

New York Water Environment Association, Inc.

ClearWaters

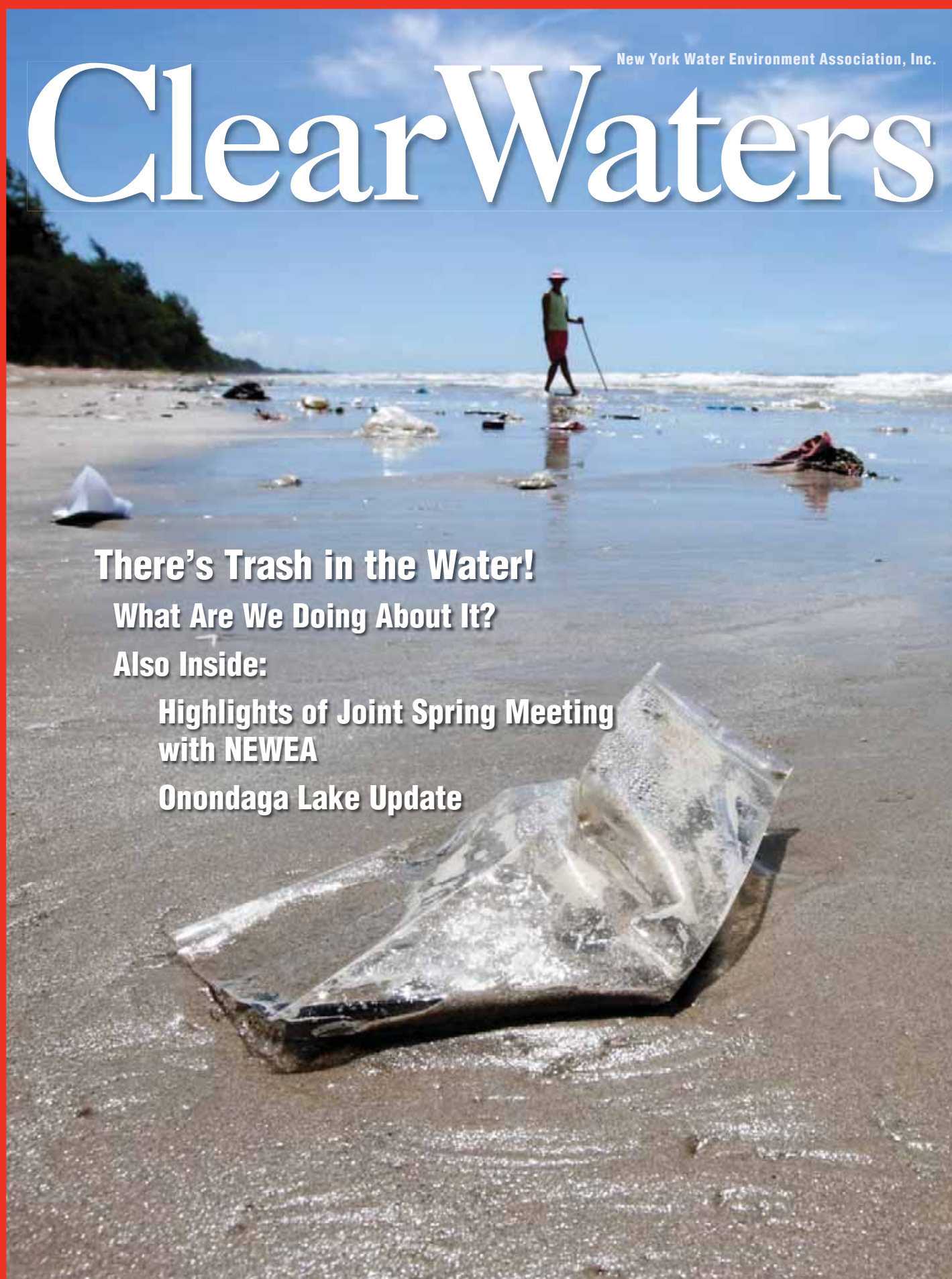
There's Trash in the Water!

What Are We Doing About It?

Also Inside:

**Highlights of Joint Spring Meeting
with NEWEA**

Onondaga Lake Update





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Cover Image: Plastics and other trash enter our waterways through storm runoff and - in the case of microbeads - by passing through water resource recovery facilities. This trash has become a significant water quality issue for both wildlife and our communities. Photo: istockphoto.com

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Clear Waters (USPS 004-595) (ISSN 01642030) is published quarterly with a directory every four years in the fall by the New York Water Environment Association, Inc., 525 Plum Street, Suite 102, Syracuse, NY 13204. Subscription is through membership; public subscription is \$25.00/year. PERIODICALS postage paid at Syracuse, NY. POSTMASTER: Send address changes to the New York Water Environment Association, Inc., 525 Plum Street, Suite 102, Syracuse, NY 13204. Ph: 315-422-7811, Fax: 315-422-3851.

Clear Waters is printed on recycled paper, using soy-based ink.



Multipronged Approaches

The New York Water Environment Association (NYWEA) has been working with the “Clean Water Infrastructure Coalition” to advocate for additional funding assistance for local municipalities. The Coalition’s stakeholders include environmental advocacy groups, business associations, and water quality professionals. The multipronged strategy used by the Coalition included meetings with key New York state officials, press

releases, correspondence with Governor Cuomo, media interviews, advisory board meetings and testimony at public hearings. Coalition participants quickly realized that the message was stronger when all stakeholders spoke with one voice. Although the Coalition members had varied backgrounds, its consistent messaging focused on the critical role clean water infrastructure has in protecting public health and the environment, while spurring economic development.

The Coalition’s efforts resulted in a \$200 million increase in the budget for the New York State Water Infrastructure Improvement Act over the next two years. This funding is above and beyond the initial \$200 million set forth in last year’s state budget. By their leadership, Governor Cuomo and the state legislators demonstrated their commitment to water quality. I would like to specifically recognize NYWEA’s Senior Policy Legislative Liaison Richard Lyons and NYWEA’s Legislative Liaison Ethan Bodnaruk for their work with this Coalition, which will benefit municipalities and water quality across the state.

While this funding increase is a great boost, it represents the proverbial “drop in the bucket” given the investment needed statewide. The state Departments of Environmental Conservation and Health estimate \$75 billion in unmet water infrastructure needs over the next two decades. With this vast need ultimately resting on local ratepayers, it is imperative that we continue to tout the benefits of clean water services so utilities receive the local support they need.

As announced earlier this year, NYWEA is creating a messaging document to promote the water quality professions, highlight the importance of clean water infrastructure investment, and raise public understanding of our members’ important work. Document development has progressed nicely over the last few months, with assistance from NYWEA volunteers statewide. I am confident that this document will prove useful to NYWEA members as an educational and promotional tool. NYWEA is also developing videos delivering the same message. Both of these endeavors enhance NYWEA’s existing public outreach and education efforts. NYWEA will employ a strategy similar to the multipronged approach of the Clean Water Infrastructure Coalition to change perceptions and promulgate a positive message regarding our industry.

Trash in the Water

Many focus on the five “B’s” of trash in the water: **B**ottles, **B**ags, **B**oxes, cigarette **B**utts, and micro**B**eads. The first four “B’s” are typically what come to mind for trash in the water. In this edition of *Clear Waters*, Joshua Kogan writes an informative article on the federal Trash-Free Waters Initiative. Pinar Balci’s article focuses on

the updates to the municipal separate storm sewer systems (MS4) permit in New York City that addresses floatables and trash control.

The fifth “B”, microbeads, is a relatively new pollutant source. Microbeads are small plastic particles added to personal care products that provide abrasive or exfoliating properties, which are subsequently disposed of down the drain. To evaluate whether microbeads pass through treatment at water resource recovery facilities, NYWEA partnered with Attorney General Eric Schneiderman’s office and Dr. Sherri Mason from SUNY Fredonia to collect samples from utilities across the state. The results showed that most facilities – which are not designed to remove these tiny microplastics – were indeed discharging microbeads. Additional testing results reported in this issue by Sandra Meola (NY/NJ Baykeeper) and Christian Shaw and Gordon Middleton (Plastic Tides) reveal that microbeads are dispersed in our waterways from the New York/New Jersey Harbor Estuary through the Erie Canal System and to the Great Lakes.

Proposed solutions to address the microbead problem included facility upgrades to treat for microbeads, ignoring the problem altogether, or instituting a ban on these products. The option advocated by NYWEA – which ultimately was implemented nationwide – was an outright ban. This ban – the “Microbead-Free Waters Act” – was unanimously approved in both Houses of Congress, proving that water quality protection is a bipartisan issue. Lemuel M. Srolovic’s article details how New York contributed to passage of this federal legislation.

Accurate Messaging: Water Resource Recovery Facilities

“Wastewater treatment” was used for decades in our industry to describe the process of removing pollutants from sewage and returning the clean water to the environment. During an April 2016 meeting, the NYWEA Board of Directors unanimously approved the use of the term “water resource recovery” when referring to “wastewater treatment”. This edition of *Clear Waters* is the first that will employ this new term throughout.

Why the change? The Water Environment Federation (WEF) had adopted “water resource recovery” in January 2013 to acknowledge that many facilities do more than “treating wastewater,” including harvesting nutrients, employing beneficial reuse of biosolids, recycling of treated effluent, and generating electricity. Water resource recovery better describes the function of these facilities and recognizes the paradigm switch within the industry as a whole towards more sustainable operations. That said, even for those facilities that may not yet be generating electricity or recycling effluent, the term water resource recovery fits. The core purpose of these facilities is to recover a valuable resource – water – from a major societal waste stream. Shifting the focus away from the waste received toward the products and benefits of treatment better captures what water quality professionals do. It is NYWEA’s belief that this change offers another opportunity for utilities to alter the conversation towards a more positive image that better portrays the essential services our industry provides.

Joseph L. Fiegl, PE, NYWEA President



Out of Sight and Out of Mind

We live in a wasteful society. Everywhere we look, we can see the results of our single-use, conveniently disposable consumer waste – in our homes, alongside roads, in the trees, and ultimately in lakes, rivers, streams and oceans. This trash presents a problem for all of Earth's inhabitants. As sure as the next full moon, as the world's population increases, our wastes (solid, municipal and otherwise) will increase too.

The saying "Out of Sight, Out of Mind" is particularly appropriate for our society's waste disposal habits – flushing toilets and throwing trash away. That is precisely the reason why the members of the Publications Committee have championed the Summer and Fall issues of *Clear Waters* to focus on those public outreach activities on which we can help make a difference.

It is hard to imagine; it wasn't actually that long ago when we sent our trash in barges out to sea to be rid of it. We have made some progress. The ocean dumping of trash was banned in 1934, while the dumping of sewage sludge in the ocean was banned in 1991. As we look to the future, we need to pair the innovative changes to re-configure our water resource recovery facilities to produce "energy" with reducing the solid waste produced from everyday living (trash that ends up in our waters). The recent ban on micro-beads is a step in the right direction; however, there is still work to do on non-flushable wipes (read *Cynthia Finlay's article on page 29*). The ubiquitous plastic bag is certainly another problem. However, there's hope when we hear about the bold leadership of municipalities like the City of New York, when in May they voted to impose a five-cent fee on disposable plastic bags to encourage shoppers to bring their own reusable bags to stores. Product stewardship and the lifecycle of our trash must be addressed. As we work to have no "waste" in wastewater – we should be able to look at our trash as a resource too.

Our trash may be out of sight in a traditional sense; however, the landfill mountains continue to grow and become more visible. I grew up in a house that didn't recycle trash, while my husband's



Children swim at a beach that is full of trash at Muara Angke Beach, Jakarta, Indonesia.

parents recycled everything. In fact, they have recycled their entire adult lives, stemming from the metal needed for tanks, ships, planes and weapons used during World War II. I am thankful that their example has rubbed off on me, and am proud to put out more recycling than trash weekly! Unfortunately, recycling is not consistent among households and businesses, and that presents a big problem for municipalities and solid waste managers.

We are fortunate here in America. In many developing nations, the impact of trash in the water is hard to comprehend. Images that I have seen are riveting and despicable; one is included here. Many more like this can be found by Googling "Trash in the Water."

We must take to heart what Chief Oren Lyons, the Faithkeeper of the Turtle Clan of the Iroquois Confederacy, said when he addressed NYWEA members during the Spring Meeting in 2007: "We have to think about our actions now and how they will affect the next seven generations." The buck stops with each and every one of us. We all must be more conscious of what we purchase and how it is disposed.

Here's wishing you all a safe and wonderful summer, and swimming in water that is clean!


Patricia Cerro-Reehil
pcr@nywea.org

Do You Want to Be NYWEA President in 2020?

If you are interested in a long-term, career-enriching opportunity, please consider applying for this important position. Being an officer is a rewarding experience, but it is also a commitment of five years (Vice President–Elect, Vice President, President–Elect, President, Immediate Past President). When reviewing applicants, the Nominating Committee will take the following items into consideration (no one is expected to have all of these items in their resumé):

- Leadership skills
- Vision and managerial skills
- Active and viable state committee chair
- Active and viable state committee involvement
- Continuous membership tenure greater than 7 years
- NYWEA award recipient
- Chapter endorsement (in writing)
- Chapter representative
- Active member of Chapter Executive Board
- Chapter officer
- Regular attendance at state meetings
- WEF Board of Directors service

Please submit an electronic resumé with a cover letter that highlights any of the attribute areas above to:

Patricia Cerro-Reehil, Executive Director, NYWEA,
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Nomination deadline is August 10, 2016. All members are eligible to apply!

Highlights of NEWEA/NYWEA Joint Spring Meeting

The NEWEA/NYWEA Joint Spring Meeting held in Mystic, CT, in early June was a great success with over 500 people in attendance! This three day technical conference featured presentations focused on Environmental Stewardship in the 21st Century and covered topics such as Utilities of the Future, Sustainable Design, Global Climate Change and Low Impact Development.

The meeting attracted over 50 exhibitors and a Regional Operations Challenge competition, with nine teams in all, competing with Team HRSD which came all the way from Virginia.

Many thanks to the sponsors and program advertisers who helped to make this event a huge success!



NYWEA President Joe Fiegl opens the Joint Meeting.



Beluga whale, Juno, engaged and awed Aquarium visitors.



Above: Dustin Price, right, thinks members are getting younger!



L to r: Krish Ramalingam, Fotios Papamichael and David Archard enjoy catch up at the reception and dinner.



Above, l to r: Christina Fortin, Patricia Cerro-Reehil, Heather Goldstone, Janine Burke-Wells and Mary Barry.



Above: Joe Massaro and Donna Bee



Above: Lauren Livermore (left) and Helen Gordon



Left, l to r: Charlie Tyler, Erin Mosley and John Rogers



Buffalo fans, Mark Boswell (left) from Total Control System Services, Inc. and OJ McFoy, General Manager, Buffalo Sewer Authority



Annette and Mike Bonomo



Boss Tweed (with Water Ambassador and Past President Mike Garland at far right) rock the house after the President's Reception.



Jim Courchane (left) and Ron Tiberi catch up during a break.



Tim Groninger of HDR addresses the subject of Utilities of the Future.



Heather Goldstone gives the keynote address at Opening Session.



Bob Wither, (center) describes size of a fish that got away to Gerry Moscinski (left) and Ken Skibinski.



Interest is high as audience listens to speakers in Opening Session.



Sarah Galst addresses members on Nutrient Recovery.



L to r: Maureen Kozeol, J. Kirk Rowland and Maggie Hoose



Joe Fiegl and Mike Garland enjoy Sunday's events.



Mike Manning (left), Nancy Struzenski and Pete Radosta



Dave Barnes (left) and Charlie Tyler



Above, 1 to r: Rob Klee, Heather Goldstone, Mike Bisi, Lauren Livermore and Helen Gordon



Left: A NEWEA and NYWEA gallery of presidents, past and present, pose for the camera.

continued on page 56



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Toward “Trash Free” Waters

Trash in our waters: a water quality issue that everyone understands and can even help address. This is not a new topic – you probably learned about it in elementary school when you were taught not to be a “litter bug.” Or, heard about in complaints concerning our “throw-away” society.

NYSDEC regulates solid waste and encourages recycling through programs and a vision forward that are well-summarized in “Beyond Waste”. This 2010 report seeks

to move New York away from the trash-litter-landfill cycle into a program that treats wastes as the resources they are. Think of the energy and fertilizer produced through anaerobic digesters, for example. And certain types of senseless wastes can be completely eliminated.

Studies have found small plastic bits everywhere, such as the infamous trash islands extending over Texas-sized areas in our oceans. Fish and wildlife are harmed eating plastic, mistaking it for food. In the ocean, plastics break down into minute particles, creating what researchers have called a global “smog” of plastic particles.

There has been some progress, like the recent ban on plastic microbeads in personal care products. But this new law addresses one very small component of the problem. According to USEPA, an estimated 8 million metric tons of plastic pollution will enter the oceans annually, an amount expected to double by 2025.

NYSDEC is collaborating with USEPA on a “Trash-Free Waters”

initiative, with the goal of reducing the plastic trash volume entering aquatic environments to near zero. Indeed, the state’s water quality standard for “trash, cinders, ashes, oils, sludge and other refuse” in saline waters is already “none in any amounts.”

A problem of this magnitude will require a broad range of ingenious solutions. I believe in attacking this problem at the source: get away from plastic trash in the first place. Professionals in the water resource recovery sector should take this position as well. Water flows downhill, and carries with it the plastic trash tossed on the hill. In regulated MS4 communities this trash becomes a problem “owned” by the operators of sewer and storm sewer systems (no one said life is fair).

New York City, for example, has initiated the BYO (Bring Your Own) campaign to reduce consumer waste and combat littering, encouraging the use of reusable shopping bags, bottles and mugs. Following the campaign, the City reported 157 million fewer plastic bags going to the landfill, saving the City \$2 million. Another City program, Adopt-a-Basket, involves volunteer monitors who keep litter baskets from overflowing on the street and into the storm drain. Other ideas include a plastic bag fee, a ban on Styrofoam cups, and the like.

The solutions range from complex recycling systems to responsible personal choices – the things we were taught years ago as kids. While there is no single solution, it is clear that all of us – as the professionals who keep the water clean – have a big stake in efforts to move our society “Beyond Waste.”

– James Tierney, Assistant Commissioner for Water Resources
NYS Department of Environmental Conservation



Working Near Water

For an occupational safety professional, an employee working around water can be a recipe for disaster – too many hazards, too little time, too few parameters. How many times have we seen the TV reality show where the person was reaching too far for that last fish, flower, or dollar bill floating away and then he fell into the water? Removing trash from water may be a routine task – such as cleaning a trash rack – or it could be a flood cleanup, or it may lay somewhere in between.

No matter the environment or situation, having your safety eyes on and operating will make the work near water safer.

So what to do? Prevent falls into the water – and if that fails be prepared for efficient rescue operations – by following these recommendations:

1. Develop a standard operating procedure (SOP) for working around water. Review the SOP annually with the personnel who will be involved. The NYS DOT has a comprehensive “Working in Proximity to Water” Safety Bulletin that may provide guidance. Also survey and include any practical suggestions from employees.
2. Develop a Health and Safety Plan (HASP) to identify potential hazards and determine the appropriate interventions/controls for the identified hazards. OSHA has a software program on their website that will assist in HASP development.
3. Provide worker training in the recognition, prevention, and avoidance of unsafe work conditions. The specific training will likely be different for routine activities than for storm cleanup.

