.

Detection of consistent effects of environmental changes related to the newly established IJC Plan 2014 will take time. The changes from the Plan 1958-D are limited, and confounding factors are also at play, including invasive species, pollution, climate change, habitat loss to development and management initiatives, among others.

Climatic variation will likely have a more pronounced effect as observed with the flood in 2017. A volatile climate will challenge

regulators to stay within prescribed acceptable bounds. Abundance responses of flora and fauna to ideal habitat conditions, as indicated by plants, muskrats and fish, were rapid and are a testament to the resilience and adaptability of wetland species. These wetlands remain immensely important to maintaining regional biodiversity and supporting ecosystem services. Their protection and continued efforts to enhance, benefit and learn from them is recommended so that wetlands and their associated resources can sustainably thrive for current and future generations to enjoy.



*Thousand Islands Biological Station Archive*

**Ericka Augustyn** (MS graduate 2017, advised by Dr. John Farrell) studied survival and early life history of northern pike in the study wetlands. She cultured thousands of larval pike, marked their otoliths (e.g., ear bones) with a fluorescent marker and tracked their survival throughout a growing season at both reference and excavation sites and compared them to wild fish. Her estimates corroborate findings in the pike emigration monitoring: survival was greatest in the excavated sites. Size was similar among channel types, but smaller fish occurred in reference sites, likely because the reference sites are thermally cooler, possibly due to ground water inputs that may maintain the natural connectivity. Zooplankton diets differed between excavated channels and the potholes and reference sites. This question was followed up with an experiment on zooplankton prey selection by comparing two different assemblages (for more information, see *Massa and Farrell, 2019*).





**Figure 6. Outmigration of juvenile pike occurs in late spring and early summer.**  
*Thousand Islands Biological Station Archive*



**Figure 7. Technicians monitor outmigration rates of young pike in both created excavation channel, as shown here, and in natural reference locations.**  
*Thousand Islands Biological Station Archive*



*Thousand Islands Biological Station Archive*

**Alex Kua** (MS candidate advised by Drs. John Stella and John Farrell) is studying the effects of water regulation changes on the aquatic plant community of the St. Lawrence River following the implementation of IJC Plan 2014. The main objectives focus on the hydrologic fluctuation effects on muskrat occupancy and interactive effects of muskrat disturbances on the wetland plants. Alex has collected winter muskrat house abundance and distribution data in 2018 and 2019 to add to a longer-term data set. In 2018 results indicate that the experimentally water-controlled marsh had higher muskrat density relative to reference sites. Earlier research by Toner *et al.* (2010) was used to create a muskrat house density indicator for the IJC modeling and it showed water level regulation, specifically low winter levels, suppressed muskrat house density on cattail-dominated floodplains. When flooded, these areas were rapidly colonized, and muskrats imparted a considerable beneficial disturbance in invasive cattail mats. Alex has recently shown that areas around muskrat houses have greater plant diversity relative to reference sites where their impacts are lessened.

*Dr. John Farrell is a professor in Aquatic and Fisheries Science and established and serves as director of ESF's Thousand Islands Biological Station ([www.esf.edu/tibs](http://www.esf.edu/tibs)). He has conducted research on topics ranging from fish habitat, sportfish management, limnology and wetlands science for over 30 years on the St. Lawrence River.*

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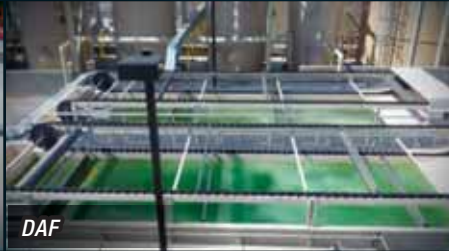
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<b>May 2</b>	Occupational Stress Bergen Point WWTP, 600 Bergen Avenue, Babylon, NY
<b>May 15</b>	Coagulants, Polymers, Metering Pumps & Blending Systems Colonie Operations Center, 347 Old Niskayuna Road, Latham, NY
<b>June 10–13</b>	<b>Spring Technical Meeting &amp; Exhibition</b> The Saratoga Hilton, Saratoga Springs, NY
<b>June 19</b>	Activated Sludge Process Control Workshop Walkill Golf Club, 40 Sands Road, Middletown, NY
<b>June 26</b>	Building NY's WRRF Interest in Strategic Energy Management Washington Co. Municipal Center, Building B, 2nd Fl. Classroom, 383 Broadway, Fort Edward, NY
<b>July 17</b>	Coagulants, Polymers, Metering Pumps & Blending Systems Fredonia Technology Incubator, 214 Central Avenue, Dunkirk, NY
<b>July 18</b>	Mathematics for Water and Wastewater Operators Holiday Inn, 75 North Street, Auburn, NY
<b>July 19</b>	Collection Systems – Inflow and Infiltration Civil Defense Training Facility, 7220 NY Route 54, Bath, NY
<b>September 18</b>	Nitrogen Removal Workshop Utica College, Economic Crime & Justice Building, 1600 Burrstone Road, Utica, NY