4. Provide the required personal protective equipment (PPE). Refer to OSHA 1910.132 for PPE requirements. Although the water treatment organization may not be directly covered by OSHA, the OSHA standards are recognized as minimum safety requirements and will provide guidance to help establish the SOPs. Keep in mind that PPE is the final effort in employee protection – it should never be the first effort. Only when all other attempts to eliminate a hazard have failed should PPE be considered.
5. Provide the correct lifesaving equipment. Refer to OSHA 1926.106 “Working on or Near Water” for guidance regarding the need for buoyancy vests, rescue skiffs, and throw-able life rings. The NYS DOT Safety Bulletin mentioned previously outlines additional information, such as prohibiting the use of canoes and John boats as rescue skiffs.
6. Conduct worksite safety inspections routinely. Trash rack maintenance activities can be periodically inspected by a dedicated safety professional, a member of the safety committee, or management. This brings multiple layers of awareness to the work area. Storm clean up safety inspections are a bit more difficult but still necessary to have eyes on the activity, have personnel know that others are looking out for their safety, and to formalize improvements to the SOPs, HASPs, and training programs.

Take care around water. Did you laugh when the guy on TV fell into the water? Falling into turbulent, cold, murky, trashy water when doing your job or reaching for a floating diaper just isn’t as funny – especially when it could be prevented.

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

USEPA's Trash-Free Waters Initiative

by Joshua Kogan

The Global Impact of Aquatic Trash

Plastic trash has become a pervasive problem in aquatic environments, presenting a challenge to water quality and habitat protection, in addition to causing aesthetic blight, ecological effects, economic impacts, and possible human health risks. From 2010 data, it was estimated that 192 coastal countries produced 2.5 billion metric tons of solid waste, of which 270 million metric tons was plastic. Of that plastic waste, 99.5 tons were produced within 30 miles of a coast, approximately one-third was mismanaged either intentionally or inadvertently, and 4.8 to 12.7 million metric tons entered our global oceans by movement through adjacent watersheds, including upstream freshwater ecosystems and sewersheds (*Jambeck et al. 2015*). In fact, as much as 80 percent of all marine debris is generated from land-based sources, such as pedestrian or motorist litter, industrial discharge of pellets and powders, and waste mismanagement (*Virginia Coastal Zone Management Program 2014, 1*). While methods of determining abundance of marine debris vary, there is agreement that the majority of debris (up to 75 percent) is made up of plastics (*Virginia Coastal Zone Management Program 2014, 5*).

The production of plastics in the U.S. since 1960 has increased significantly, and one-third of this plastic material comes from single-use disposable packaging – a predominant aquatic plastic pollution type (*Thompson 2014*). Once in the aquatic environment, plastic trash debris is found on the water surface (“floatables”),

in the water column (“suspendables”), and in the benthic regions (“settleables”) of water bodies, where it has been shown to negatively impact more than 663 species as it flows from upstream aquatic environments, to where it ultimately traverses the oceans due to a combination of thermohaline circulation and water surface gyres (*Secretariat of the Convention on Biological Diversity and the Scientific and Technical Advisory Panel–GEF 2012*). The United Nations conservatively estimates the overall financial damage of plastics to marine ecosystems at \$13 billion each year (*UNEP 2014*).

The Local Impact

New York State has a narrative water quality standard for trash of “none in any amounts”, with a historical focus on the reduction of floatables (*6 NYCRR Part 703*). Currently, New York State contains 35 water bodies designated “impaired” due to floatables pollution, 22 of which are located within New York City (*MS4 Permit NY-0287890*). As a result of a history of extensive floatables wash-ups in and around New York-New Jersey (NY-NJ) Harbor, the City of New York Department of Environmental Protection (NYCDEP) began studying floatables pollution in 1987. Between 1987 and 1991, the City identified that much of the floatables pollution that washes onto City shorelines originates as street litter, and then reaches the shoreline as point source discharges. Specifically, this litter is carried off streets by runoff during rainfall events and enters receiving surface water bodies through combined sewer overflows (CSOs) and storm sewers (*HydroQual 1997*). Further studies conducted between 1991 and 1994 evaluated potential non-structural floatables-control methods including enhanced street cleaning, modifications to catch basins, and the use of skimmer boats and containment booms.

By 1992, the City of New York and the New York State Department of Environmental Conservation (NYSDEC) entered in an “Order of Consent” calling for the City, among other requirements, to take actions to abate CSO pollution that causes contraventions of the narrative sections of the NYSDEC water quality standards. These actions, which were intended to deal mainly with floatables pollution, included development of a “City-Wide CSO Floatables Plan” to control CSO floatables by 1997. This plan built on the floatables-control activities initiated by the City as part of the effort to implement the U.S. Environmental Protection Agency’s (USEPA) Nine Minimum Controls as part of continuing efforts to reduce CSO floatables discharged into the NY-NJ Harbor. Floatables-control elements of the City-Wide CSO Floatables Plan included retrofitting catch basins with hoods, street sweeping, increasing the amount of wet-weather flow captured and treated at Water Pollution Control Plants (WPCPs), outfall booming and skimming, pilot testing of in-stream catchment technologies, education and outreach, and an illegal disposal track-down program. This 1997 plan presented a goal to reduce floatables discharged to the Harbor up to 87 percent, with estimated costs of \$151.1 million in initial outlay and \$2.2 million annually, thereafter dependent on program development (*HydroQual 1997*). The plan also contained a conceptual framework for the monitoring of floatables conditions of the waters of NY-NJ Harbor, along with a work plan for a pilot program.

In 2006, due partly to the CSO Consent Order and partly to requirements of a State Pollutant Discharge Elimination System



Photo: Joshua Kogan

Litter along a New York City street with some material collected on the catch basin inlet (2015)



Photo: Bronx River Alliance

Floatables trash boom installed at Concrete Plant Park (Bronx, NY) in 2014

(SPDES) permit, NYCDEP piloted the City-Wide CSO Floatables Plan's monitoring program to assess the effectiveness of floatables-control methods. The monitoring program investigation protocols were developed to characterize floatables, identify sources of floatables, correlate numeric effectiveness ratings to floatables control programs, and in conjunction with CSO Long Term Control Plan (LTCP) processes, initiate appropriate remediation planning where feasible. After the pilot in 2006, the program was fully-implemented in 2009. The program identified floatables hot spots which were used to establish site-specific floatables capture plans, many of which are still ongoing.

Additionally, as part of USEPA's mandated responsibilities defined under Subtitle C of the Marine Plastic Pollution Research and Control Act of 1987, and in consultation with other agencies, USEPA prepared a New York Bight Restoration Plan. As part of this plan, a Floatables Action Plan was included to focus on locating and cleaning up floatable debris in the NY-NJ Harbor Complex and surrounding areas. This Floatables Action Plan was developed jointly by an interagency workgroup comprised of the USEPA, U.S. Army Corps of Engineers, U.S. Coast Guard, National Oceanic and Atmospheric Administration, New Jersey Department of Environmental Protection, NYSDEC, NYCDEP, New York City Department of Sanitation, Passaic Valley Sewerage Commission, and Interstate Environment Commission.

The Floatables Action Plan was amended in 2008, and most recently into its current form in 2013. From an economic perspective, during the summer months of 1987 and 1988 the impacts of floatable debris in New York and New Jersey water bodies were significant. Several beaches were forced to shut down for extended periods of time due to the debris washing up on shore. The State University of New York Waste Management Institute estimated an economic loss of between \$900 million and \$4 billion in New Jersey, and between \$950 million and \$2 billion in New York. Furthermore, implementation of the Floatables Action Plan is attributed with the removal of over 450 million pounds of debris from the NY-NJ Harbor Complex through the year 2013. In general, the amount of floatable debris collected remained steady for 10 years from 1997 to 2006 – with a decline reported in 2007 – and remained relatively steady through 2012. In 2013, a considerable increase was shown relative to effects from Super Storm Sandy (USEPA 2014).

In 2015, Columbia University's Marine Debris Research Team, with support from USEPA Region 2 and the NYSDEC, surveyed 121



Photo: Lisa Schepfle, American Littoral Society

Debris experienced during 2014 NY State Beach Cleanup

municipalities within a 790-square mile Hudson-Raritan watershed area for cost data associated with the following marine debris waste management strategies: beach and waterway cleanup; street sweeping; storm drain cleaning/maintenance; stormwater and runoff capture devices; manual debris cleanup; and public education. Thirty-four municipalities responded, including New York City, representing 71 percent of the population in the Hudson-Raritan estuary. In total, these municipalities spend nearly \$60 million annually on marine debris waste management activities – an average cost of \$6.16 per capita per year, or \$75,407 per square mile annually (Kim 2015).

It's important to note that floatables pollution is a statewide issue, as 13 of New York's 35 floatables-impaired water bodies exist outside of New York City. Even with a significant amount of commitment in publically-funded floatables capture, floatables still continue to wash up on the coasts and shores of New York State in large amounts, and each year several grass roots organizations conduct shore and coast cleanups to remove floatables accumulation. In 2014, over 6,800 volunteers joined the American Littoral Society to collect and remove 46 tons of debris from 245 miles of shorelines across New York State, as part of their annual New York State Beach Cleanup program (American Littoral Society 2015). Likewise, in 2015, 2,000 volunteers joined Riverkeeper to remove over 40 tons of debris from the Hudson River Estuary (Riverkeeper 2015).

This steady state in floatables pollution recently provoked a robust floatables (and settleables) provision in the City of New York's 2015 MS4 Permit. The permit requires the City to develop a floatable and settleable trash and debris management program as part of the Stormwater Management Program Plan. The objectives of the floatable and settleable trash and debris management program shall be two-fold: (1) to develop a methodology to determine the loading rate of floatable and settleable trash and debris – including land-based sources – from the MS4 to waterbodies listed as impaired due to floatables in the MS4 areas; and (2) to assess and implement strategies to reduce floatable and settleable trash and debris to waterbodies listed as impaired due to floatables in the MS4 areas (MS4 Permit NY-0287890). In the interim, the City will implement a Floatable and Settleable Trash and Debris Reduction Media Campaign that further educates the public on trash and debris control. The City's Media campaign, "Trash Free NYC Waters," has been developed and is currently being implemented.

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Plastic-Ecosystem Interactions

There has been substantial research on the impacts of plastic aquatic trash on organisms, particularly the physical interaction such as entanglement and ingestion. However, there has been increasing focus on the impacts of toxic chemicals as they relate to plastic aquatic trash. Some plastic debris can act as a source of toxic chemicals, as substances that were added to the plastic during manufacturing leach from plastic debris (flame retardants, antimicrobials, UV inhibitors, etc.). Plastic debris also acts as a sink for toxic chemicals. Plastic can adsorb persistent, bioaccumulative, and toxic substances (PBTs), such as polychlorinated biphenyls (PCBs) and dioxins, from the water or sediment. These PBTs may desorb when the plastic is ingested by any of a variety of aquatic species. While there is uncertainty and complexity in the kinetics and thermodynamics of the interaction, plastic debris appears to act as a vector transferring PBTs from water to the food web, increasing risk throughout the aquatic food web, including risk to humans (Engler 2012).

Furthermore, plastic debris has the potential to breakdown into microscopic or nanoscopic particles. The resulting microplastics (<5mm) and nanoplastics (<0.10µm) in the aggregate provide increased surface area when compared to larger plastic debris of the same material that they originate from; this provides more adsorptive surface for PBTs, as well as more surface area to leach additives. Additionally, these smaller particles are available to more organisms for consumption. This increases the potential for greater transfer of the physical plastic, as well as any toxins (innate or adsorbed) to the food web. A recent study by NY/NJ Baykeeper indicates that 165 million microplastic pieces are floating within the NY-NJ Harbor Estuary at any given time (NY/NJ Baykeeper 2016). This study did not include suspendable or settleable plastics sampling.

USEPA's Trash-Free Waters Program – Focusing Upstream

History has shown that although sewershed trash capture (mid-stream or downstream end-of-pipe) can reduce and potentially eliminate point source trash discharges, it's often cost prohibitive, and all measures implemented are ultimately funded by local tax payers.

Given the land-based origins of aquatic trash, the USEPA developed the national Trash-Free Waters (TFW) program to prompt and support collaborative actions identified by public and private stakeholders to prevent and reduce land-based trash from entering U.S. waters. This upstream approach seeks to lessen the load of plastics making their way into sewer systems, and ultimately into capture facilities. In 2014, USEPA Region 2 expanded the national TFW program to the New York/New Jersey region, which has created an opportunity to develop a local strategic approach to support aquatic trash prevention and reduction initiatives by many public, private, and nonprofit stakeholders in the region.

The regional TFW program is multi-faceted, and includes bolstering citizen science, conducting supporting research, regulation and permit guidance, stakeholder capacity building through technical guidance and grants, and collaboration through the TFW Partnership (TFWP). The TFWP, the backbone of the regional strategy, is a collaborative between federal, state and local governments, academia, and environmental and business communities with a common goal: to reduce trash in all waterbodies. The TFWP serves as a forum for various stakeholders to discuss the latest research and ideas, then develop a focused set of actions and projects that significantly reduce the volume of trash entering watersheds and the marine environment, approaching zero-loading of



Photo: David Conover, Hudson Sloop Clearwater

Manta trawl being towed up the tidal Rondout Creek during microplastics sampling (2014)

trash into regional waters by 2024. The focus of the TFWP is to give stakeholders the opportunity to participate in and provide support to each other's efforts on reducing marine debris by sharing and distributing technical and educational resources.

The regional strategy was developed to reflect stakeholders' needs and concerns, and has led to the development of the TFWP "PB5" working groups, namely: Plastic Bottles; Bags; cigarette Butts; Restaurant Service Ware/Boxes; and Microplastics/MicroBeads. Each working group has selected a plastic pollutant type to develop replicable, achievable and measurable aquatic trash prevention and source reduction projects throughout New York and New Jersey.

Since 2014, each of the groups has been working diligently, with efforts including: microplastics pollution citizen science and research; installing and maintaining monofilament line receptacles and water bottle refill stations; and researching human behavior in order to develop project development strategies. In an effort to continue progress towards the zero-loading goal, USEPA Region 2 provided \$365,000 to the New England Interstate Water Pollution Control Commission (NEIWPCC) to administer a grants program that funds projects demonstrating the successful prevention of land-generated trash and debris from discharging into aquatic environments.

A Future Trash-Free Waters of New York

As demonstrated by the 35 water bodies "impaired" due to floatables in New York State, experience has shown us that mid and downstream floatables capture technologies are expensive practices that impact taxpayers and prove very difficult to be fully effective in controlling sewershed collection and transport of litter and debris. In order to enjoy trash free waters in the future in New York State, agencies, businesses, organizations, and citizens must consider adjusting behavior upstream, on land. Waste needs to be reduced at the source. Simply put, less waste leads to less aquatic waste. As USEPA Region 2 administrator, Judith Enck, recently remarked, "Plastic in our harbor and ocean

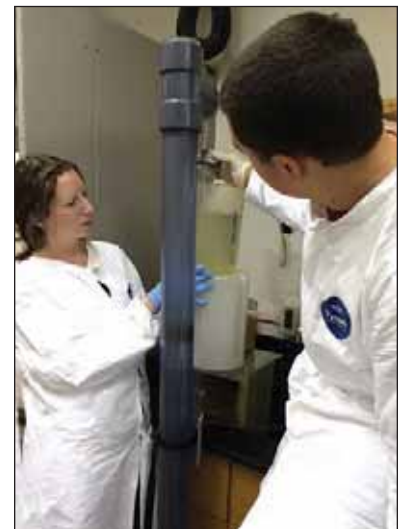


Photo: Clean Ocean Action

Clean Ocean Action staff and student researchers process microplastics.



Photo: Carole Trottere

Monofilament line recycling receptacles in North Hempstead (2015)

is an assault on the environment. We are essentially turning our waters into a landfill ... the best way to remove trash from our waters is to keep it out in the first place." The Trash-Free Waters Program adds this necessary upstream component in the overall sewershed "treatment train" for floatables control. With an effort on upstream source reduction and litter prevention, the goal of zero trash discharge by 2024 is accomplishable.

Joshua Kogan, P.E., is the Coordinator of the the Trash-Free Waters Program for USEPA Region 2, Clean Water Division. He can be reached at Kogan.Joshua@epa.gov.

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New York City MS4 Stormwater Management Program

by Pinar Balci

The Clean Water Act was passed by Congress in 1972 to protect and restore the health of the waters of the United States. The Act regulates certain types of stormwater discharges, as well as wastewater discharges, to waterbodies across the country.

Starting in 1990, medium and large cities have been required to obtain a permit to discharge stormwater through municipal separate storm sewer systems (MS4s). Nine years later, all urbanized areas were required to obtain an MS4 permit. Since the 1990s, the New York State Department of Environmental Conservation (NYSDEC) has imposed certain stormwater related requirements on the New York City Department of Environmental Protection's (NYCDEP) MS4.

Up until August of 2015, the MS4 requirements were incorporated into the State Pollution Discharge Elimination System (SPDES) permits for NYCDEP's 14 individual water resource recovery plants. Then, on August 1, 2015, NYSDEC issued a new comprehensive MS4 permit for New York City (the City). This permit includes robust requirements that considerably expanded the City's obligations to reduce pollutants discharging to the MS4. There are 14 City agencies with significant obligations under the new MS4 permit, and NYCDEP is responsible for coordinating the interagency efforts to meet the permit requirements.

The Stormwater Management Program

The new MS4 permit requires the development of a Stormwater Management Program (SWMP) by August 1, 2018, the goal of which will be to reduce pollution reaching waterbodies through the MS4 (Figure 1). The SWMP will include a comprehensive plan describing how the City will address stormwater discharges through Best Management Practices and other controls. This will require robust and collaborative efforts citywide to assess existing activities that could help meet – or be modified to meet – the MS4 permit requirements. These activities will subsequently be written into the SWMP plan.

The SWMP plan will describe in detail how the MS4 permit requirements are prioritized and implemented through these ten

programmatic elements:

1. Public Education and Outreach
2. Public Involvement/Participation
3. Mapping
4. Illicit Discharge Detection and Elimination (IDDE)
5. Construction Site Stormwater Runoff Control
6. Post-Construction Stormwater Management
7. Pollution Prevention/Good Housekeeping for Municipal Operations and Facilities
8. Industrial and Commercial Stormwater Sources
9. Control of Floatable and Settleable Trash and Debris
10. Monitoring and Assessment of Controls

Public Components: Education and Outreach, Involvement/Participation. The education and outreach program will focus on educating the public on stormwater quality issues, and identify the steps people can take on their own to reduce pollution and improve water quality. The involvement and participation program will seek input – through community and stakeholder meetings – on the development, implementation, review and major revision of the SWMP. These two programs will require substantial involvement from all agencies involved with educating the public by hosting civic participation events and activities throughout the year. Several relevant existing programs have already been identified, and some are now updating their publications (e.g., flyers, website content, and presentation material) to include MS4 language. NYCDEP aims to engage in even more stewardship activities, such as beach cleanup events and volunteer water quality monitoring, which will ultimately help to keep New Yorkers involved and informed.

Mapping. The mapping task will result in the creation and maintenance of a detailed map showing areas draining to the MS4, as well as showing locations of the City owned and operated MS4 outfalls discharging to surface waters of the State. Preliminary estimates show that approximately 30 to 40 percent of the City's land area is covered by the MS4 permit. Working congruently with all the affected citywide agencies, NYCDEP is compiling this comprehensive GIS-based map. For this mapping task, the City must also provide information such as zoning districts and related land uses, and locations of major structural controls for stormwater discharge. All

affected agencies are engaged in providing the information necessary to develop a preliminary map within three years, and a final version within five years.

IDDE. NYCDEP's current Illicit Discharge Detection and Elimination (IDDE) program is structured to detect and eliminate illicit discharges into the MS4. The City will continue to implement its well-developed, existing IDDE program, while also exploring additional methods to prevent, detect, and eliminate illicit discharges to all City agencies' storm sewers.

Construction Runoff Control. The construction runoff control program continues an existing State program that aims to reduce pollutants in stormwater runoff from construction activities. Construction activities involving land disturbance of one acre or more are required to implement erosion and sediment control measures as well as pollution prevention practices. The program, as implemented by the City under the MS4 permit, will include site inspection and

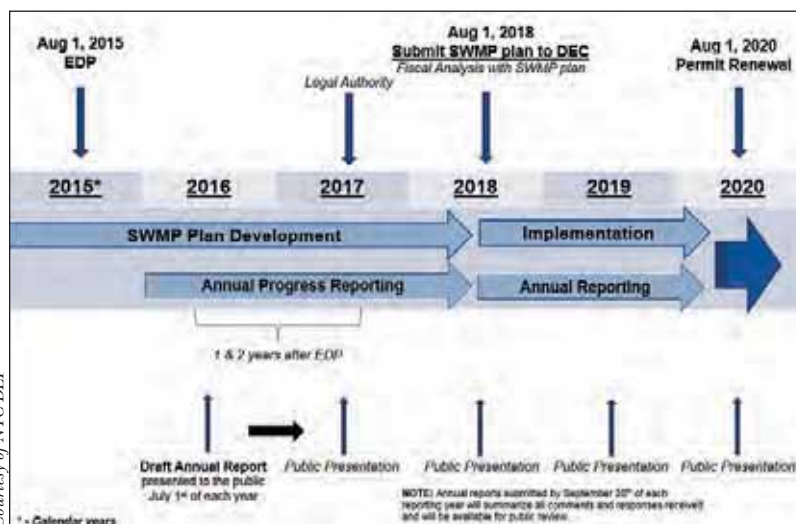


Figure 1. (Source: New York City MS4 permit)

enforcement actions. The City will also conduct a study to determine the appropriate reduction in the soil disturbance threshold at which projects must implement erosion and sediment control measures, and identify which management practices are acceptable.

Post-Construction Management. As part of the SWMP, the City will develop a post-construction stormwater management program. This program will be a continuation of an existing State program designed to reduce pollutants in stormwater runoff by requiring that new development and redevelopment projects incorporate stormwater controls in the final site plans, following the New York State Stormwater Management Design Manual. Under this program, stormwater controls must be inspected and maintained by trained personnel. The City will also conduct a study to determine the appropriate reduction in the soil disturbance threshold for triggering the applicability of post-construction stormwater management requirements at new development and redevelopment sites. This study will consider water quality improvements, compliance costs, local site conditions, numbers of affected public and private properties, types of development/zoning, total area managed, impervious coverage and other relevant factors. NYCDEP initiated the scoping of this study with involvement from the construction community, environmental organizations and other interested stakeholders.

On the Municipal Side: Pollution Prevention and Good Housekeeping. The City must be aware of all its municipal operations and facilities in order to develop and implement a Pollution Prevention and Good Housekeeping Program. This program addresses municipal operations and facilities that contribute or can possibly contribute pollutants to the MS4 in stormwater runoff, and subsequently to the waters of the State. A complete inventory of facilities and operations will be compiled and maintained by the City. A preliminary municipal facility inventory has already been created, and will be prioritized into high, medium and low categories on the basis of the potential for water quality impact. The City is currently developing a procedure for conducting assessments of all municipal operations and facilities in MS4 areas in order to identify appropriate stormwater management control measures. Each facility will be required to implement best management practices (BMPs), policies and procedures to reduce or prevent the discharge of pollutants. Facilities will conduct regular self-assessments to evaluate the effectiveness of the practices implemented. In addition, the program will require the City to consider and incorporate runoff reduction techniques and green infrastructure during planned municipal upgrades, including municipal rights of way if feasible and cost-effective, as well as implement retrofits.

On the Industrial and Commercial Side: Stormwater Management. The Industrial and Commercial Stormwater Sources Program requires the City to prepare and maintain an inventory of industrial and commercial facilities that are possible sources of pollution to the MS4. In addition, the City will develop an inspection plan to assess whether unpermitted private industrial and commercial facilities require SPDES Multi-Sector General Permit (MSGP) coverage. The City will also conduct inspections and appropriate enforcement of covered MSGP facilities to ensure that appropriate BMPs are in place to prevent stormwater pollution. A prioritization schedule will be applied to this requirement and submitted with the City's SWMP plan.

Floatable/Settleable Trash and Debris. As part of this program, the City is developing management strategies and techniques to control

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Photo: DEP Photographer, Kristen Aviz



Catchbasin pollution

phone kiosks, bus shelters, and on transit bus banners – to increase awareness and educate the public.

Monitoring and Assessment. Within three years, the City should have a tracking system framework developed for following each of the requirements listed in the MS4 permit and the information required to be included in the annual report. Correspondingly, the Monitoring and Assessment Program must be designed to meet various objectives including the measurement of effectiveness of the City’s SWMP.

The Road Ahead

The City of New York is working hard to develop a comprehensive

floatable and settleable trash and debris. NYCDEP has partnered with Columbia University and NY/ NJ Harbor Estuary Program to develop a methodology for litter surveys in order to identify sources of street litter and floatables. Street litter surveys will be conducted in the summer and fall of 2016. In coordination with GreenNYC, NYCDEP launched the first phase of the citywide floatable and settleable trash and debris reduction media campaign on February 1, 2016. Accordingly, several advertisements have been placed in many common areas – such as tele-



Courtesy of GreenNYC

stormwater management program with measurable goals to reduce pollutants in stormwater to the maximum extent practicable. The City has many challenges and opportunities ahead, and is determined to surpass the requirements stated in the MS4 permit. The ultimate goal of these efforts is to manage urban sources of stormwater runoff to protect overall water quality and enhance water quality in impaired waters through comprehensive integrated planning.





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The Sewage Pollution Right to Know Act

by Holly Shear

The Sewage Pollution Right to Know Act (SPRTRK), enacted in August 2012, is a reporting and notification law meant to inform the Department of Environmental Conservation (NYSDEC), the Department of Health (NYSDOH) and the public about partially treated or raw sewage discharged into the waters of the state. The purpose of the SPRTRK is to help the public make informed decisions about where to recreate in, on or near the water; nobody wants their children to swim in raw sewage or have unmentionables float by as they kayak. The law also informs people about the state of their community's wastewater infrastructure.

NYSDEC has been working with a wide range of stakeholders – including environmental groups, the public, and permittees – to develop regulations to implement the SPRTRK. The draft regulations went out for public comment in the summer of 2015. NYSDEC received over 700 comments, including: requests that all discharges be reportable; suggestions to make reporting discharges easier; and recommendations to add a minimum release volume before reporting is required. The NYSDEC has been reviewing all the comments and anticipates modest changes to the draft regulations to clarify reporting requirements. As of this writing, the final regulations have been adopted effective June 29th, 2016. Updates about the regulations will be sent out through NYSDEC's electronic newsletters *Making Waves* and *Sewage Pollution Right to Know Law*. The official release of the final regulations will be published in the *Environmental Notice Bulletin*. Search “sewage pollution right to know” on NYSDEC's website to find the web pages for this program.

SPTRK requires reporting of sewage discharges and the use of NY-Alert. NY-Alert is an existing, widely used electronic state notification system that provides an accessible, standard, and free method of reporting sewage spills. Through NYSDEC's implementation of the reporting requirement, all publicly owned treatment works (POTWs) should have already applied for access to NY-Alert. A new category of public works – publicly owned sewer system (POSS) – has been introduced and defined as a sewer system owned by a municipality and which discharges to a POTW owned by another municipality. POSSs will have 30 days after the regulations are finalized to register with NYSDEC to use NY-Alert, if they have not already done so.

In addition to the comments on types of reportable discharges, NYSDEC received comments from municipalities concerned about “how” and “what” to report. Existing guidance on the NYSDEC website, <http://www.dec.ny.gov/chemical/90323.html>, includes the Notifier Manual with step-by-step instructions on how to enter a discharge report into NY-Alert. The website also links to YouTube videos that demonstrate how to use NY-Alert to create a notification, and how the public can use NY-Alert to receive the notifications. NYSDEC will continue to develop guidance to help operators submit proper reports.

What Needs to Be Reported

The most common question received from operators has been: Which discharge should I report and to whom? The simplest answer: Use NY-Alert to report any sewage spill. The NY-Alert system will notify NYSDEC and NYSDOH and – if required – the public.

Discharges that need to be reported include: all sanitary sewer

overflows (SSO); combined sewer overflows (CSO); all dry weather combined sewer discharges; and discharges from overflow retention facilities (ORFs) or similar structures. In addition, any discharge of untreated sewage that has the potential to reach the waters of the state – both ground and surface water – needs to be reported. While a limited reporting exemption exists for discharges directly from a POTW that is in compliance with a plan or permit, NYSDEC notes that many of the plans or permits still stipulate reporting. It may be difficult to make a determination on compliance with a plan or permit while in the process of trying to control a discharge. A good rule of thumb to follow: If in doubt about whether reporting is required, report anyway.

Discharges from privately owned sewage systems and private laterals are not required to be reported under SPTRK.

The following information is required to be reported for all discharges: volume; treated state of the discharge; date and time; expected duration; location of discharge; reason for discharge; and description of steps taken to contain the discharge, except for wet weather CSOs. These fields are required in NY-Alert and need to be filled-out before an alert can be published. There are other required fields in the report that are needed to help NYSDOH make determinations about public health advisories.

Tips for Reporting

The NY-Alert wizard and NYSDEC NY-Alert Notifier Manual, located on the NYSDEC website, make reporting relatively easy. But there are always a few tricks and tips for better reporting.

- Make sure to use the proper button to create the notification form, either “New DEC Notification” or “New From DEC Template.” Other options will not send the notification to the correct recipients.
- Make sure the “Smart Dial” box is checked. This ensures recipients will be notified if they do not have text messaging or email.
- Use the map and satellite views, after clicking the “Map It” button, can get you very close to the exact location of the discharge. The law requires the location to be given with the maximum level of specificity possible. You can clarify the address using the “Selected Address of Discharge Description” field.
- The “Headline” needs to follow the pattern in our guidance materials. The basic required format for the headline is “County, City/Town/Village, Sewage Discharge, Waterbody Name, Impacted Areas.” This is necessary because the public may receive multiple types of alerts and needs to be aware that this alert is about a sewage discharge.
- Create links to your municipality's website in the “Additional Instructions” section to explain what you are doing about sewage discharges. Include as much information about the discharge as possible. The more detailed information that is provided in the discharge report, the less follow-up is needed for the press and concerned citizens. For example, provide information about your response and cleanup; details on the impact; or plans to end the discharge. It can often create a favorable impression by demonstrating the municipality's responsiveness and actions taken.
- The “Additional Instructions” section is also a good location to explain estimated or unknown characteristics of the event. The NYSDEC understands that volume is one of the most difficult



This CSO discharge to the Hudson River needs to be reported.

NYSDEC, Koon Tang

required elements to quantify. For example, in this section, describe how your best professional judgement was used to estimate the volume or duration of the discharge.

- Create templates for frequently discharging or fixed locations, such as SSOs, ORFs and CSOs. Templates allow notifiers to quickly submit NY-Alert reports. Using a template simplifies the number of required fields to update for each event, such as date or volume. To use a template, click the “New From DEC Template” button.
- Make sure to have more than one person with a NY-Alert notifier account in case that person is unavailable. Accounts are for individuals; sharing account information is not permitted.
- Wet weather CSO discharges do not require daily and termination reports. CSO communities can also create notifications by waterbody. If you are interested in creating CSO waterbody notifications, please contact the NYSDEC at 518-402-8177 or sprtkcomments@dec.ny.gov for assistance in using this function.

Training

Your first stop should be the NYSDEC website. We have videos and guidance on our website that provide information on how to report. In addition, NYSDEC is offering some hands-on training sessions; training information is posted on NYSDEC’s website. Also, NYWEA has invited the NYSDEC to present information about SPRTK and NY-Alert at chapter meetings. Check your local chapter to see when NYSDEC will be presenting near you.

Reports

Thank you to all the operators and facilities for reporting and keeping the public informed. Reports have been improving and increasing over time since operators and facilities started SPRTK reporting on May 1, 2013. Since that time, NYSDEC has received over 4,200 reports. Since the start-up of NY-Alert in January 2015, 127 individual facilities submitted over 1,500 reports. We thank you for all your effort!

For more information about SPRTK and updates on the regulations, please visit the NYSDEC website at <http://www.dec.ny.gov/>

chemical/90315.html and subscribe to DEC Delivers service, where you can sign up for e-newsletters *Making Waves* (Water Program Information) and *Sewage Pollution Right to Know Law*.

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 - stormwater and green infrastructure

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Success! New York's Efforts Critical to Passage of Federal Microbead Ban

by Lemuel M. Srolovic

In the Summer 2015 issue of *Clear Waters*, I wrote about how New York waters are being polluted with tiny plastic microbeads contained in some personal care products. One of the highlights in that article was the partnership between the Office of the New York Attorney General Eric Schneiderman and the New York Water Environment Association. The goal of this partnership was to shed light on the microbead pollution problem and strengthen the scientific basis for efforts to ban this emerging water pollutant. Now, just a year later, I am thrilled to report that a federal ban on microbeads in personal care products is the law of the land! This achievement is due largely to the collective efforts of New Yorkers who care passionately about clean water and a healthy environment.

The Problem and the Legislative Solution

Microbeads are tiny plastic beads produced for use as abrasives in body washes, scrubs, soaps, toothpaste, and other personal care products and cosmetics. Buoyant, multicolored and often spherical, these plastic microbeads are washed down bathroom sinks, pass through water resource recovery plants, and end up discharged into New York's waters. In our waters, microbeads persist for decades, acting as sponges for toxic chemical pollutants. Mistaken for food by aquatic organisms, microbeads serve as a pathway for pollutants to enter the food chain and contaminate the fish and wildlife we eat.

In late 2013, Attorney General Schneiderman learned of the issue of microbead pollution from ground-breaking research out of the State University of New York at Fredonia. The Attorney General acted quickly, and in February 2014 his office worked with legislative leaders in Albany to propose the first-in-the-nation ban on microbeads in personal care products, the Microbead-Free Waters Act. In May 2014, the Attorney General released a report detailing the dangers microbeads pose to New York's waters. The report, entitled *Unseen Threat: How Microbeads Harm New York Waters, Wildlife, Health and Environment*, provided background on the dangers of microbeads and highlighted the need to pass the Microbead-Free Waters Act. While the New York State Assembly unanimously passed the Attorney General's bill, unfortunately it did not pass in the State Senate.

The Microbead-Free Waters Act was re-introduced in the 2015 legislative session. In April 2015, the Attorney General's office partnered with NYWEA to illuminate the pathway between the use of personal care products and microbead pollution of New York waters. With the participation of 34 water resource recovery plant operators – all NYWEA members! – we conducted a study of microbeads in the effluent discharges of water resource recovery plants across the state. The resulting first-of-its-kind report, entitled *Discharging Microbeads to Our Waters: An Examination of Wastewater Treatment Plants in New York*, revealed the presence of microbeads in the discharges of 74 percent of the water resource recovery plants



New York State Office of the Attorney General

New York State Attorney General Eric Schneiderman worked with local, state and federal leaders to achieve a national ban on plastic microbeads in personal care products.

participating in the study. The report supported three conclusions: first, that most of New York's recovery plants are not designed to remove microbeads from the wastewater stream; second, that microbeads are being released into waters across the state; and third, stopping the use of these beads in personal care products is a more efficient and effective way to address microbead pollution than retrofitting most recovery plants across the state.

This new report, coupled with support from a broad coalition – including NYWEA, environmental and conservation advocates, the scientific community and the sport fishing community – propelled the bill forward, and it was passed again by the State Assembly. However, it stalled once more in the State Senate and the session ended with no state law enacted.

When at First You Don't Succeed

With an apparent microbead impasse in Albany, the Attorney General's office turned its attention to local and national efforts that would achieve the goal of protecting New York waters from microbead pollution. Attorney General Schneiderman's staff crisscrossed the state lending support to local leaders working to pass local bans in their jurisdictions, and at the national level the Attorney General joined U.S. Senator Kirsten Gillibrand to announce a new push to ban microbeads.

Starting in mid-2015 counties and cities across New York began adopting local bans. Erie County led the effort with a ban that would take place six months after enactment. Notably, four water resource recovery plants in Erie County participated in our 2015 study, and the local data generated there motivated local leaders to action. Largely modeled after Erie County's ban, Chautauqua, Suffolk, Cattaraugus, Tompkins and Albany Counties also passed

bans by the end of 2015, with at least five more municipalities considering bans, including New York City.

Simultaneously, outside of New York State, there was a push to ban microbeads. Nine states, including Illinois and California, passed microbead bans, but with differing scopes of coverage and implementation timelines.

The patchwork of regulations enacted nationwide, combined with the imminent deadlines approaching in many New York state counties, were critical factors in advancing national legislation. In December 2015, both the United States Senate and House of Representatives unanimously approved the Federal Microbead-Free Waters Act of 2015 championed by Senator Gillibrand. On December 28th, the bill was signed into law by President Obama. Under the national law, the manufacturing of personal care items containing plastic microbeads will be phased out starting July 1, 2017, and the sale of all such products will be prohibited by July 1, 2019.

New York's Efforts Were Key to Passage of the Federal Ban

While many individuals, organizations, and levels of governments across the nation contributed to the adoption of a national ban on plastic microbeads in personal care products, there is no

question that New York was a leader in the effort. The supporting science that was collected and presented, the coalition that was assembled, and the level of local and state legislative activity in New York focused on ending microbead pollution were unparalleled in their breadth as well as in their impact. New York has a long, rich history of leadership in defending clean water. Our collective contribution to achieving a national ban on microbeads in consumer products is yet another example of this proud legacy.

The Attorney General is proud to have played an important role in the ban of microbeads in personal care products, and we extend our great appreciation to all the water resource recovery plant operators who worked with us on the 2015 microbead report and to NYWEA for its support of legislation to ban microbeads in personal care products. This success would not have been possible without the work of all our partners on the local, state and federal levels to stop microbead pollution of New York waters and beyond.