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Water Ambassador Richard J. Lyons is inducted into the NYWEA Hall of Fame.



Operator scholarship winners of the Lucy Grassano Memorial Scholarship are, (l-r), Christopher DiLascio, Lower Hudson Chapter; Robert Knecht, Long Island Chapter; Angel French, Central Chapter. Presenting scholarships NYWEA President Geoff Baldwin; Michelle Hess, Genesee Chapter; Daniel O'Sullivan, Western Chapter; and Robert Ortiz, Metropolitan Chapter.



Khris Dodson receives the outgoing Committee Service Award for his work on the Public Outreach Committee.



Water Ambassador's breakfast—early risers all!



Alexander Lopez receives the Young Professionals Service Award.



Water Ambassador, Paul McGarvey.



Vin Rubino receives the outgoing Committee Service Award for his Sustainability Committee work.



Larry Brincat, Conference Management Committee.



Robert Adamski receives the Robert D. Hennigan Water Hero Award.



Above: Good conversations on the Exhibit floor.



Left: The Metropolitan Chapter's Jamaica Sludge Hustlers take part in the Pipe Cutting event. (L-r:) Ray Antenucci, Anthony Petrone, and Robert Ferland.



Right: Mike Kessler and Joyette Tyler during the inaugural Exhibitor Mobile Session.



Diane Hammerman, NYCDEP, Co-Chair Scholarship Committee.

Not all readers  
are leaders,  
but all leaders  
are readers.  
Harry S. Truman

## Readers Roundtable

Edited by Kerry A. Thurston

As editor of *Clear Waters* magazine, I have the exceptional privilege of reading articles on a wide range of water-related topics. In the past few years, I have learned much about biosolids, trash in the water, public outreach, aeration, disinfection and water infrastructure financing. Our magazine has covered regional topics as well, from the Finger Lakes to the Long Island Sound, and from the Susquehanna River Basin to, in this issue, the St. Lawrence River.

Given the broad range of knowledge and depth of experience among the authors who have contributed articles to *Clear Waters*, I began to wonder ... what do our authors read to inform their own work? And wouldn't it be great if we could share our reading lists with our colleagues through *Clear Waters*?

I contacted the authors who contributed articles to our St. Lawrence River issue and asked them to recommend books, either relating to the St. Lawrence River or to water topics in general. They responded enthusiastically. What follows are their recommendations.

### “The Sound of a Wild Snail Eating”

Chastity Miller, the District Manager of the Franklin County Soil & Water Conservation District, recommends “The Sound of a Wild Snail Eating” by Elisabeth Tova Bailey and published by Algonquin Books (reprint 2016). This natural history/memoir received the 2012 William Saroyan International Prize for Nonfiction, a 2011 John Burroughs Medal Award for Distinguished Natural History, a 2010 National Outdoor Book Award in Natural History Literature and a Gold Award from Foreword Book of the Year for Memoir.

Of this book, Ms. Miller said, “This takes a very interesting look at how something so small can really have an important effect on all.”