Lemuel M. Srolovic is chief of Attorney General Eric T. Schneiderman's Environmental Protection Bureau. Both reports and the consumer alert cited in this article can be found on the OAG website at: www.ag.ny.gov. If you would like copies of the consumer alert for distribution, please contact Jennifer Nalbone at (716) 853-8417 or Jennifer.Nalbone@ag.ny.gov.



Consumers Must Remain Vigilant

While many stores across New York have already removed products containing microbeads from their shelves, many New Yorkers are likely to still encounter products containing microbeads until the federal ban comes into full effect in July 2019. The Attorney General issued a consumer alert, entitled *Microbeads, Mega-Problem: Keep Your Home Free of Plastic Microbeads* to educate consumers how to help curb the flow of microbeads into the environment by choosing microbead-free products when you are shopping. Here are three easy steps:

- 1. Check the ingredient list:** The most common type of plastic microbead will be listed as the ingredient "polyethylene." A few other types of plastic microbeads may be used including "polypropylene" or "nylon."
- 2. Check your product against a list of products containing microbeads:** The "Beat the Microbead" campaign has developed lists to check and see if your personal care products contain microbeads. Review the list at www.beatthemicrobead.org.
- 3. Download the "Beat the Microbead" App:** You can download an app to scan the barcode of any personal care product with your smartphone camera and check to see if it contains microbeads before purchase.



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Microplastics in the NY-NJ Harbor Estuary

by Sandra Meola

Our world's oceans are expected to contain 1 metric ton of plastic for every 3 metric tons of fish by 2025, and by 2050 more plastics than fish by weight (Ellen MacArthur Foundation, 2016). At an alarmingly quick pace, we are contaminating our waterways and critical global food source with plastics and contaminants. To reverse this startling prediction, environmental advocates have sounded the alarm, encouraging the public to avoid like the plague single-use, throwaway plastics and switch over to sustainable and renewable alternatives.

How did we become so reliant on plastic? After World War II, the plastic industry exploded, producing modern convenient throwaway products. Today, many of us are reliant on single-use products such as plastic bags, bottles, straws, utensils, and to-go boxes. These plastics, once used and discarded, can enter local waterways through littering, stormwater runoff, and improper waste management. Once in a local waterway, plastic never truly biodegrades. Rather, a plastic bag breaks down into tiny pieces, becoming microplastics (defined as plastics smaller than 5mm, about the size of a grain of rice and smaller). We have also used personal care products containing exfoliating plastic microbeads. These microbeads enter the wastewater stream to the water resource recovery plant that, unable to capture these tiny floating plastics, discharges them into the environment, illuminating one of the technical challenges for water resource recovery processes. Plastic also poses health risks to marine life as well as humans. Plastic can attract and adsorb contaminants already present in waterways. Plastic, itself, is a synthetic material derived from oil. Thus, when plankton, fish, or birds mistake microplastic for food, they also ingest contaminants adhered to the plastic. Microplastics and the associated contaminants can move up the food chain and potentially end up on our dinner plates.

The NY-NJ Harbor Estuary Plastics Study

NY/NJ Baykeeper, an environmental non-profit focused on water quality issues within the New York-New Jersey Harbor Estuary



A jarred sample of plastics was collected from Newark Bay prior to lab analysis.

Sandra Meola

(NY-NJ Harbor Estuary), set out to quantify the number of plastic pieces in the waters surrounding the most densely populated region in the country. A first-of-its kind study, NY/NJ Baykeeper provided a first look at the quantity, type, and distribution of plastic pollution within NY-NJ Harbor Estuary waters with a goal of educating the public and policymakers and encouraging behavioral changes.

Eighteen samples were collected in 18 locations in the NY-NJ Harbor Estuary using a 333-micron manta trawl net designed to collect floatable debris off the water's surface. For each sampling site, the net was dragged alongside the vessel for 30 minutes. Plastics present in samples were separated into three size classes (0.333-0.999 mm, 1.00-4.749mm, and >4.75mm) (Figure 1) and categorized by type. Type categories included: fragments (unidentified hard plastic); polystyrene foam (popularly known as Styrofoam or cigarette butt filters); line (fishing line or clothing fibers); pellets (nurdles or microbeads); and film (plastic bag or cling wrap). All plastics within each sample were then counted using a dissecting microscope.

The NY-NJ Harbor Estuary is one of the most urban estuaries on Earth, including the Ports of New York and New Jersey, ranging as far north as the Tappan Zee Bridge and as far south as Sandy Hook Bay, and encompassing an area of approximately 250 square miles (647.5 square kilometers). Nevertheless, research results were still alarming. According to NY/NJ Baykeeper's estimates, at least 165 million plastic pieces are floating within NY-NJ Harbor-Estuary waters at any given time. Approximately 85 percent of particles counted were microplastics (smaller than 5mm) and the average plastic quantity per square kilometer sampled in New York waters was approximately twice the average of New Jersey waters (556,484 and 391,634 per square kilometer, respectively). Thirty-

Nurdles: Very small pellets of plastic that serve as raw material in the manufacture of plastic products.

Source: *Oxford Dictionaries.com*



NY/NJ Baykeeper utilized a manta trawl net to gather the samples. The net is designed to float on the water's surface capturing floatable plastics.

Sandra Meola

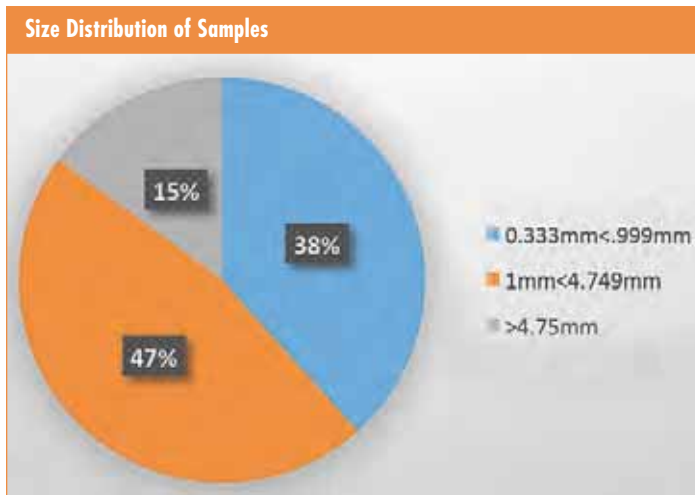


Figure 1

eight percent of plastics within the samples was polystyrene foam, likely from Styrofoam single-use products such as take-out boxes and coffee cups.

The Road Ahead

There is significant progress being made to prevent and reduce plastic trash from entering local waterways and making its way into oceans. In December of 2015, President Obama signed the Microbead-Free Waters Act into law, which will ban the sale and manufacturing of personal care products containing plastic microbeads by 2019. On May 5, 2016, the New York City Council passed a bag fee bill requiring merchants to collect 5 cents per

carry-out bag from consumers beginning October 1, 2016. State lawmakers in New Jersey have introduced a bottle bill, which would require a refundable deposit on beverage containers to ensure a higher rate of recycling and litter reduction.

Together, we can all make a difference to prevent and reduce plastic pollution, restore our waterways and associated habitat, and protect these resources for future generations to enjoy.

About NY/NJ Baykeeper

NY/NJ Baykeeper is the citizen guardian of the NY-NJ Harbor Estuary. Since 1989, we've worked to protect, preserve, and restore the environment of the most urban estuary on Earth – benefiting its natural and human communities. Through our estuary-wide programs we seek to end pollution, improve public access, conserve and restore public lands, restore aquatic habitats, encourage appropriate and discourage inappropriate development, carry out public education, and work with federal and state (New York and New Jersey) regulators and citizen groups as partners in planning for a sustainable future for the NY-NJ Harbor Estuary.

Sandra Meola is the Communications and Outreach Associate for NY/NJ Baykeeper. She can be reached at sandra@nynjbaykeeper.org.

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Standing Up for Microbead Free New York Waters

by Christian Shaw and Gordon Middleton

A 240-mile journey is finally complete. Though this may not seem like a long distance by car, think about doing it on a paddleboard. Then consider attempting it during November in upstate New York. This feat is what Christian Shaw and Gordon Middleton, co-founders of Plastic Tides, completed on November 19, 2015, after a polar vortex of winter weather halted their journey in 2014. They came back with a vengeance, and renewed determination to raise awareness about microbead pollution in the Finger Lakes, Great Lakes, and other waterways of their home state.

This journey started as a way to draw attention to the issue of plastic pollution, but more specifically microplastics and microbeads. Leading the science behind microbeads: Dr. Sherri “Sam” Mason from the State University of New York at Fredonia. With cooperation from the New York State Attorney General’s Office, Dr. Mason had published findings about microplastics in the Great Lakes and water resource recovery systems statewide. She found 75 percent of the pollution in the Great Lakes comes from microplastics – pieces you can’t see that come from the photodegradation of plastic bags, toothbrushes and other debris. Twenty percent of this total microplastic pollution is microbeads. These microbeads were found in the effluent from 75 percent of water resource recovery plants (n=44) sampled around New York state. Plastic Tides did their own sampling on the first go-round of their Erie Canal trip, found microbeads in Cayuga Lake, Oneida Lake, the Erie Canal and Mohawk River, and became the first group to find microbeads in inland waterways. Microbeads concentrate pollutants, get ingested by animals ranging in size from plankton and mussels to birds and fish, and eventually make it up the food chain to humans. They also leach chemicals known to be endocrine disruptors which are not remediated at the recovery plants. Middleton and Shaw hoped that their adventure would inspire and bring attention to a microbead ban that had been proposed to the New York State Legislature.



Photo: Gordon Middleton

Gordon Middleton (left) and Christian Shaw enjoy the last meal of their Erie Canal adventure.

In spring 2014 a pending bill in the New York State Legislature was passed overwhelmingly in the Assembly, but was shelved and refused to be voted on by the Senate. Even after the 2014 Plastic Tides expedition – which resulted in their film, *The Canal*, and a growing body of microbead research in New York state – history repeated itself in 2015 as the bill failed to make the Senate floor. This provoked Middleton and Shaw, in collaboration with their Plastic Tides Junior Ambassador summer program, to work fervently to pass the legislation – but this time through a more grassroots approach.

If the state wouldn’t hear their voice, maybe smaller local governments would – and they did. One by one, Erie, Cattaraugus, Chautauqua, Suffolk, Albany and finally their home county of Tompkins passed their own bans, the strongest legislation ever, on products containing plastic microbeads. The evidence found right here in New York state was too strong for honest local governments to ignore, especially after the issue was taken up by a group of middle and high school students who, after becoming Plastic Tides Junior Ambassadors, contacted the local legislature themselves. Then, just one month later, in a turn of events that could never have been predicted, President Obama signed the Microbead-Free Waters Act into law. The bill had been proposed for a number of years, but with the passing of the California ban and the grassroots movement in New York, the bill was finally taken seriously and passed through the House and the Senate by unanimous vote. It was a massive victory.

Common questions Shaw and Middleton get from talking about this issue are: Why don’t we just make smaller filters at the treatment plants? Why do we even care about this? Well, to that they respond that the filtration upgrade required at treatment plants would be extremely expensive; oftentimes when we try to use technology to mitigate systemic problems, it can create separate but equal problems in its own right. And while microbeads haven’t specifically been proven harmful to humans, why should the burden of proof for that be on the consumer? Shouldn’t it be the industry’s responsibility to prove that their products are safe for us to use?

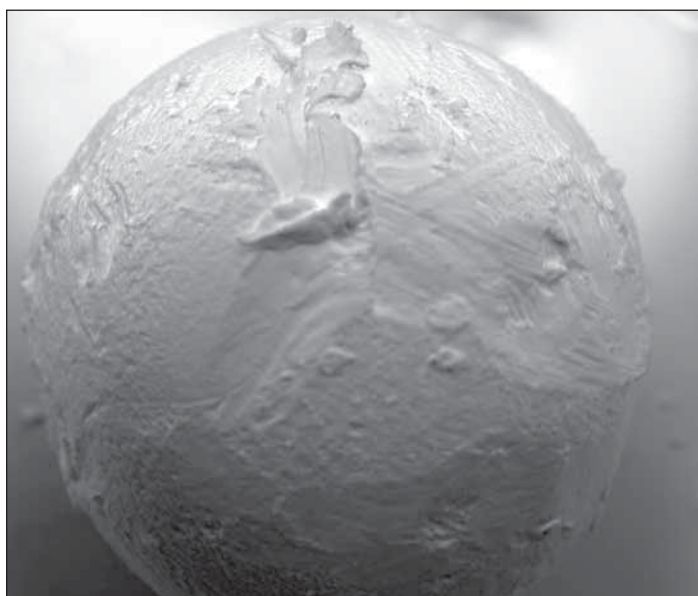


Photo: Gordon Middleton

An image of a plastic microbead is recorded through a scanning electron microscope during analysis supervised by Dr. Sherri Mason at State University of New York at Fredonia.



Photo: Gordon Middleton

Christian Shaw looks at the conditions at Lock 23 in Brewerton, NY, mid-November 2015.



Photo: Gordon Middleton

Christian Shaw looks west across the length of Oneida Lake during an 11 day paddle board trip to sample water from Ithaca to the Erie Canal for plastics.

If you are inspired by this article, then follow Shaw and Middleton on their journeys on social media, @plasticides on Instagram, www.facebook.com/plasticides and at their website www.plasticides.org. Coming up on Plastic Tides' radar is a campaign to avoid single-use plastic cutlery in school cafeterias, and its annual Stand Up Paddleboard (SUP) race around Bermuda, the Devil's Isle Challenge, situated smack in the middle of the North Atlantic Gyre. The events surrounding this 50-mile paddleboard race are intended to help raise awareness of plastics pollution in the oceans.

Remember, Don't Ride the Plastic Tide.

Christian Shaw (lead author and contact for questions) is the Science and Education Director, and Co-founder of Plastic Tides. He can be reached at Christian@plasticides.org. Gordon Middleton is the Creative Director and Co-founder of Plastic Tides. He can be reached at Gordon@plasticides.org.



Photo: Gordon Middleton

Christian Shaw holds up a water sample.



Photo: Christian Shaw

Gordon Middleton records images on the Erie Canal near Utica, NY.



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Non-Flushable Wipes Wreaking Havoc for Utilities: What's the Solution?

by Cynthia A. Finley

For the last decade, wipes have been wreaking havoc on sewer and water resource recovery systems in the U.S. and all over the world. Although toilet paper alone was sufficient for many years, clever marketing of disposable wipe products has created a demand for another level of personal care. The use of all types of wipes has increased steadily in recent years, and while wipes manufacturers profit from these sales, utilities and their ratepayers bear the burdens of flushed wipes.

The National Association of Clean Water Agencies (NACWA) became involved with the wipes issue in 2009, after several utilities reported problems with wipes and asked the Association if it was doing anything about the issue. NACWA and the Water Environment Federation (WEF) formed a joint workgroup to study the issue. Representatives from the American Public Works Association (APWA) joined the workgroup later, and now these associations also cooperate with the Canadian Water & Wastewater Association (CWWA), the Water Services Association of Australia (WSAA), and other international utilities and organizations.

There is no single solution to the wipes problem. Rather, it's a puzzle with many pieces – including increased public awareness, and improved standards for flushability and product labeling – that combined will work together to reduce the impact of wipes on sewer systems and water resource recovery utilities.

Media Attention

Utilities began noticing problems caused by wipes during the timeframe of 2006 through 2010. Some local media picked up on the story and featured it in newspaper and TV news spots. The media attention exploded in July 2013, when a *USA Today* article featured the issue (Marohn, 2013). Additional local newspapers, TV stations, and radio shows picked up the story, and attention increased even more with the publication of an Associated Press article on wipes (Associated Press, 2013).

The issue received additional national attention in 2014, when *The Dr. Oz Show* featured a segment on flushable wipes (*The Dr. Oz Show*, 2014). Dr. Oz, who had previously recommended the use of flushable wipes, visited the New York City Department of Environmental Protection's Newtown Wastewater Treatment Plant. He saw firsthand how even though wipes may disappear down the toilet, most of them are not breaking down before reaching the treatment facility. Dr. Oz declared, "After seeing all these wipes, I'm officially switching back to toilet paper!"

Additional articles in the *New York Times* (Flegenheimer, 2015), the *Washington Post* (Ehrenfreund, 2013), *Real Simple* magazine (Pirie, 2016), and other publications have helped keep the focus on this issue. The press coverage is always beneficial because it shows the problems caused by wipes and educates consumers that wipes should not be flushed, even if they are labeled flushable. A comprehensive list of news articles is available at the Maine Water Environment Association's Resource Guide on-line (<http://www.mewea.org/wipes-in-the-news/>).

Are Flushable Wipes the Problem?

The wipes industry has taken the position that the flushable

wipes are not causing the problems in the sewer systems (Rousse, 2016). In a sense, this is correct: baby wipes and paper towels are found in greater numbers in sewer systems than flushable wipes. However, utilities know from long experience that paper towels on their own do not cause frequent and significant issues with pumps and other equipment. Utilities did not experience this recent magnitude of clogging problems until flushable wipes became popular. Many wipes that call themselves "flushable" are still found intact in sewer systems.

Marketing some wipes as "flushable" has created confusion about what should and should not be flushed. A consumer who sees some wipes labeled and advertised as flushable can easily assume that all wipes are flushable, especially in the absence of a clear "do not flush" message for non-flushable wipes. We must solve both problems – non-flushable wipes that are flushed anyway and flushable wipes that do not break down – to improve the situation for utilities.

Improving the Performance of Flushable Wipes

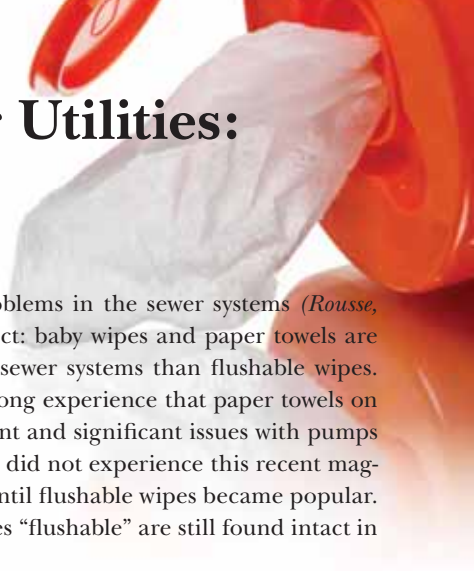
Just because a wipe is labeled "flushable" doesn't mean that it is actually safe to flush from the utilities' perspectives. Unfortunately, there are no laws or regulations that govern the use of the term "flushable." The term can be used on packaging by wipe companies without the requirement for the wipes to meet any particular standard.

INDA (Association of the Nonwoven Fabrics Industry in North America), along with EDANA (INDA's European counterpart), have published a series of voluntary flushability guidelines that contain a series of tests that a wipe must pass to be considered flushable. Unfortunately, none of these guidelines were developed with input of water resource utility professionals. The most recent version (INDA 2013), the third edition (GD3) was published in June 2013, despite the NACWA stating that the criteria were inadequate.