### “Voices for the Watershed: Environmental Issues in the Great Lakes-St. Lawrence Drainage Basin”

Ms. Miller also recommended “Voices for the Watershed: Environmental Issues in the Great Lakes-St. Lawrence Drainage Basin” by Gregor Gilpin Beck and Bruce Litteljohn (editors) and published by McGill-Queen's University Press (2000). Mr. Beck is a research biologist and writer specializing in ecology, environmental

education and conservation. He teaches college and university courses in water pollution, biology and ecology in Toronto. Mr. Litteljohn, who passed away in 2014, was a respected nature photographer, environmental conservationist and naturalist researcher, educator and advocate.

“While I have just started to read this one, it provides a look at whole watersheds,” said Ms. Miller. “It is not just a river but the whole of the watershed that affects what we have. Our food, our air, our climate, our habitat ... all are intertwined. We are stewards and this is a great look at the big picture.”

### “Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants”

Patricia Shulenburg, the Program Manager for Save The River, recommends “Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants” by Robin Wall Kimmerer and published by Milkweed Editions (2013). Dr. Kimmerer is a mother, plant ecologist, writer and SUNY Distinguished Teaching Professor at the SUNY College of Environmental Science and Forestry in Syracuse, New York. She serves as the founding Director of the Center for Native Peoples and the Environment whose mission is to create programs which draw on the wisdom of both indigenous and scientific knowledge for our shared goals of sustainability.

“The author talks about our interconnectedness with our environment and awakening our ecological consciousness,” said Ms. Shulenburg. “It offers a unique local perspective on how the environment heals us while we restore and heal the environment. I think fondly of this book and its teachings when I apply it to my ecological restoration practices.”

### “The Source: How Rivers Made America and America Remade Its Rivers”

Alaina Young, the Education and Outreach Coordinator for the Thousand Islands Land Trust, recommended “The Source: How Rivers Made America and America Remade Its Rivers” by Martin Doyle and published by W.W. Norton & Company (2018). Dr. Doyle is director of the Water Policy Program at the Nicholas Institute for Environmental Policy



Solutions and a professor of river science and policy at Duke University's Nicholas School of the Environment.

"It's a brilliantly written book that tells the story of how America's rivers have shaped our history, and how we in turn shaped our rivers," said Ms. Young. "It was written by a professor of mine at Duke and actually recommended to me by a TILT volunteer!"

#### **"Right to Water"**

Erica Tauzer, AICP, is a Senior Community Planner with Environmental Design & Research, DPC (EDR). She recommended "Right to Water" edited by Farhana Sultana and Alex Loftus and published by Routledge (2012). Farhana Sultana is Associate Professor of Geography at the Maxwell School of Citizenship and Public Affairs at Syracuse University, and Research Director for Environmental Collaboration and Conflicts, PARCC (Program for the Advancement of Research on Conflict and Collaboration). Alex Loftus is a Lecturer in Geography at Kings College, London, UK.

"This book has shaped my own thinking about the importance of water planning, particularly as it relates to public access, water quality protection, and community-based planning," said Ms. Tauzer. "I highly recommend it to those interested in the philosophy behind water planning, law and governance. While the case studies occur in an array of areas throughout the world, the book provides a lot of on-the-ground insights that are relevant to local waterbodies in New York, especially international waterbodies such as the St. Lawrence River."

#### **"Crucial Conversations: Tools for Talking When the Stakes Are High"**

Tony David, Director of the Environmental Division of the Saint Regis Mohawk Tribe, recommended "Crucial Conversations: Tools for Talking When the Stakes Are High," published by McGraw-Hill Education (2011). Authors Kerry Patterson, Joseph Grenny, Ron McMillan and Al Switzler are cofounders of VitalSmarts, a leadership training company specializing in corporate training and organizational performance.

"Projects that impact the public may require communication strategies uncommon to the physical sciences," said Mr. David. "The presentation of robust, factually-based information may not be enough to avoid conflicts and may actually inflame

emotions. I found 'Crucial Conversations' helpful in developing the confidence to meet these opportunities head-on and find ways to create a space for healthy, constructive conversations."

#### **"Riverine Ecosystem Management: Science of Governing Toward a Sustainable Future"**

John Farrell, Ph.D., Professor of Aquatic and Fisheries Science and Director of the Thousand Islands Biological Station with the SUNY College of Environmental Science and Forestry recommended "Riverine Ecosystem Management: Science of Governing Toward a Sustainable Future." This book, published by Springer International Publishing (2018), is edited by Stefan Schmutz and Jane Sendzimir, both from BOKU—University of Natural Resources and Life Sciences, Institute of Hydrobiology and Aquatic Ecosystem Management (IHG) in Vienna, Austria.

"This book is a comprehensive multi-authored presentation of 29 chapters on a variety of topics revolving around human impacts on rivers and their mitigation and restoration to methodologies in management and governance," said Dr. Farrell. "The book provides several case studies in river ecosystem management with emphasis on the Danube and fisheries but also sustainable fisheries in West Africa. A wonderful feature is that this entire resource is Open Access and is available for download at no cost."

#### **More Recommended Reading**

##### **"Pandora's Locks: The Opening of the Great Lakes-St. Lawrence Seaway"**

Ms. Shulenburg's second recommended book was "Pandora's Locks: The Opening of the Great Lakes-St. Lawrence Seaway" by Jeff Alexander and published by Michigan State University Press (2011). An environmental journalist, Jeff Alexander was awarded the 2009 Historical Society of Michigan State History Award for this book. In the book's Preface, the author writes:

"Hopefully, this work adds to the general understanding of how invasive species have radically altered the Great Lakes ecosystem, and how those changes have affected the region's 40 million residents."

##### **"Great Lakes Water Wars"**

Ms. Shulenburg's third recommendation, "Great Lakes Water Wars" by Peter Annin, was published by Island Press (2009). A

former correspondent with *Newsweek* magazine, Peter Annin is Co-Director of Northland College's Freshwater Innovation Center, which is dedicated to understanding and solving issues related to fresh water. In the Author's Note of the 2nd edition (2018), Mr. Annin writes:

"This new edition only reinforces the primary take-home message of the last: water diversion remains one of the most fought-over environmental issues in the Great Lakes, which hold roughly 20 percent of all fresh surface water on earth."

#### **"Wastewater Engineering, Treatment and Reuse"**

Charles Prior, a Senior Managing Engineer with EDR, recommended a classic: "Wastewater Engineering, Treatment and Reuse" by Metcalf and Eddy/AECOM and published by McGraw-Hill Education. The Foreword of the fifth edition (2014) states:

"One hundred years have passed since the three-volume "American Sewerage Practice" treatise was published in 1914-1915 by Leonard Metcalf and Harrison P. Eddy. The initial publication quickly became the standard of care and established the foundation for modern wastewater treatment. The original concept of combining theory with a strong compliment of practical data and design guidance continues on in the fifth edition."

#### **So Now It's Your Turn!**

What are you reading that informs your personal or professional life? What books or other publications would you recommend to your colleagues in the water/wastewater field? Please feel free to share your recommended reading material with me at [clearwaters@nywea.org](mailto:clearwaters@nywea.org), and we will include it in a future installment of Readers Roundtable.

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*Kerry A. Thurston is the editor of Clear Waters magazine and the owner of InFocus Environmental Consulting. She may be reached at [clearwaters@nywea.org](mailto:clearwaters@nywea.org).*

## The Future of Phosphorus: A Gathering of the Leaders for Biological Phosphorus Removal and Recovery

by *Patrick Dube*

In January, the Water Environment Federation convened the James Barnard Research Forum on Emerging Themes in Biological Phosphorus Removal and Recovery. This three-day forum paid tribute to Dr. James Barnard by celebrating his significant contributions to wastewater processing, specifically focusing on biological phosphorus removal.

Three themes emerged from the forum. First, participants set out to discuss the science behind phosphorus removal and recovery to find out how much we know and don't know about the process. Second, the forum turned an eye toward future markets and drivers. This discussion also focused on the value proposition of phosphorus recovery, including products (phosphorus, biosolids, valuable metals), services (eutrophication prevention, meeting discharge limits) and global drivers (food products, energy to mine mineral phosphorus). Third, the forum provided an opportunity to look at a broad overview of the environmental effects of phosphorus recovery.