INDA began working in earnest with the water resource recovery associations' joint workgroup after the publication of GD3. After a series of facilitated discussions, INDA agreed to work with the joint workgroup on a fourth edition of the flushability guidelines (GD4). GD4 is scheduled to be completed in September 2016 – if a consensus can be reached among the associations.

The goal of the water resource recovery associations is to develop GD4 criteria which define flushable wipes as those which break apart quickly and have no impact on wastewater systems. This is technically feasible, since two products that are not yet on the market in the U.S. (Aralar and Haso) have performed extremely well in laboratory and field tests. Frank Dick, P.E., Sewer and Wastewater Engineering Supervisor for the City of Vancouver Public Works, Washington, has conducted tests of wipes and toilet paper in one of the City's sewer lines (Frank Dick, personal communication). After soaking for 30 minutes and then traveling 45 to 60 minutes through the sewer line, the wipes produced by Aralar (labeled "3") and Haso (labeled "4") had broken down, with only their duct tape markers remaining (Photograph 1). Other flushable wipes that are currently sold in the U.S. appeared intact after traveling the same route (Photographs 2 and 3). In pump tests, these wipes accumulated

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in the pump, while wipes produced by Haso and Aralar did not. The results of these first tests have not been published as of this writing, and a second set of tests is planned. Once these results are obtained, NACWA plans to produce a report that will, at minimum, be posted on its website.

In addition to the ongoing GD4 work, an ISO technical specification for flushability is also being developed. International wipes manufacturers and water resource recovery professionals are seeking consensus on flushability, and this effort is expected to be completed within the next year.

Improved Labeling

Over half of the people who buy baby wipes do not have babies in their homes. They are using these wipes for other purposes,

including personal hygiene, general cleaning, and adult incontinence care. When baby wipes are used for babies, they are typically wrapped up in a diaper and thrown in the trash. However, if they are used for toddlers or adults for toileting purposes, they are likely to be flushed; there is a definite “yuck factor” that makes people not want to put these used wipes in the trash can!

The water resource recovery associations believe that the best way to initiate consumer education on non-flushables is clear “do not flush” labeling on each package of wipes, where the consumer will see it both when purchasing the wipes and when using the wipe. INDA has developed an effective “do not flush” logo, which studies have shown is readily understood by almost all consumers. Costco was an early adopter of this type of clear labeling using the “do not flush” logo (*Photograph 4*).



Photo credit: Frank Dick

Photograph 1. Samples of wipes, labeled numerically, after passing through the sewer system. Labels “3” and “4” represent the products Aralar and Haso, respectively.

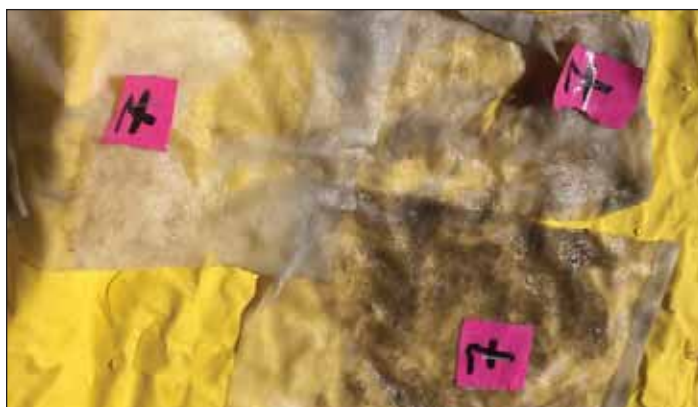


Photo credit: Frank Dick

Photograph 2. Samples of wipe after passing through the sewer system. Label “7” represents the product Kandoo Flushable Wipes.



Photo credit: Frank Dick

Photograph 3. Sample of wipe after passing through the sewer system. Label “8” represents the product Nice-Pak EcoFlush Technology wipes.



Photo credit: Nathan Gardner-Andrews

Photograph 4. Example of a “do not flush” logo printed on a package of wipes.



Photo credit: Cynthia Finley

Photograph 5. Package of non-flushable wipes with the “do not flush” logo hidden under a fold in the packaging.

The water resource recovery associations’ joint workgroup is currently working with INDA on an updated labeling Code of Practice (COP) for non-flushable wipes. The current voluntary COP is inadequate, allowing the “do not flush” logo to be placed on the back of the package and otherwise used in ways that are not clearly noticeable to consumers. Sometimes the logo even appears under the flap seal on the back of the package, as shown in *Photograph 5*.

The work on the improved COP is scheduled to be completed by September 2016 – again, if consensus can be reached among the associations.

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Turning Voluntary into Mandatory

Like the flushability guidelines, the labeling COP is voluntary for wipes manufacturers and retailers. Unfortunately, compliance with both has been severely lacking. The Federal Trade Commission (FTC) investigated the flushability issue and finalized an agreement in 2015 with Nice-Pak, Inc. (manufacturer of wipes for retailers including CVS, Target, and Costco) requiring it to stop advertising its wipes as flushable unless it can substantiate the claim.

The order (FTC, 2015) only applies to one particular type of wipe – which is no longer manufactured – but the order provided a clear statement about the meaning of “flushable”: there must be “competent and reliable scientific evidence” to substantiate the flushability claim, including demonstration that the product “disperses in a sufficiently short amount of time after flushing to avoid clogging, or other operational problems... and substantially replicate the physical condition of the environment [is claimed] expressly or by implication to be properly disposed of ...” This language matches the goals of the water resource recovery associations for flushability criteria.

Since the FTC can only take action against existing products that are likely already causing significant problems for water resource recovery utilities, additional action is needed to prevent these problems in the first place. State and local legislation may be the best way to accomplish this. When plastic microbeads from personal care products received significant media attention after being found in the nation’s waters, states and counties began banning microbeads. The ban quickly went to the federal level, with the *Microbead-Free Waters Act of 2015 (H.R. 1321)* easily passing both the House and Senate.

On May 19, the Minnesota Senate passed a bill by a vote of 49-9 that specified both flushability criteria for wipes labeled “flushable” and labeling requirements for non-flushable wipes. The bill was not voted on by the Minnesota House, but may be considered again during the next session. The Minnesota bill demonstrates that the time may be right for pursuing state and local legislation, particularly after the water resource recovery associations sign on to appropriate flushability and labeling standards.

Increasing Public Awareness

Even with mandatory requirements for flushability and labeling, consumer behavior must still be addressed to reduce the problems for water resource recovery utilities. The public must understand what can and cannot be flushed, and it will take time and significant outreach to raise awareness and change habits. NACWA began its *Toilets Are Not Trashcans* campaign in 2013 to focus on products and materials that should not be flushed and drained, including wipes, feminine hygiene products, pharmaceuticals, FOG (fats, oils, and greases), and product additives such as triclosan and plastic microbeads. NACWA introduced its *Toilets Are Not Trashcans* logo last year (Photograph 6).



Photograph 6. NACWA logo for Toilets Are Not Trashcans campaign.

Credit: NACWA

This logo is available free of charge to any entity that would like to use it for public education purposes. Utilities are using it on their websites, on flyers, in email signatures, and in public demonstrations. NACWA has produced a removable sticker with the logo which can be placed on toilets and other surfaces. NACWA also plans to produce templates for other educational items, such as bill stuffers and flyers, that will be available for utilities to customize. For more information, please see www.nacwa.org/toilets.

Cynthia Finley, Ph.D., is the Director for Regulatory Affairs with the National Association of Clean Water Agencies. She may be reached at CFinley@nacwa.org.

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Making the Connection between Litter “Drops” and Rain “Drops” Carrying Litter into Water Systems

by Madison Quinn

Onondaga Lake water quality is the best that it has been in 100 years, and the ecosystem is experiencing an amazing recovery. The fishery is thriving and bald eagles have returned to Onondaga Lake. Recreational opportunities, including fishing and boating, are abundant and water quality is now meeting swimmable standards every day of the year in the northern two thirds of the lake (*Upstate Freshwater Institute 2015*). With these improvements, individual behavior really does make an impact on the overall water quality. The next step is engaging the community to get involved in preventing and cleaning up litter before it reaches Onondaga Lake and its tributaries.

Introducing the “Connect the Drops” Campaign

Onondaga County, New York, has recently launched Connect the Drops, a new component of the education and outreach campaign under the award-winning Save the Rain Program, to specifically focus on reducing litter in local waterways. Under the leadership of County Executive Joanie Mahoney, the Save the Rain Program has become a national model for stormwater management and mitigation of combined sewer overflows (CSOs) using both green and gray infrastructure solutions. As a result of these and other efforts, Onondaga Lake water quality has seen vast improvements and has once again become an asset for our community.

The Save the Rain Program’s Connect the Drops campaign will focus on more sustainable methods of protecting water quality by preventing street litter at the source and increasing public awareness and participation. Considerable environmental degradation can occur when litter is allowed to enter combined sewer systems through storm drains, in part because the litter clogs pipes. This results in sewer backups and other damage to water resource recovery collection and treatment systems. During significant wet weather events this debris can also be discharged from combined sewer overflows or storm sewers into local water bodies.



The Connect the Drops campaign is built on the success of the education and outreach efforts under the Save the Rain Program. The branding was developed so that it can stand alone or be used in combination with existing Save the Rain branding elements. *Onondaga County, www.savetherain.us/drops*

Quantifying the Litter Problem

Wet weather can wash litter and debris – classified as “floatables” by the US Environmental Protection Agency – into the sewer system and water bodies, including Onondaga Lake and its tributaries, reducing water quality. In 2012, Onondaga County staff, assisted by consultants from ARCADIS, conducted a limited floatables assessment to obtain data for the County’s long term floatables abatement plan (*ARCADIS 2013*). A floatables sample net was constructed

and deployed at 18 CSOs to define the floatable characteristics, including types and composition of debris and potential origin.

Composition results obtained from sampling the individual CSOs indicated that the vast majority of material sampled was natural debris (such as sticks, leaves, and branches) ranging from 52 percent to 98 percent. This finding is consistent with the high percentage of natural materials captured at both the Harbor Brook Floatables Control Facility (FCF) (88 percent) and Inner Harbor skimming boat (92 percent). Including the other debris – assumed to be derived from street litter, such as paper, plastics and foam – the total percent of street-derived material ranged from 68 percent to 100 percent, with an average composition of 87 percent from the individual CSOs. This percentage is slightly lower than the observations at the downstream Harbor Brook FCF (98 percent) and Inner Harbor skimming boat (99 percent). The remaining debris – health and hygiene products such as sanitary napkins and condoms, in addition to textiles such as sanitary or household wipes – were presumed to originate through the sanitary sewer system.

The Dual Approach

Onondaga County is taking a dual approach to reducing litter in waterways, by first controlling the source of the litter through enhanced catch basin management; and second by engaging the community through Connect the Drops, a robust education and outreach campaign.

Reducing street litter and debris from entering our waterways is necessarily a community effort in which we can all play a role. Onondaga County is already undertaking efforts to capture litter and remove it from sewer systems and bodies of water. These measures include in-stream net bag facilities, increasing hoods and filter inserts on catch basins, and operating a skimmer boat in the Syracuse Inner Harbor.

Community engagement is also an essential part of the solution. The Connect the Drops campaign is putting out a call to action that we can all be a part of properly disposing of trash to keep our water clean and free of litter. The educational component of the program strives to make the mental connection across our community that the “drops” – dropping litter on the ground – connect with the “drops” of rain – drops which can carry litter into catch basins, the sewer system, and our local waterways.

The Connect the Drops campaign is building on the success of the Save the Rain Program’s very diverse education and outreach efforts that include traditional, digital and social media, as well as public presentations and community engagement events. The Save the Rain website is a key component of our education outreach for Connect the Drops. The landing page is the main location on the web for information on all related activities and messaging, www.savetherain.us/drops. The social media and digital advertising will drive traffic toward this page, which will deliver the calls to action for community residents and businesses to participate and become part of the solution. Save the Rain followers on Facebook (www.facebook.com/savetherainus) and twitter (@SaveTheRainUS) interact with our Connect the Drops content, both through organic reach and paid advertisements on social media. The branding elements from

Connect the Drops are designed to complement the Save the Rain branding.

Collaborative Efforts and Outreach Activities through Connect the Drops

Onondaga County is collaborating with a variety of organizations and community groups as partners with Connect the Drops, as well as with the other aspects of education and outreach under the Save the Rain Program. There are many stakeholders in the public, private and nonprofit sectors of the Central New York community that share a common interest in reducing litter and continuing to improve the water quality in Onondaga Lake and its watershed.

For Earth Day in April 2016, Onondaga County Department of Water Environment Protection (OCDWEP) partnered with the local authority for solid waste management, Onondaga County Resource Recovery Agency (OCRRA). OCDWEP and OCRRA worked together to cross promote, through digital and social media, OCRRA's annual Earth Day cleanup efforts with the messaging of Connect the Drops. Onondaga County also put together a team of volunteers to participate in the cleanup and work directly on litter reduction within the Onondaga Lake watershed. Additional litter cleanups beyond Earth Day, as well as litter prevention, will remain a call to action across this community throughout the Connect the Drops campaign.

Onondaga County is also partnering with the Downtown Committee of Syracuse, a private, nonprofit management organization representing all property owners and tenants within the central business district of Downtown Syracuse. Some of these efforts will be focused particularly on downtown street level signage and trash can wraps with Connect the Drops infographics to attract attention of pedestrians. Heavily trafficked pedestrian corridors are being targeted for the initial launch of the trash can wraps. Additional areas may be added in the future. We are also exploring sidewalk art and messaging that can grab the attention of passersby.

Long time Save the Rain team member Onondaga Earth Corps will continue to be partners under the Connect the Drops campaign. Onondaga Earth Corps was developed in the conservation corps model to employ and train local youth and young adults from the City of Syracuse to work on implementing and maintaining green infrastructure and other "green" jobs. These experiences provide opportunities for youth and young adults to work directly on improving the environmental quality within their city.

The "Clean Streets Crew" of Onondaga Earth Corps will be talking to their neighbors, friends, and local businesses about litter reduction and cleanup along select corridors with heavy pedestrian traffic and high litter concentrations. The crew will conduct door-to-door outreach, engaging businesses and residents in litter prevention and asking for them to take a pledge to help reduce litter and to clean up litter in front of their property. Onondaga Earth Corps has been awarded grant funding from the Central New York Community Foundation toward this effort, and will receive support from the County in the form of in-kind staff time and various Connect the Drops educational materials to assist with this outreach during the summer months of 2016.

The Connect the Drops campaign is very relevant to the US Environmental Protection Agency (USEPA) Trash-Free Waters initiative, and Onondaga County has been a partner in the working group assembled by USEPA to discuss Trash-Free Waters endeavors in the states of both New York and New Jersey. At the time of this writing, Onondaga County is seeking additional funding through



Onondaga County, www.savetherain.us/drops

"Connect the Drops" includes a very active social media presence. This image appears on the Onondaga County Save the Rain Facebook page (<https://www.facebook.com/savetherainus/>) with the message: "Miss the trash can by an inch, and you could really be missing by miles" and urging Facebook users to properly toss their trash.

the New York/New Jersey Aquatic Trash Prevention Grant Program, a USEPA-funded Request for Proposals administered through the New England Interstate Water Pollution Control Commission (NEIWPCC).

Save the Rain will also have a presence at various festivals, events, and gatherings within the community to help spread Connect the Drops messaging. The culminating event will be the annual Save the Rain Clean Water Fair on September 10. This is the largest annual event hosted by Save the Rain and will feature displays both on the green and gray stormwater infrastructure implemented to date, as well as new displays and activities specifically relating to Connect the Drops.

The issue of litter reduction and prevention of litter entering bodies of water is not only a local or regional issue – it is impacting communities throughout the world. Onondaga County continues to serve as a model for other municipalities that are implementing water quality improvement measures and related public outreach campaigns. We will strive to further build on that record with the broad implementation of Connect the Drops. The County is hopeful that with additional partnerships and funding opportunities, this will become a transferable campaign that other communities can utilize to help make the connection between responsible litter disposal and improved water quality. We can all make a difference – every drop counts.

Madison Quinn is the Project Coordinator for the Save the Rain Program at the Onondaga County Department of Water Environment Protection. She can be reached at madisonquinn@ongov.net.

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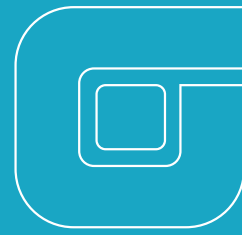


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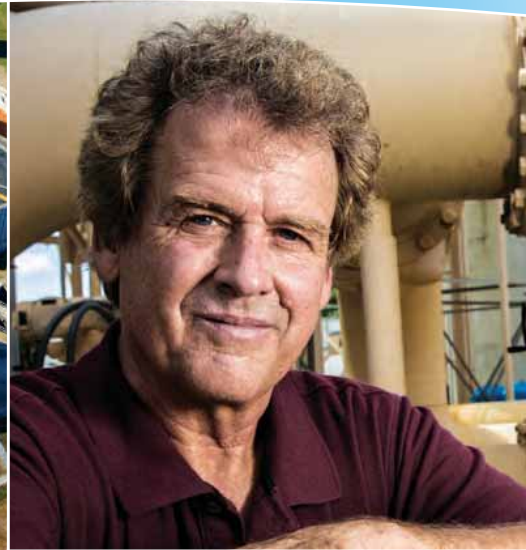
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Aquatic Connectivity Happenings – Great News in the Wynants Kill!

by Andrew Meyer

A couple of exciting things are coming together for the connectivity of our Hudson River Estuary streams. Many people are collaborating to make sure these are just the first of many re-connection projects. Here are some quick updates and places to get more information.

River Herring Retake the Wynants Kill!

In the City of Troy, the first barrier to fish migration was removed on the Wynants Kill in early May. In less than five days, alewives – a species of river herring – had retaken the tributary as spawning habitat for the first time in 85 years! Partnering with Riverkeeper and the NYSDEC Hudson River Estuary Program, the City of Troy received a Tributary Restoration Grant from the Estuary Program to remove the barrier, reconnecting over a quarter mile of spawning habitat for river herring, and improving habitat for many other species as well, including the American eel. See the end of this article for links to Riverkeeper’s press release with video and the WAMC radio story.

Reconnection Projects Underway

We released two Tributary Restoration Grants last year (*see end of article for links*), and are just starting to see the benefits of the great work being undertaken by our partners. In addition to the City of Troy project mentioned, another dam removal project at Shapp Pond in Dutchess County and five culvert replacements (Village of New Paltz, Town of Ancram, the Klyne Esopus Kill, and the Town of Kingston) are starting up. These projects will remove potential flooding hazards, help communities address problem infrastructure, and reconnect habitat for fish and other aquatic and riparian organisms.

Funding Opportunities Announced

The Climate Smart Communities Grant Program was announced recently. Of the many potential project categories, the construction of natural resiliency measures could encompass dam removal and culvert upgrade projects that result in flood-risk reduction and resiliency for future climate conditions. Learn more at the Climate

continued on page 41



In May, river herring spawned in the Wynants Kill for the first time in 85 years after a dam was removed that had disconnected the stream from the Hudson River.

Photo credit: NYSDEC/Erica Capuana

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Smart Communities Grant Program website (*see end of article for link*).