### About James Barnard and the Forum

As the developer of the Bardenpho, Modified Ludzack–Ettinger and Phoredox processes for biological nitrogen and phosphorus removal, Barnard was instrumental in bringing these innovative technologies to water resource recovery facilities (WRRFs) around the globe. The forum, held in Austin, Texas, featured leaders in

biological phosphorus (bioP) removal for invited presentations and facilitated discussions. With short presentations and panel discussions, the forum encouraged free-flowing dialogue to examine the past, present and future of biological phosphorus removal topics, and set the agenda for years to come.

### Phosphorus 101

Phosphorus is an essential mineral for growth. However, phosphorus runoff and deposition in water bodies can cause aquatic dead zones that choke off oxygen to plants and wildlife. This leads to a unique conundrum where there can be no life without phosphorus, yet too much has disastrous effects.

Furthermore, global supplies are dwindling, and we are facing a potential crisis if renewable sources are not developed. A balance must be struck between efficiently using phosphorus while simultaneously developing recovery techniques. Recovering biological phosphorus via WRRFs can help fill this gap, but continued research is necessary to make it more efficient, reliable and accessible to utilities of all sizes.

### Bacterial Populations and Modeling

Current knowledge and existing gaps emerged as the first theme at the forum. Presentations dove into the microbial ecology of enhanced biological phosphorus removal (EBPR), starting

with understanding two of the most important polyphosphate accumulating organisms (PAOs) in wastewater treatment, *Tetrasphaera* and *Candidatus Accumulibacter*. These two organisms are studied widely, but there remains a knowledge gap about them as researchers continue to try to better utilize them by fully unlocking their mechanisms.

The Microbial Database for Activated Sludge (MiDAS), a program started at Aalborg University in Denmark, aims to learn more about these and other organisms by mapping the microbial diversity present in wastewater treatment systems worldwide. Getting people talking the same language by learning more about what options are present at WRRFs can help select for the most efficient and effective microorganisms.



Attendees gather for a group shot commemorating the forum.

WEF



Likewise, models frequently are used to help optimize WRRFs, plan for upgrades and design new facilities. However, the limitations of these models came to the forefront of the modeling discussions as presentations addressed different approaches to unlocking the process dynamics of a WRRF. Each WRRF is a unique system with specific parameters and influent; as such, there exists no one-size-fits-all approach to modeling or treatment.

Two approaches highlighted during the forum tackled overcoming modeling challenges. One suggested modeling individual units within a system, while the other seeks to develop a predictive system relying on process metabolics. Both models are viable options and the presentations set up a further discussion on how to use information gleaned from a model and put it into practice.

The discussions highlighted one universal truth: the key to all good models is more data to better understand process dynamics. As we get to know more about the intricacies of these systems, models will be more accurate.

### Value Propositions

Forum participants also examined the value proposition of phosphorus recovery. One of the current pain points in widespread phosphorus recovery is that turning these value propositions into reality requires overcoming current technology bottlenecks and improving industry business models.

The key to success is broadening the current value potential of bioP from only recovered products to the entire ecosystem. When discussing the barriers for real-world application, several ideas were put forth. These included implementing real-time population sensing, developing cheaper and simpler instruments that can be used by utilities of any size, and incorporating phosphorus recovery in all industries such as food reduction and waste recycling. Additionally, work must be done to develop regulations and incentives that help promote resource recovery while continuing to educate the public and increase awareness about the potential value.

Overall, the tone of the session was optimistic, and attendees agreed that the research and ideas currently being developed were building a much-needed knowledge base, which will soon be translated to implementation at WRRFs.

### Addressing Environmental Effects

The forum also provided an opportunity to look broadly at the environmental effects of phosphorus recovery. Representatives from utilities and government entities who have successfully addressed phosphorus concerns in their regions provided insight on replicating their successes. All panelist agreed that clearly defining regional problems is the first step in beginning to address them; science alone can't fix all problems. The buy-in of local communities and positive public perception often drives success as much as sound science. Without seeing a direct effect – perhaps the project isn't entirely local, or the effects aren't readily visual – achieving buy-in can be difficult.

One example shared the experience of the U.S. Environmental Protection Agency's Chesapeake Bay Program. When first starting, this program, which aims to clean up the formerly polluted bay, required getting signatures on more than 400 best management practice documents from around the entire region. These 400 individual agreements combined to increase the health of the bay, but individually, they only had a small effect and local communities had to be convinced to buy-in to help the overall region.

Forum speakers recommended making the effort to translate

national or regional challenges into the effects it has on your specific locality. By making it a personal issue, citizens are more likely to connect. Also, involving key, trusted members of a community can further help promote public acceptance. Overall, a clear message tackling a well-defined problem that community members can engage with is the best way to quickly and efficiently get projects completed locally.

### More to Come

All participants reconvened at the end of the forum to summarize and discuss the best ways to approach phosphorus removal and recovery now and in the future. Throughout the next few months, the forum's steering committee members plan to summarize the event thoroughly and release outcome reports. They aim to capture the entirety of the forum, the current state of the phosphorus removal and recovery science, what recovery needs to look like in the next 50 years, and what research needs to be tackled to meet these needs. In the meantime, the forum's complete, 42-page technical program can be accessed online at [www.wef.org/forum](http://www.wef.org/forum).

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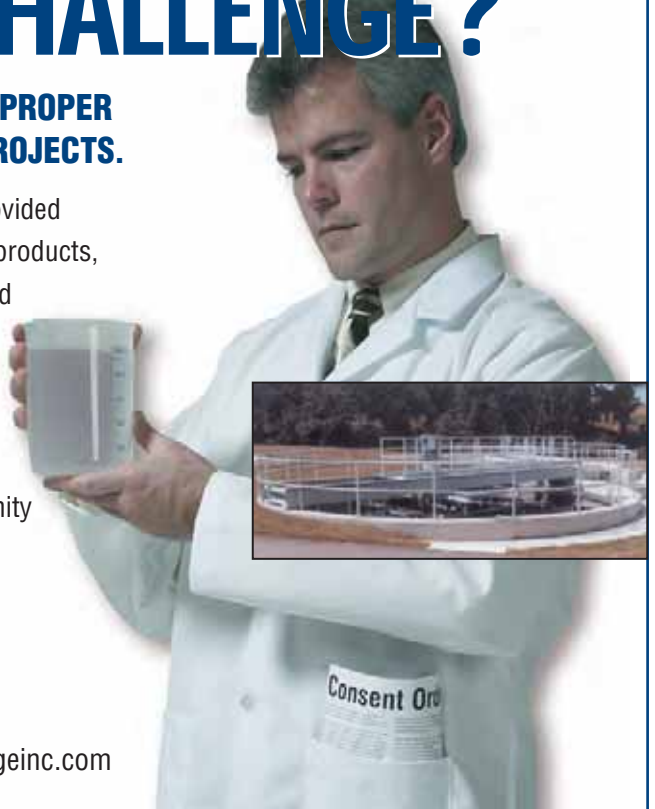
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## WEF InFLOW Program Introduces Underrepresented Minority Students to Working in Water

by Morgan Brown and Bri Nakamura

As the “silver tsunami” of retirements that will result in a mass exodus of U.S. workers approaches, the water sector is taking steps to prepare as well as encourage greater diversity in its workforce. At WEFTEC® 2018, the Water Environment Federation (WEF) piloted a new program to help address this need for a younger and more diverse workforce. WEF InFLOW, which stands for Introducing Future Leaders to Opportunities in Water, brought underrepresented minority students to WEFTEC and introduced them to working in the water sector. The program also sought to help these students foster a network within WEF’s membership to increase opportunities for mentorship and employment.

### The Exodus

New research this summer helped prompt action on the coming wave of retirements. In June 2018 the Brookings Institution (Washington, D.C.) published the report, *Renewing the Water Workforce: Improving Water Infrastructure and Creating a Pipeline to Opportunity*. The report found that the silver tsunami will cut drastically into the pool of skilled, qualified water sector workers. For some utilities this could result in staffing vacancies of up to 50 percent.

The report also points out a lack of diversity in the water workforce. The percentage of black and Asian water workers lags behind the national average for all occupations combined.

Additionally, for higher paying water occupations, such as engineering and management, black and Hispanic workers are particularly underrepresented.

### WEF InFLOW

This pilot year of the WEF InFLOW primarily focused on African-American students. African-Americans are one of the most underrepresented groups with respect to the percentage of the population versus percentage engaged in STEM.