Field Work Ongoing

Several teams are out in the field evaluating and prioritizing problem culverts in the Hudson River Estuary watershed. NYSDEC, Vassar College, Pace University, the SCA Excelsior Corps, Office of Parks, Recreation and Historic Preservation (OPRHP), and the Soil and Water Conservation Districts of Dutchess, Greene, Columbia and Rockland Counties are collecting information this spring and summer on the passability and capacity of culverts in the watershed, including assessment of 15 new subwatersheds. Check our Water Resources Institute Aquatic Connectivity and Barrier Removal webmap for more information (*see end of article for link*).

Economic Benefits of Stream Barrier Removal

The Massachusetts Division of Ecological Restoration released a report entitled “Economic & Community Benefits of Stream Barrier Removal Projects in Massachusetts”. The report shows that at the three dam and three culvert locations investigated using 30-year cost comparisons, on average it was 60 percent cheaper to remove the dams instead of repairing and maintaining them. Likewise, it was 38 percent cheaper to upgrade culverts instead of replacing them in kind. Check out the report on-line (*see end of article for link*) to learn more about the conditions at each location and the economic benefits accrued by the communities.

World Fish Migration Day

May 21st was the 2016 World Fish Migration Day. If you missed

out on engaging with eels or helping some herring this year, check out the great videos on the website (*see end of article for link*) and stay tuned for next year’s events.

Andrew Meyer is a Conservation Specialist with the Hudson River Estuary Program/NYS Water Resources Institute at Cornell University, New York State Department of Environmental Conservation. He may be reached at andrew.meyer@dec.ny.gov.

Website Links

Riverkeeper’s press release with video “Herring return to Wynants Kill after 85 years”: <http://www.riverkeeper.org/news-events/news/preserve-river-ecology/herring-return-wynants-kill-85-years/>

WAMC radio broadcast “Troy Dam Removed to Protect Native Fish”, by Lucas Willard, June 2, 2016: <http://wamc.org/post/troy-dam-removed-protect-native-fish>

Tributary Restoration Grant links: (<https://content.govdelivery.com/accounts/NYSDEC/bulletins/132b9cc>) and (<https://content.govdelivery.com/accounts/NYSDEC/bulletins/118d84d>)

Climate Smart Communities Grant Program link: <http://www.dec.ny.gov/energy/76910.html>

Water Resources Institute Aquatic Connectivity and Barrier Removal webmap: (<https://wri.cals.cornell.edu/hudson-river-estuary/watershed-management/aquatic-connectivity-and-barrier-removal-culvert-dams>)

“Economic & Community Benefits of Stream Barrier Removal Projects in Massachusetts” report link: (<http://www.mass.gov/eea/docs/dfg/der/pdf/phase-iii-benefits-from-stream-barrier-removal-projects.pdf>)

2016 World Fish Migration Day: (<http://worldfishmigrationday.com/>)



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“Flushing Awesome” and Other Creative Campaigns to Educate the Public about Trash in the Water

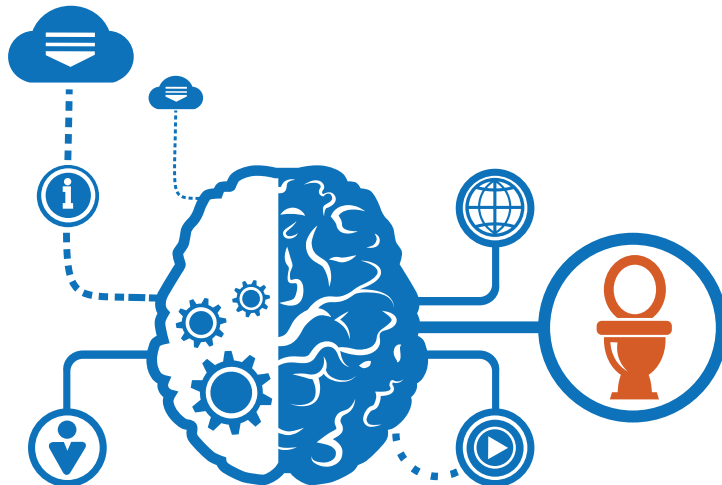
by Kerry Thurston

Municipalities and concerned citizens are finding different and unique ways to get the word out about trash in the water. In this issue of *Clear Waters*, for example, the group Plastic Tides has taken to their paddle boards to draw attention to the issue of microbeads in the waters of New York State. The mission of this organization combines adventure and science to address plastic pollution in our waters via stand up paddle board expeditions (@plasticides on Instagram, <https://www.facebook.com/PlasticTides/>, and their website www.plasticides.org). Other creative efforts to address trash in the water are also underway:

- *Edible Six-Pack Rings* from the Saltwater Brewery in Delray Beach, Florida. These edible rings, made from the waste by-products of the beer brewing process, are designed to replace the plastic six-pack rings which cause damage to wildlife (<http://www.saltwaterbrewery.com/community-swb/>).
- *The Seabin Project*, a prototype in-water automated marina rubbish collector invented by Australians Andrew Turton and Pete Ceglinski, has found investor funding on-line through Indiegogo (<http://www.seabinproject.com/>).
- *The Ocean Cleanup*, a project envisioned by 22-year old Dutch entrepreneur, Boyan Slat. The goal of this ambitious project is to design, test and implement a network of long floating barriers that passively gather plastics from the ocean currents. Once concentrated at a central point by these barriers, the plastics can be collected for recycling (<http://www.theoceancleanup.com/technology.html>).

The Water Environment Federation’s *Highlights* (WEF Highlights) has been showcasing flushables outreach efforts on-line (<http://news.wef.org/tag/flushablepsa/>), noting that utilities are turning to humor and lighthearted messages to educate the public. Some of the municipal efforts highlighted include:

- In King County, Washington, the county’s Wastewater Treatment Division (WTD) launched a “**Flushing Awesome**” campaign to control non-dispersibles in the sewer system by educating their rate-payers about the problems caused by the flushing of non-flushable wastes. As reported in the Water Environment Federation’s *Highlights* (April 27, 2016), the King County campaign features two cartoon musical videos, one of which is a take-off from *A Chorus Line* aptly titled “One to Flush”. Contributing author Jeff Gunderson quotes King County WTD communications specialist Annie Kolb-Nelson: “There is a certain uncomfortableness with discussing bathroom-related topics and these types of products, which can make it challenging to approach. Humor allows us to break the ice and make it easier to talk about. It can be a great tool to get people to pay attention.” More information about this campaign – including the “One to Flush” video – is available at the WEF *Highlights* web page on-line (<http://news.wef.org/flushing-awesome/>), as well as the King County website (<http://www.kingcounty.gov/services/environment/wastewater/education/protect-environment/flush-trouble.aspx>).



- In Orange County, California, the Orange County Sanitation District in Fountain Valley launched its “**What 2 Flush**” website. As reported by Jeff Gunderson on WEF *Highlights* (May 18, 2016), the website features the headline, “The toilet is only meant to flush the three P’s —pee, poop, and (toilet) paper.” In addition to educational videos, the Orange County Sanitation District promotes clothing, hats and other items (“swag”) sporting the “What 2 Flush” logo.
- In Maine, a joint project between the Maine Water Environment Association, the Portland Water District, and the Association of the Nonwoven Fabrics Industry resulted in two educational videos of a mock game show called “What the Flush?!?”, as part of their “**Save Your Pipes Don’t Flush Baby Wipes**” campaign. These public service announcements were designed to educate constituents about what should and should not be flushed down the toilet. (WEF *Highlights* March 30, 2015; <http://news.wef.org/save-your-pipes-dont-flush-baby-wipes/>).
- And from across the pond, the Singing Sewermen of London, England were also featured in WEF *Highlights* (November 25, 2015; <http://news.wef.org/flushables-outreach-the-singing-sewermen/>). Lyrics from their rendition of “The Twelve Days of Christmas” – revised as the “Twelve Blockages of Christmas” – are aimed at stopping sewer utility customers from dumping turkey grease and fat down the drain during the holiday season, causing troublesome “fatbergs” in the sewer system. Thames Water, self-described as the largest water and wastewater services provider in the United Kingdom, showcases their “Bin It Don’t Block It” campaign on their website (<http://binit.thameswater.co.uk/>), which is also a good place to see what they mean by “fatbergs”!

If you like these public outreach activities, you’re sure to enjoy the upcoming Fall issue of *Clear Waters* that will focus on the variety of Public Outreach activities taking place at water resource recovery utilities across New York. Stay tuned!

Kerry Thurston is the Editor of *Clear Waters* magazine, and owner of InFocus Environmental Consulting. She may be reached at clearwaters@nywea.org.


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Onondaga Lake Continues Its Path Towards Recovery

by Aimee Clinkhammer

Onondaga Lake has a rich and diverse history. It is known as the birthplace of democracy, where the Haudenosaunee Confederacy was formed. It was once touted as a popular tourist and recreation destination, and then as a site of heavy industrial activity. The industrial pollution, coupled with rising population, led to increases in industrial and sewage discharge that left long-lasting impacts on Onondaga Lake and the surrounding land.

As a result, by 1940 swimming was banned due to high bacteria levels and turbidity resulting from combined sewer overflows, municipal wastewater and stormwater runoff. In 1970, due to the high levels of contaminants and low oxygen levels, fishing was banned. In an excerpt taken from the New York State Department of Health (NYSDOH) report in 1946: “The southern end of the lake near the Syracuse sewage plant outfall was generally turbid and some suspended solids could be seen. When the surface of the lake was very calm, rising gas could be seen in nearly all areas.... Areas in which a distinct oil film containing soot, small white flecks, rubber goods, grease balls, and debris were found generally and the location depended on wind conditions.”

The declining conditions in and around Onondaga Lake led to two lawsuits that marked renewed effort to address the water quality in the Onondaga Lake watershed. In 1988, Atlantic States Legal Foundation and New York State filed a lawsuit against Onondaga County for violating the Clean Water Act. In 2012, the parties reached an agreement to capture 95 percent combined sewer overflow (CSO) volume by 2018. In 1989, New York State filed a lawsuit against Allied-Signal (now Honeywell) to clean up the industrial contaminants that it and its predecessor companies had discharged into and around Onondaga Lake. In 2007, the federal court approved a Consent Decree obligating Honeywell to clean up the industrial waste.

Today, remediation and restoration projects continue and Onondaga Lake is the cleanest it has been in over one hundred years. The lake’s ongoing recovery is once again making it a popular recreational destination and an asset to the community. Improvements in Onondaga County’s municipal water resource recovery facilities, in addition to its robust green infrastructure program, “Save the Rain”, have led to decreases in nutrient concentrations, algal growth and bacteria levels in the lake and tributaries. Furthermore, Honeywell’s work remediating the industrial contamination through dredging, capping and habitat enhancements have resulted in improved water quality. The over \$1 billion in federal, state, local and private investments, as well as the strong partnerships between stakeholders, have been key in this vast and complex clean up.

Onondaga Lake Bottom Remediation

A major milestone in the remediation of the Onondaga Lake bottom was accomplished in November of 2014 when Honeywell announced dredging was completed over a year ahead of schedule. About 2.2 million cubic yards of contaminated sediment was removed from the lake bottom. Additionally, more than 450 acres of the lake bottom are currently being capped and this task is scheduled to be completed by the end of 2016. This multifaceted remedy will inhibit contaminants such as mercury, chlorinated ben-

zenes, naphthalene, PCBs and various metals from contaminating the lake.

The addition of diluted calcium nitrate solution in the deep water areas, or hypolimnion, of the lake began in 2012 and is ongoing. Upstate Freshwater Institute, working in collaboration with Honeywell and the New York State Department of Environmental Conservation (NYSDEC), is adding the nitrate solution to inhibit the production of methylmercury. Monitoring results indicate that methylmercury concentrations in Onondaga Lake have declined significantly (*Figure 1*), leading to lower concentrations in zooplankton and some fish species. Fish consumption advisories are still in place for fish from Onondaga Lake; however, further reductions in mercury in fish tissue are anticipated as water quality continues to improve and sources of mercury from in and around the lake are eliminated.

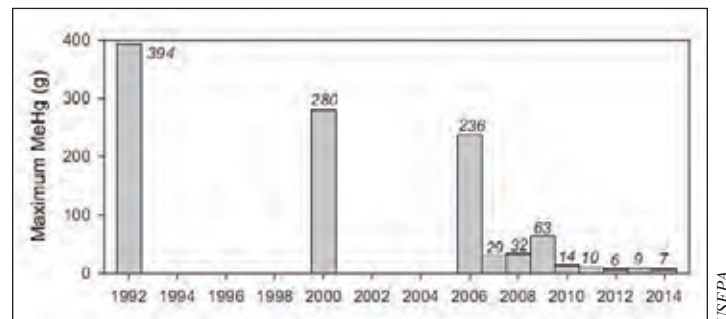


Figure 1. Annual maximum mass (in grams) of methylmercury (meHg) in the hypolimnion (10 to 19-meter water depth) of Onondaga Lake from 1992-2014

Onondaga Lake Watershed Remediation

Additional remediation and restoration activities continue along the shoreline and tributaries of Onondaga Lake, including the restoration of approximately 87 acres of wetlands. To date more than 400,000 native plants, trees and shrubs have been planted; shoreline restoration is on schedule to be completed by the end of 2017. There are several sites around Onondaga Lake that have been identified as contaminated. These sites have been remediated, have ongoing remediation activities, or are currently under investigation. Examples of some of the progress on these sites include:

- Completed in 2014: The removal of contaminated soils and sediments from the **Nine Mile Creek** channel and the construction of forested wetlands and the enhancement of stream conditions for fish spawning and migration.
- Completed in 2013: The remediation of **Geddes Brook**, which involved the restoration of approximately 17 acres and the removal of contaminated soils and sediments. To date, more than 65 varieties of fish, birds – including the pied-billed grebe, blue heron and bald eagle – and other wildlife have returned to the re-established wetlands.
- Ongoing: The mudboils located in the Tully Valley contribute approximately 20 tons of sediment to **Onondaga Creek** per day. This excess sediment degrades water quality and habitat for aquatic species from the Tully Valley, through the Onondaga Nation territory, the City of Syracuse, and eventually impacting Onondaga Lake. NYSDEC, with funding from US Environmental Protection Agency (USEPA), is currently convening an expert

panel to look at strategies to address the impacts from the mud-boils with the end goal of returning Onondaga Creek to a viable fish habitat.

- Ongoing: A pilot test is currently underway for the cleanup and removal of contaminated material at the **Semet residue ponds**. The 2002 remedy also called for a lakeshore barrier wall/groundwater collection system, which was completed in 2007, to prevent any contaminated groundwater from entering the lake.
- Ongoing: Remediation and restoration activities are ongoing along the shoreline of the **Wastebeds 1-8** and include shoreline stabilization and wetland restoration. This task is scheduled to be completed in 2016. Additionally, just over 3 miles of a groundwater collection system has been installed on the western shoreline to collect contaminated groundwater to keep it from entering the lake.

Wastewater and Stormwater Advancements

Wastewater and stormwater improvements are also contributing to a cleaner lake and watershed. In 1998, there were 72 active CSOs discharging into three major tributaries to the lake: Onondaga Creek, Harbor Brook, and Ley Creek. To date, 26 CSOs have been closed and 21 have been abated as a result of the County's gray and green infrastructure projects. Additionally, Onondaga County's "Save the Rain" program reduced stormwater runoff by over 120 million gallons in 2015. Since 2009, over 180 green infrastructure projects have been completed. Onondaga County has been recognized by the USEPA as a model green infrastructure community, and other municipalities across the nation are replicating their efforts.

Additionally, Onondaga County completed major upgrades to the Metropolitan Syracuse Wastewater Treatment Plant ("Metro"), which reduced the discharge of ammonia by 98 percent and of phosphorus by 80 percent (**Figures 2 and 3**). Currently, Onondaga Lake is meeting New York State water quality standards for ammonia, and phosphorus has been at or near the Total Maximum Daily Load (TMDL) standard for the past several years. As a member of the Central New York Stormwater Coalition, Onondaga County has also been working with Municipal Separate Storm Sewer System (MS4) communities to reduce phosphorus loading to Onondaga Lake throughout the watershed.

Following significant storm events, high bacteria levels continue to occur along the southern portion of the lake and in tributaries due to combined sewer overflows and other sources. However, according to recent data, overall bacteria concentrations in the southern end of the lake dropped to the lowest levels on record. Furthermore, the northern two-thirds of Onondaga Lake is consistently meeting NYS Department of Health swimming standards (**Figure 4**). Onondaga County recently commissioned a feasibility study to examine the technical aspects and public interest in opening a swimming beach at Willow Bay.

Recreational Opportunities

There has always been significant public interest in increasing and preserving public access to and around Onondaga Lake. The Onondaga Creekwalk, completed in 2011, is a 2.6-mile pedestrian and bike path connecting Syracuse's Armory Square to the Inner Harbor. The City of Syracuse will soon start construction on a "Lake Lounge" at the end of the Creekwalk at the lake, and is working on plans to extend the path south along the creek through the city for over two additional miles.