InFLOW brought a total of 16 undergraduate and graduate students to WEFTEC from Howard University (Washington, D.C.), Tuskegee University (Tuskegee, Alabama), and the University of South Florida (Tampa, Florida). The group of eight men and eight women had a range of technical backgrounds and awareness of water sector opportunities. One student is pursuing a doctorate in the water sector. The students from Tuskegee University had summer internships related to water. Many other students, however, had no background knowledge of water sector possibilities.

The 2018 InFLOW program relied on generous support from program sponsors: Arcadis, GlobalWET, Centrysis/CNP, Environmental Technical Sales Inc. (ETEC), and the Milwaukee Water Council. Because of these sponsors, the students received travel assistance, hotel accommodations, registration, and special networking opportunities at WEFTEC.





## Water Sector Introductions

The students' schedules included both technical and networking events. They participated in many events coordinated by the WEF Students and Young Professionals Committee. These included Water Palooza – where the USF students are now famous for introducing us to the “Water Cycle Dance” – the Community Service Project, committee meetings, the WEF Career Fair, and Student Design Competition. The students attended the Opening General Session and were encouraged to explore the exhibition and attend technical sessions.

Aside from these traditional WEFTEC activities, the students attended two special events. The first was a networking panel that introduced the students to some African-American water sector leaders who represented utilities, academia, consulting and manufacturing. Panelist such as David Gadis, CEO and president of DC Water (Washington, D.C.), and Kishia Powell, Commissioner of the Department of Watershed Management for the City of Atlanta, talked about their journeys and career paths as well as answered the students' questions. Gadis and Powell shared their insights about how to use diversity not as a barrier, but as a quality to be remembered by. A networking lunch wrapped up the InFLOW students' WEFTEC experience.

The program already has yielded one result: Howard University is working to start a WEF student chapter. This chapter will help to expand the program's reach to more students at the university. The chapter is hoping to participate in future Student Design Competitions.

The InFLOW program will continue to grow in the coming years. WEF intends to expand the number of participating schools and students, as well as include a second track with activities focused on operations and maintenance.



The WEFTEC Opening General Session was among the activities slated for students participating in the WEF InFLOW program. The students received front row seats. *Oscar & Associates*

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**Below: WEF InFLOW participants with WEF President Tom Kunetz and panelists from a networking event scheduled just for them.**

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# Operator Quiz Spring 2019 – Basic Conversion Factors, Digester Gas

The following questions are designed for trainees as they prepare to take the ABC wastewater operator test. It is also designed for existing operators to test their knowledge. Each issue of *Clear Waters* will have more questions from a different section of wastewater treatment. Good luck!

- 1 liter equals \_\_\_\_\_ milliliters
  - 8.34
  - 10
  - 100
  - 1,000
- 1 kilogram equals \_\_\_\_\_ milligrams
  - 7.45
  - 1,000
  - 10,000
  - 1,000,000
- 1 foot of water equals \_\_\_\_\_ psi
  - 0.231
  - 0.433
  - 0.866
  - 1.00
- 1 MGD equals \_\_\_\_\_ GPM
  - 7.48
  - 8.34
  - 694
  - 1,000,000
- 1 gallon equals \_\_\_\_\_ liters
  - 3.78
  - 7.48
  - 8.34
  - 10
- 1 horsepower equals \_\_\_\_\_ kilowatts
  - 746
  - 3.48
  - 7.46
  - 7.48
- 25° Celsius equals \_\_\_\_\_° Fahrenheit
  - 100
  - 98
  - 77
  - 50
- 1 cubic meter equals \_\_\_\_\_ liters
  - 1
  - 10
  - 100
  - 1000
- 1 pound equals \_\_\_\_\_ grams
  - 100
  - 250
  - 454
  - 565
- 1 kilogram equals \_\_\_\_\_ pounds
  - 2.2
  - 22
  - 220
  - 2000
- A properly operating anaerobic digestion process typically produces how many cubic feet of gas for every pound of volatile matter added?
  - 1 to 2
  - 2 to 4
  - 6 to 8
  - 8 to 12
- Calculate the digester gas production in cubic feet of gas produced per day per pound of volatile solids destroyed using the following information:  
Gas produced = 150,000 cu ft/day  
VS destroyed = 17,500 lbs/day  
Digester Volume = 1.5 million gallons
  - 0.12 cu ft gas/day/lb VS destroyed
  - 0.17 cu ft gas/day/lb VS destroyed
  - 8.57 cu ft gas/day/lb VS destroyed
  - 12.9 cu ft gas/day/lb VS destroyed
- The composition of digester gas consists of 65%-70% methane and 30%-35% of:
  - Carbon monoxide
  - Nitrogen
  - Hydrogen
  - Carbon dioxide
- Digester gas has a heat value of about:
  - 100 – 200 BTU/cu ft
  - 200 – 400 BTU/cu ft
  - 400 – 500 BTU/cu ft
  - 500 – 600 BTU/cu ft
- A mixture of 85%-95% atmospheric air in combination of 5%-15% methane creates which of the following?
  - An explosive condition
  - Struvite
  - Excess pressure
  - Increased BTU