Onondaga County completed an extension of the West Shore Trail at Onondaga Lake Park in May of 2014 and completed

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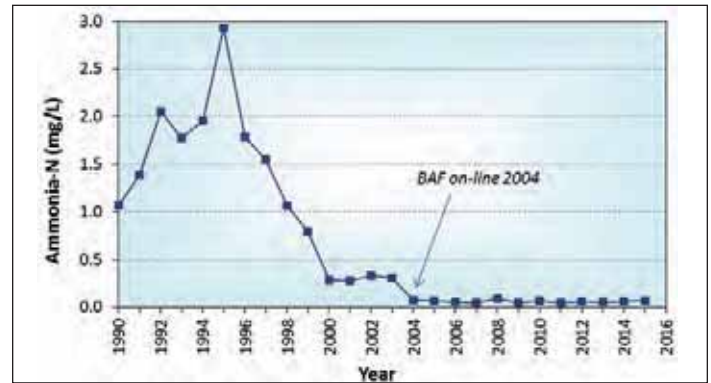


Figure 2. Summer average annually for ammonia-N concentrations in the upper waters (0-3 meters) of Onondaga Lake, 1990-2015

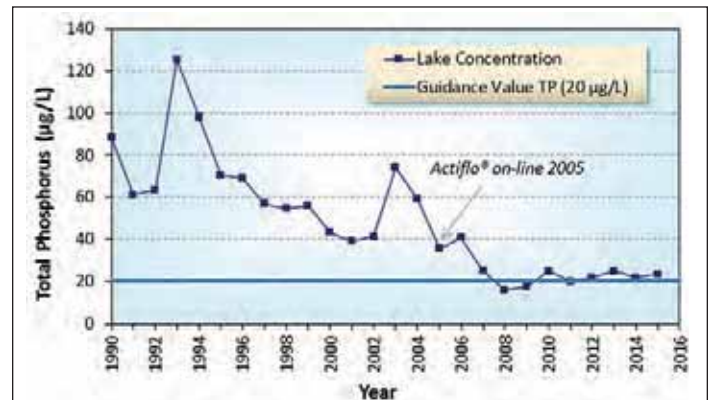


Figure 3. Summer (June to September) average phosphorus (TP) concentrations in the upper waters (0-3 meters) of Onondaga Lake, 1990-2015

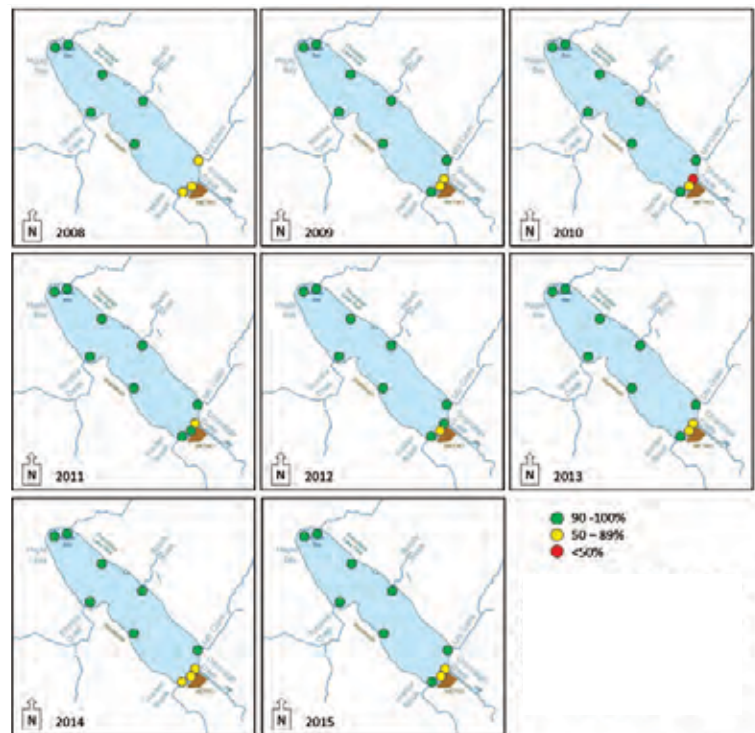


Figure 4. The percentage of months in compliance with the water quality standard for fecal coliform bacteria for nearshore stations in Onondaga Lake, April-October: (a) 2008, (b) 2009, (c) 2010, (d) 2011, (e) 2012, (f) 2013, (g) 2014 and (h) 2015. Note: Compliance is calculated for each location by comparing the monthly geometric mean of a minimum of five samples with the NYS AWQS (200 cfu/100 mL).

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construction of the Lakeview Amphitheater in August of 2015. Onondaga Lake Park, with more than one million visitors annually, has 7.5 miles of paved trail surrounding approximately three-fourths of Onondaga Lake. This summer, Onondaga County will install a seasonal dock and a trail connection to the west shore trail and amphitheater as well as a kayak launch on the Seneca River. The County also has plans to continue the trail south along the shoreline and connect to the Creekwalk in 2017. This extension will complete the trail along the west shore of the Lake and plans for completing an entire loop of Onondaga Lake are currently being discussed.

NYSDEC recently announced plans to construct a public boat launch in 2017. The site will include ADA-compliant accessible shoreline fishing access, a trailer boat launch, kayak launch, and parking for cars and vehicles with trailers. The visitor center will be operated at the site on the west shore of Onondaga Lake near the State Fairgrounds and maintained through a partnership between NYSDEC and Onondaga County.

What's Next?

The Trustees of Onondaga Lake are currently conducting a Natural Resource Damage Assessment (NRDA) which is the first step to eventually restore, replace or acquire the equivalent of natural resources and resource services injured by hazardous materials released into the environment to baseline conditions. Restoration



Onondaga County Save the Rain

Ground-level view of Water Street green infrastructure in the City of Syracuse

projects are currently being discussed, and the public will be able to both provide their input on potential projects and comment on a proposed plan when it is completed.

The combined investments and efforts of many stakeholders – in addition to the unique partnerships between federal, state and local entities, private corporations, residents and lake users – have been a major driver of the significant progress in the cleanup and restoration of Onondaga Lake and its watershed. There is renewed interest now in Onondaga Lake as a valued natural resource. Water quality data indicates that the lake is continuing to recover from its troubled past. Over 60 species of fish have been documented in the lake and this summer a fishing derby and regatta will be hosted on Onondaga Lake.

While the industrial and combined sewer overflow remediation is on track to be completed within the next few years, the lake is still far from being as clean as it was historically. The responsible parties will be monitoring water quality and providing maintenance for years to come. Various stakeholders have different visions for the future of Onondaga Lake, and while some of these visions will be achieved when the remediation is complete, others will take additional work to be realized. The ongoing revitalization efforts of the Onondaga Lake Watershed are remarkable but we can always do more to protect our environment and further restore Onondaga Lake.

Aimee Clinkhammer is the Onondaga Lake Watershed Coordinator with the New England Interstate Water Pollution Control Commission, working out of the NYSDEC Region 7 office. She may be reached at Aimee.clinkhammer@dec.ny.gov.

Additional Resources

- Onondaga Lake Watershed Partnership, <http://www.olwp.org/>
- Onondaga County Save the Rain Program, <http://savetherain.us/>
- Honeywell Onondaga Lake Cleanup, <http://www.lakecleanup.com/>
- NYSDEC Region 7 Environmental Remediation Project information, <http://www.dec.ny.gov/chemical/37558.html>
- USEPA Superfund Program, Onondaga Lake, <https://cumulis.epa.gov/superfund/cursites/csitinfo.cfm?id=0203382>



Honeywell

Forested wetlands north of the mouth of Nine Mile Creek



NYSDEC

Proposed boat launch on west shore of Onondaga Lake

On and Off

The Alternate Cycling Process Can Be a Cost-effective Way to Reach Nutrient Removal Goals

by *Mónica de Gracia, Randall Marx and Rafael García*

One of the current concerns in the field of wastewater treatment is how to meet new effluent nitrogen limits in a cost-effective manner. The application of oxic and anoxic cycles in a wastewater treatment bioreactor is one effective way.

An on/off strategy applied to aeration makes it possible to maintain nitrification and denitrification in a single aeration reactor. Reducing the time of oxygenation to include anoxic periods, and the possible need to increase solids to provide a longer retention time for autotrophic bacteria, lead to high oxygen-transfer rates in the reactor.

Using high-purity oxygen (HPO) enables an oxygen transfer rate increase of up to five times greater than the air-based systems' maximum. And using mechanical oxygen injection avoids the reduction of the alpha factor when higher solids concentrations must be maintained in the process, thus maintaining the highest efficiency. With HPO, the biological process becomes a compact and powerful solution for high-strength industrial wastewater treatment.

This strategy of operating with alternating cycles (AC) was tested at a full-scale industrial facility. The AC process has been optimized to obtain the required effluent limits at minimal operation costs. An online sensor for $\text{NH}_4\text{-N}$ and $\text{NO}_3\text{-N}$ has been installed at the full-scale facility to monitor performance. Model-based simulation tools were used to design the required cyclic pattern and evaluate an automatic control loop that has also been applied in the real facility and successfully validated.

Truck-cleaning Facility Description

The full-scale water resource recovery facility (WRRF), which treats wastewater resulting from truck cleaning, consists of a membrane bioreactor (MBR) aerated with HPO. Oxygenation is carried out using a mechanically agitated contacting system called the In-Situ Oxygenation (I-SO™ aerator) developed by Praxair, Inc. (Danbury, CT). The plant treats 50 to 100 m³/d of flow intermittently in a 500-m³ volume reactor. Tubular ceramic membranes with 300 kD of membrane pore size are used for solids separation (see Figure 1). An equalization tank stores the effluent and feeds the MBR for about 10 hours on working days. Considering both the heterogeneous origins of the wastewater and the discontinuous feeding pattern, the biological model has a highly variable inflow.

The wastewater characteristics depend on the number of trucks to be cleaned and the goods they transport. The facility will use an oxic/anoxic cycling strategy at intervals of 160 minutes on, 45 minutes off. Only the $\text{NH}_4\text{-N}$ content of the effluent was tracked.

A remote monitoring tool, AqScan, recorded and displayed all the online measurements generated by the multiple probes (measuring dissolved oxygen [DO], pH, redox, $\text{NH}_4\text{-N}$, $\text{NO}_3\text{-N}$, temperature, and flow) and actuators. In addition, AqScan automatically estimates the oxygen uptake rate (OUR), oxygen transfer coefficient (KLa), and oxygen transfer efficiency.

A mathematical biological model-based simulator was developed using the WEST® modeling platform. The biological model is a

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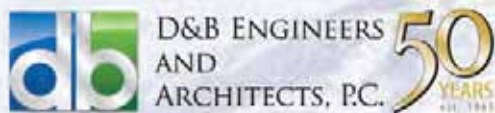


Figure 1. The biological reactor with the mechanical HPO injection aerator tank (left), equalization tank (center) and the membrane system (right)

Photos courtesy of Mónica de Gracia

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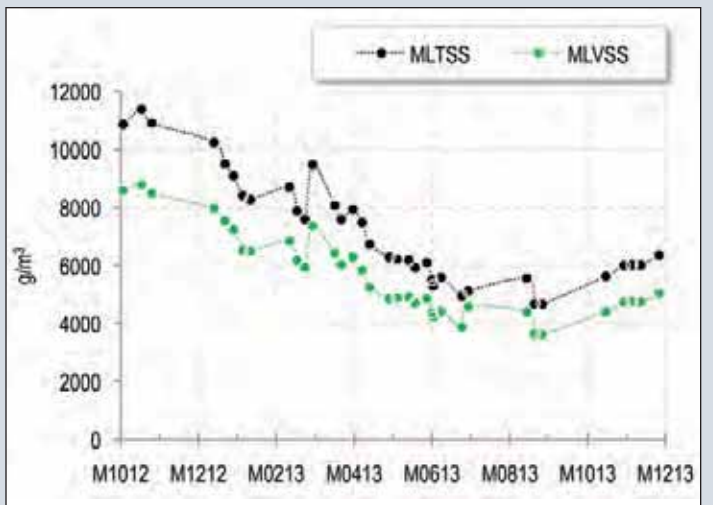
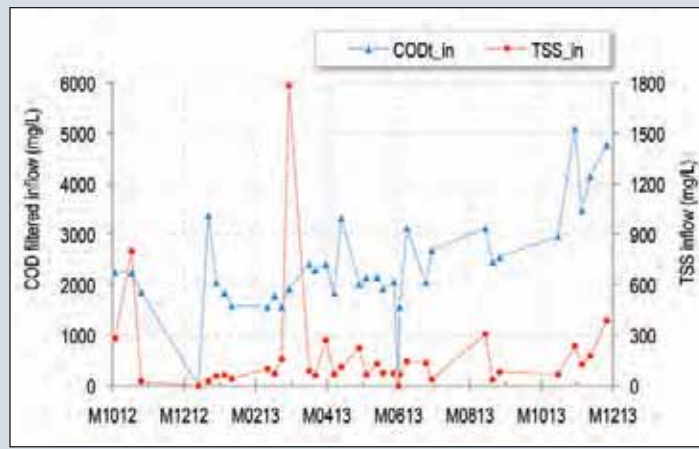


Figure 2. Influent characteristics and reactor solids states

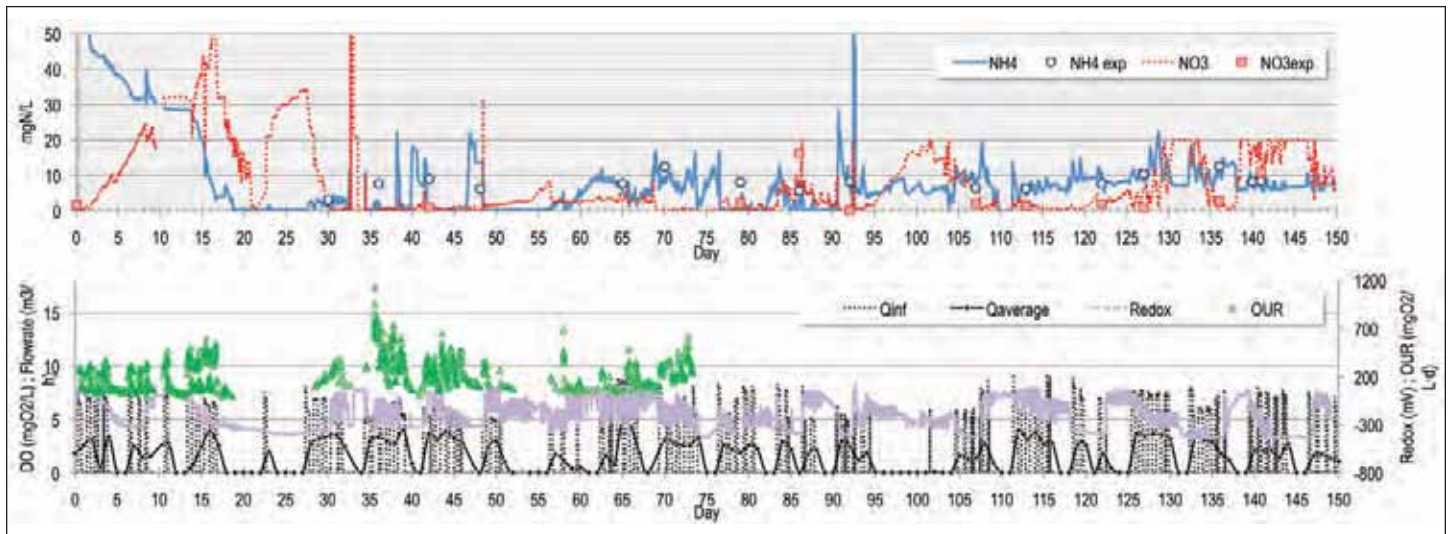


Figure 3. Online measurements compared to lab measurements and OUR estimates

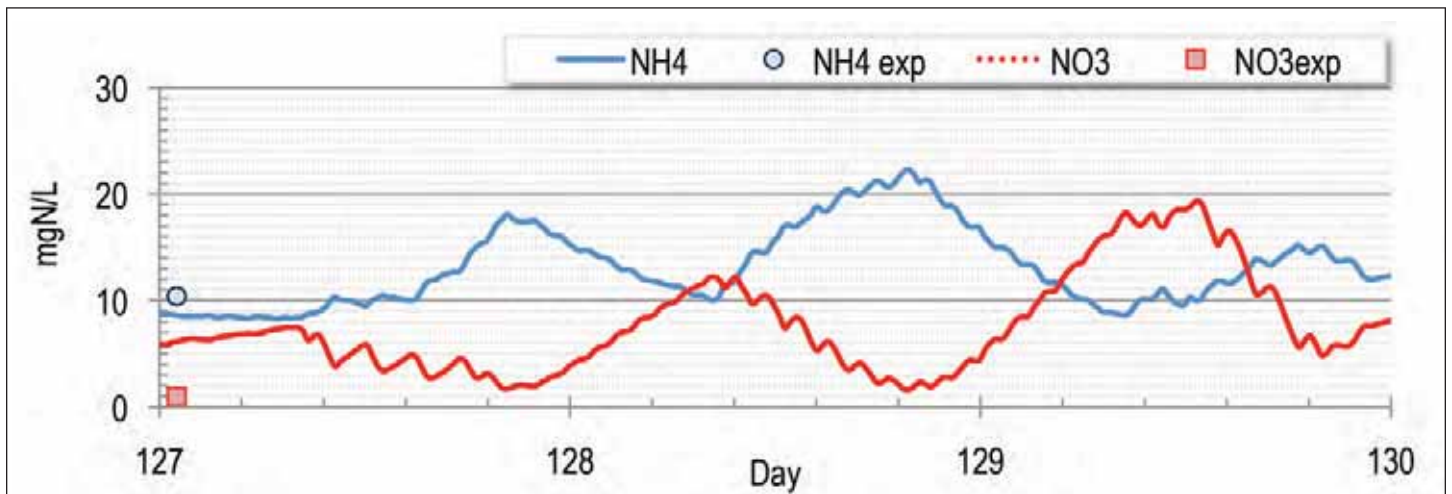


Figure 4. Nitrogen after 3 days of intermittent oxygenation

modified ASM1 model extended to include inorganic particulate compounds and temperature variation prediction, which is crucial for industrial compact treatment solutions. The model would help aid design enhancements to the existing basic DO control scheme to incorporate other process variables such as $\text{NH}_4\text{-N}$ and $\text{NO}_3\text{-N}$ concentrations and the inflow rate.

Promising Results

Figure 2 shows the influent characteristics and the reactor's mixed liquor total and volatile suspended solids measured during the study. The results suggested reducing mixed liquor total suspended solids in the bioreactor to around 6000 mg/L.

The first 2 months were dedicated to trial runs at the plant to observe the immediate response of the process to a variation in crit-

Table. Summary of the Results at the Full-scale Facility

Period	Days	Goal	Oxic/Anoxic Cycle (min)	Results
1	0-15	Reduce NH ₄ -N	120/60	Goal reached, but NO ₃ -N increased
2	15-35	Reduce NH ₄ -N and NO ₃ -N	90/60	Both NH ₄ -N and NO ₃ -N removed efficiently
3	35-60	Trials	Variable	Different observations prior to control strategy application
4	60-70	Reduce oxic periods	60/60	No clear conclusions due to inflow variability. To be analyzed in pilot plant.
5	70-125	Improve efficiency, apply first automatic control loop	Feeding	Good performance in terms of effluent quality and oxygen consumption
6	125-150	Improve NH ₄ -N oxidation	Increase oxic cycles for no feeding periods	No improvement in NH ₄ -N

ical process parameters. By the third month, the automatic control strategy designed was applied and was maintained until the end.

The effect of the cyclic operating strategy was clear. Online OUR estimations indicated that OUR is maintained at 120–140 g/m³•d throughout both the oxic and anoxic phases. The oxygen demand in the anoxic phase is ostensibly met by denitrification of nitrates.

Figure 3 shows the system's response during the study period.

Figure 4 shows this effect in detail (during three days of operation).

The *Table* summarizes the different operational strategies applied to the full-scale plant.

The HPO-MBR process was retrofitted for nitrogen removal using the oxic/anoxic cycles in the same compact reactor, providing more efficient nitrogen removal and energy savings.

The final strategy (validated at the full-scale plant) is as follows:

1. If the inflow rate is higher than 0: 120 minutes anoxic, 60 minutes oxic,
2. If the inflow rate is 0 (no feeding): 60 minutes anoxic, 90 minutes oxic,
3. If the inflow rate changes from 0 to another value: Switch directly to anoxic operation,
4. If the inflow rate changes from a value to 0: Switch directly to oxic operation.

This study demonstrated that the AC process requires only min-

imal, if any, additional capital or infrastructural upgrades, making it a cost-effective solution to reach nutrient removal goals. The development of robust, calibrated biological process model and the development of control strategies for optimizing the AC process will enable more robust and cost-effective implementation of the treatment process at this facility.

Mónica de Gracia is a process engineer at the Hernani, Spain, office of Praxair Inc. (Danbury, CT). Randall Marx is a development specialist and Rafael García is a global market development manager at the Burr Ridge, Ill., office of Praxair.