**Answers and explanations on page 62.**

For those who have questions concerning operator certification requirements and scheduling, please contact Tanya May Jennings at 315-422-7811 ext. 4, [tmj@nywea.org](mailto:tmj@nywea.org), or visit [www.nywea.org/OpCert](http://www.nywea.org/OpCert).

# Clear Waters

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Answers from page 61:  
1D, 2D, 3B, 4C, 5A, 6A, 7C, 8D, 9C, 10A, 11D, 12C, 13D, 14D, 15A

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### Operator's Quiz "Spring 2019 – Basic Conversion Factors, Digester Gas" Answers Explained

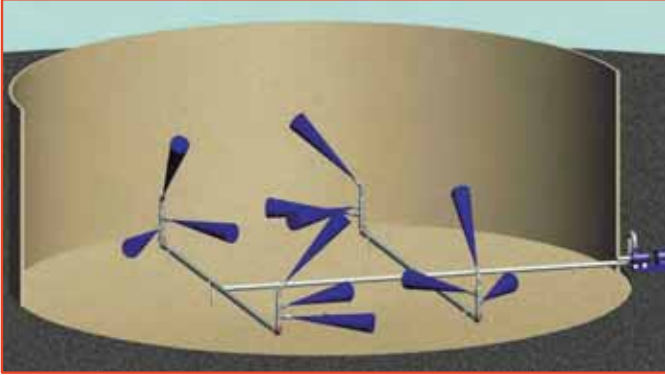
11. A properly operating digester will produce 8 to 12 cu ft of gas for every pound of volatile matter added; and for every pound volatile matter destroyed, produce 12 to 18 cu ft of gas. This is dependent on the characteristics of the sludge.
12.  $\text{Cu ft of gas/day divided by lb VS destroyed} = (150,000 \text{ gas produced cu ft/day}) / (17,500 \text{ VS destroyed lbs/day})$   
(Digester volume is not needed for this specific example.)
13. Digester gas consists of about 65%-70% methane, 30%-35% carbon dioxide and a small percentage of hydrogen, nitrogen and other gases.
14. BTU value of digestion gas is a result of the methane composition.
15. An explosive atmosphere will happen with between 5%-15% methane mixed with 85%-95% atmospheric air.

*(Questions composed using Operation of Wastewater Treatment Plants. Vol II, 7th ed.)*

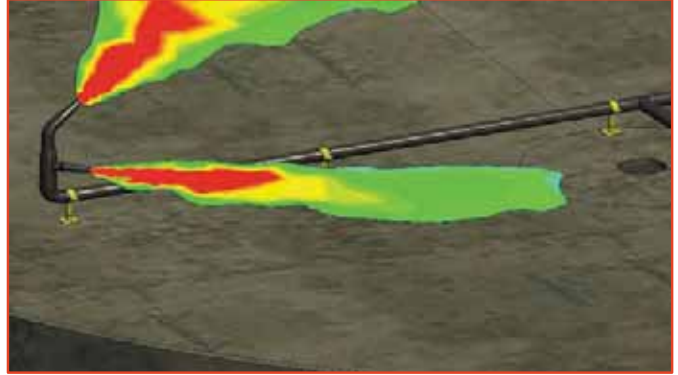


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