The information provided in this article is designed to be educational. It is not intended to provide any type of professional advice including without limitation legal, accounting, or engineering. Your use of the information provided here is voluntary and should be based on your own evaluation and analysis of its accuracy, appropriateness for your use, and any potential risks of using the information. The Water Environment Federation (WEF), author and the publisher of this article assume no liability of any kind with respect to the accuracy or completeness of the contents and specifically disclaim any implied warranties of merchantability or fitness of use for a particular purpose. Any references included are provided for informational purposes only and do not constitute endorsement of any sources.



Call for Papers: 89th Annual Meeting February 6–8, 2017

Here's an opportunity! NYWEA's largest technical conference and exhibition is held in NYC at the Marriott Marquis. This meeting attracts over 1,400 environmental professionals. We invite you to submit an abstract for one of the 20 technical sessions. This meeting also makes available space for 185 exhibits. Presenting a paper at this meeting gives you the opportunity to share your knowledge and be recognized in the field.

Deadline for abstracts is August 15, 2016.

Selenium Removal Using a Moving Bed Biofilm Reactor

by Caroline Dale and Barry Liner

Selenium is a naturally occurring and essential nutrient for humans, animals, and some plants; however, selenium also can cause adverse health and reproductive effects when consumed in excess. In nature, selenium is found primarily in organic-rich sedimentary rocks (e.g., petroleum source rock, coal, phosphorites, and carbonaceous shales) and sulfidic ores. Because of its natural occurrence in geologic materials used as industrial feedstocks, selenium often is present in wastewater due to oil and gas extraction, petroleum refining, coal-fired electric power generation, metals mining and processing, and production of phosphate fertilizers. It also is found in wastewater and sludge at wastewater treatment plants. Selenium also may be present in irrigation water and stormwater runoff from agricultural operations located in areas with seleniferous soils.

In mining and coal-fired power plant effluents, selenium is mainly found in the form of selenate (*Se [VI]*) and selenite, (*Se [IV]*). Both compounds are toxic to aquatic life; hence, discharge limitations for selenium are becoming increasingly stringent. The U.S. Environmental Protection Agency (EPA) requires selenium concentrations in discharges from coal-fired power stations to be below 12 ppb on a monthly average and 23 ppb as daily maximum. The discharge consent for release into freshwater systems at certain sites is 5 ppb.

Treating Selenium

Selenium treatment technologies can be applied either at the source (upstream) or at the end of the pipe (downstream), or both. The species of selenium can change as wastewater moves through different chemical, physical, and biological processes within the facility's treatment plant or process units. The applicable treatment technology required will depend on the species of selenium in the wastewater and discharge requirements.

Selenate and selenite can be reduced biologically to the elemental form of selenium, which makes it virtually insoluble. Particulate elemental selenium can then be separated from the wastewater by traditional liquid–solid separation methods. Biological treatment methods include constructed wetlands and fixed-film bioreactors – using granulated activated carbon as support material for biofilm growth, either as a packed bed or as a fluidized bed – and moving bed biofilm reactors (MBBRs) utilizing a plastic support for biological growth.

Other methods include precipitation with iron salts, ion exchange, zero valent iron, and reverse osmosis.

Although technologies are capable of removing selenium from industrial wastewater, the ability to consistently and reliably remove selenium remains a challenge. Treatment of selenium using these core technologies will require primary, tertiary, and residuals treat-

ment. The effectiveness of selenium treatment is highly dependent on species, concentration, and mass of selenium in wastewater and other water matrix parameters. Therefore, a detailed wastewater characterization including selenium speciation and mass balance would be important to properly evaluate treatment options. An example of this evaluation based on utilizing an MBBR process on both power plant and mining effluent is provided below.

MBBR Technology

An MBBR is a biological method to remove selenium that can operate with the same support material for over 20 years, while granulated activated carbon in other biological methods may need to be replaced regularly. The MBBR does not require back-washing; it can tolerate high suspended solids concentrations in the feed and is not subject to clogging. MBBRs also are generally energy-efficient, and individual reactors can be made significantly larger than other bioreactors.

The MBBR process has been used extensively for carbon and nitrogen removal. The process utilizes media made of polyethylene, which has a shape that provides a large protected surface area for biofilm development. Two examples of MBBR media are shown in *Figure 1*. K1 is the original media with a protected surface area for biofilm growth of 500 m²/m³ at 100 percent filling (bulk volume/volume). K5 is a later development that provides 800 m²/m³ at 100 percent filling. Fillings up to 60 percent to 65 percent can be used. Under anoxic conditions, the media are kept in suspension using mechanical mixers.

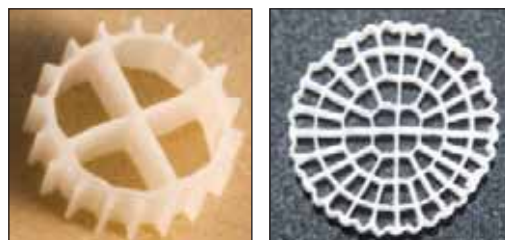


Figure 1. Examples of MBBR media: K1 (left) and K5 (right)
Credit: Veolia Solutions and Technologies

Performance Evaluation

Studies were performed on laboratory MBBR models that were continuously fed with industrial wastewater from two sources: flue gas desulfurization (FGD) from a power plant and a coal mine. Carbon sources and nutrients were added in small separate feed streams. Effluent samples were collected and treated in batches with either filtration through 0.2- μ m membrane filters or with coagulation and flocculation using ferric chloride and polymer.

The characteristics of the wastewaters treated are summarized in the *Table*.

Table. Influent Characteristics of the Tested Wastewaters

Parameter	FGD Effluent	Coal Mine Effluent	Copper Mine Effluent
Selenate (ppb)	237	–	469
Selenite (ppb)	<5	–	9.5
Total Selenium (ppb)	249	38	560
NO ₃ -N (ppm)	90	23	1.5
NO ₂ -N (ppm)	0.7	0.02	0.015
Sulphate (ppm)	2000	420	240
COD (ppm)	105	<10	<10
PO ₄ -P (ppm)	0.11	0.03	0.03
NH ₄ -N (ppm)	3.3	<0.015	<0.015

FGD Effluent

Treatment of the FGD effluent containing approximately 250 ppb selenate and 90 ppm NO₃-N was studied in a two-stage MBBR with K1 media. Glucose was added as carbon source and the process was operated at 30°C.

The results (Figure 2) show that it was possible to achieve 10–20 ppb of total selenium after chemical treatment. The total selenium concentrations after chemical treatment were consistently lower than that of the filtered samples, which demonstrates that chemical treatment was more efficient than filtration through a 0.2-µm filter for separation of selenium from the effluent.

NO₃-N and NO₂-N were depleted in the first MBBR, while most of the selenium removal took place in the second reactor.

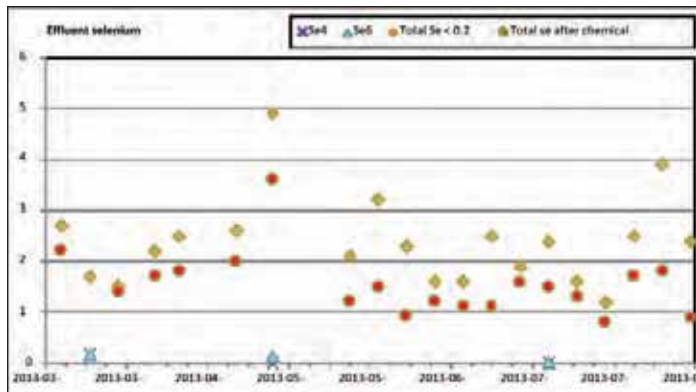


Figure 2. Effluent concentrations of selenium when treating FGD wastewater

Coal Mine Effluent

Treatment of coal mine effluent containing approximately 38 ppb total selenium and 23 ppm NO₃-N was studied in another two-stage MBBR using K5 media and Micro C as a carbon source. The process temperature was decreased gradually from 22°C to 6°C during the study, and the total hydraulic retention time was decreased from 30 to 4.5 hours.

The results (Figure 3) show that it was possible to consistently achieve concentrations of less than 5 ppb total selenium after chemical treatment and frequently below the detection limit of 3 ppb. The concentration of NO₃-N + NO₂-N was reduced to 0.4 to 1.2 ppm after the first reactor and then further reduced to around 0.2 ppm after the second (Figure 4). Between 50 percent and 85 percent of the selenium reduction also occurred in the first reactor, with the second reactor acting mainly as a polishing step for both nitrate and selenium.

A Viable Treatment Option

The results show that MBBR can be a viable solution for biological selenium removal as well as nitrate removal from FGD and mine

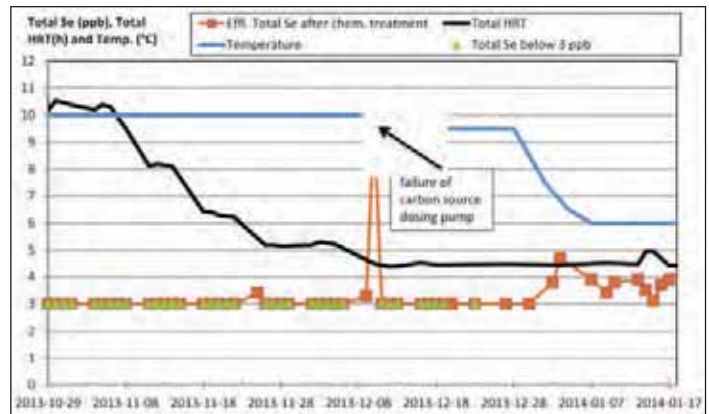


Figure 3. Total HRT, process temperature, and effluent concentrations of total selenium in coal mine effluent (green triangles represent samples that were below the detection limit, 3 ppb, for total selenium)

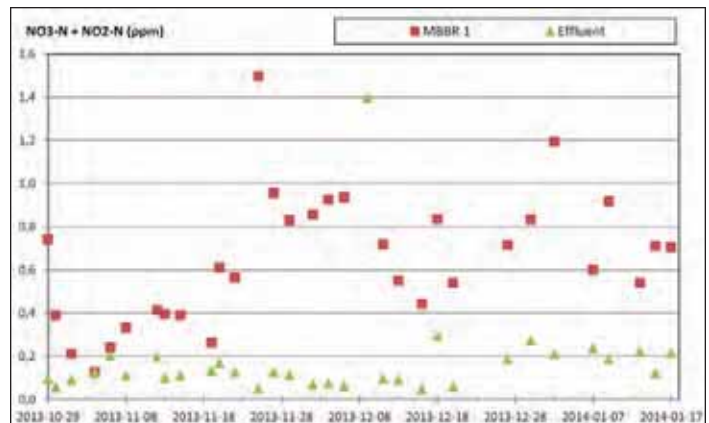


Figure 4. Concentrations of NO₃-N + NO₂-N in MBBR 1 and in effluent for coal mine wastewater

effluents. By combining the MBBR with traditional chemical treatment, very low effluent selenium concentrations can be reached. With so much focus on the selenium regulations, having a biological solution offers treatment options where they were previously limited, especially in the mining and energy markets.

Note: This article was adapted from a WEFTEC 2014 presentation, “Moving Bed Biofilm Reactor for Selenium Removal from FGD and Mine Effluents,” by Caroline Dale, Maria Ekenberg, Mikael Sjölin, Flemming Wessman, and Jens Morän.

Caroline Dale is a principal engineer of biological processes at the Cary, NC, office of Veolia Water Technologies (Paris). Barry Liner is the director of the Water Science and Engineering Center at the Water Environment Federation (Alexandria, VA).

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Bellies Full of Microplastic Rob Baby Fish of Their Basic Instincts

by *Nsikan Akpan*

Originally published on-line for the PBS News Hour Science Blog, June 6, 2016 at 11:34 AM EDT. Reprinted with permission.

When exposed to microplastics, baby fish stop eating natural food and prefer consuming the pollutant, according to a report from ecologists at Uppsala University in Sweden. The dietary switch derails the basic instincts of the fish, the researchers found, elevating the likelihood of being caught by predators. The findings may explain why populations of European perch (*Perca fluviatilis*) – the main species analyzed in the study – have declined in the Baltic Sea.

“Perch are common and popular recreational fish in Sweden,” said Oona Lönnstedt, an Uppsala ecologist and the project’s leader. “But they have seen continuous and rapid declines in density and abundance since the mid-1990s in the Baltic Sea.”

The trend is especially true for young perch (*Ljunggren et al, 2010*), and the cause remains unknown. Some experts blame habitat destruction (*Sundblad, 2013*), while others cite too much salty runoff from land due to climate change (*Bignell, 2011*). But two years ago, Lönnstedt and her colleagues set their sights on microplastics as a leading factor.

Microplastics litter the Earth’s oceans. The particles typically measure less than five millimeters (one-fifth of an inch) in size, and recent estimates suggest up to 236,000 metric tons wash into the oceans each year (*Law, 2016*). That’s equivalent to the weight of 1,300 blue whales, and it may represent just one percent of the total contained in oceans. The Baltic Sea carries about 25 to 40 plastic particles per gallon of water – or 229 quadrillion pieces across its entire volume.

Lönnstedt’s study examined how microplastics influence every stage of European perch development. The team started with eggs collected from the Baltic Sea. They raised 60 of these embryos in three tanks carrying either no microplastics, an average amount observed in parts of the Baltic Sea (40 particles per gallon) or an extreme level (300 particles per gallon).

Sans pollution, the eggs hatched about 96 percent of the time, but birth rates fell with both average (89 percent) and extreme (81

percent) quantities of microplastics.

Things got weirder when the animals grew older. The researchers raised European perch for 10 days in regular water with the perch’s favorite food, brine shrimp, and then added microplastics to the tanks.

“The biggest surprise in this study was the fact that larvae preferentially ate microplastic particles,” said Lönnstedt, whose study was published June 2 in the journal *Science*. “They literally stuffed themselves with the microbeads and ignored their natural food source.”

Larval fish exposed to microplastics also became lethargic, spent more time in a motionless state and swam shorter distances across their aquarium.

One way baby perch survive their vulnerable youth is by smelling predators. Much like stinky gym socks, predators exude repulsive scents that the baby fish can sniff and avoid. When the team squirted drops of these chemical alarms into the tanks, they found fish with microplastics were less likely to flee. The microplastics impaired the perch’s olfactory reflexes.

“There could be two potential reasons for this. Either the plastic particles exude toxic chemicals that interfere with nerve development, effectively altering their behaviors and olfactory responses,” Lönnstedt said. “Alternatively, the fish are lacking so much energy, due to plastic-filled stomachs, that they simply have no energy...and consequently ignore the chemical threat cues of predators.”

This dampened fear response translated into real-world doom. In a separate experiment, the team added a perch predator – Northern pike (*Esox lucius*) and then monitored survival for 24 hours. Without microplastics, 46 percent of baby perch survived the night. Average microplastic levels cut 24-hour survival by another 20 percent. None survived against predators with high levels of microplastics.

Perch may not be suffering alone. Since completing this study, Lönnstedt and her colleagues have recorded similar (unpublished) patterns in other species of larval fish, both tropical (coral reef damselfish) and temperate (pike and flounder).

“In this way, the plastic contaminants are transferred from the small prey fish to the larger predatory pike and are likely to bioaccumulate in the food chain,” Lönnstedt said. “If this process takes place in the marine ecosystem, plastics can affect the health of food webs, which include humans as an apex predator.”

The next step in the project will be examining the process in nature. They’ve found European perch in the Baltic Sea with bellies filled with plastic, but this needs to be studied more in depth, according to Lönnstedt. The other open question is whether all types of plastic cause these problems. This study used polystyrene, a common and inexpensive polymer found in fishing floats, buoys, packaging and insulation, toys, kitchen appliances, lids, bottles and disposable cutlery.

“Now we know that polystyrene is harmful, but we also need to compare it to the other common polymers such as polyethylene



The European perch (*Perca fluviatilis*) is one of the fish species affected by microplastics in the environment.

continued on page 58



Congressman Joe Courtney addresses the members on the importance of sustaining infrastructure funding.



Bill Grandner welcomes Joe Fiegl as a regular member of the SSSSS.



Paul McGarvey (left) and Bruce Munn



Spouses, Sana Barakat and Vatche Minassian, are inducted into the SSSSS.



NYWEA's John Fortin of Hazen & Sawyer visits with NEWEA Executive Director Mary Barry.



Bob Wither and Tanya Jennings



Jamie Saxe (right) and Cinar Akman



Bob Albright (right) presents a Golden Manhole Society pin and certificate to Tom Lauro.



L to r: Jaime Saxe, Alex Emmerson and Geoff Baldwin are inducted into the SSSSS.



Exhibitor Larry Aldrich (right) talks with Bob Robinson.



Left, L to r: Ginny Roach, Jessica Fosbrook and Bob Robinson



Jeannette Brown and Edward McCormick, both WEF past presidents, catch up in the Exhibit Hall.



Water for People Fun Run/Walk participants gather for a photo at end of race. Over \$600 were raised, nice job, everyone!

... and the winners are ...

The 2016 Operations Challenge was a wonderful opportunity for our four “home teams” to show off their skills against three teams from New England as well as the two visiting teams from Maryland and Virginia. It was a hard fought battle with the 26th Ward Unflushables taking the top spot, Jamaica Sludge Hustlers in second, with the Long Island

Brown Tide right on their heels in third.

For the first time in NYWEA Ops Challenge history, there will be three teams representing our association at WEFTEC in New Orleans this September. Good luck to our teams and a big THANK YOU to all the volunteers that make this event happen every year!



Met Chapter’s “26th Ward Unflushables” win the Annual Operator’s Challenge trophy. L to r: NEWEA President Ray Willis III, Howard Robinson, David Taylor, Michael Leone, Ellis Watson, Salvatore Scapelito and NYWEA President Joe Fiegl.



The Met Chapter’s “Jamaica Sludge Hustlers” win first place in the Safety Challenge. L to r: NEWEA President Ray Willis III, Ray Antenucci, Bobby Ferland, Yu-Tung Chan, Anthony Petrone and NYWEA President Joe Fiegl.



Met Chapter’s “26th Ward Unflushables” also win first place in the Collection Systems Challenge. L to r: NEWEA President Ray Willis III, Ellis Watson, David Taylor, Salvatore Scapelito, Michael Leone and NYWEA President Joe Fiegl.



Long Island Chapter’s “Brown Tide” win first place in the Lab Challenge. L to r: NEWEA President Ray Willis III, Rob Jentz, Alec Breen, Jake Miller, Dale Grudier, James Behr and NYWEA President Joe Fiegl.



The two Met Chapters pose for group photo. Back row, l to r: Pump Maintenance Coordinator, Kevin McCormick, Howard Robinson, Yu-Tung Chan, Ray Antenucci, Michael Leone, Ellis Watson, David Taylor, Collection Coordinator Joe Atkins. Front row, l to r: Safety Coordinator Marty Bunce, Anthony Petrone, Bobby Ferland, Salvatore Scapelito and Lab Coordinator William Sedutto.



GeneseeChapter’s Genesee Valley Water Recyclers win first place in the Process Control Challenge. L to r: NEWEA President Ray Willis III, Timothy Keegan, Jr., Justin Slentz, Michael Burkett, Robert Holland, and NYWEA President Joe Fiegl.



Very colorful NEWEA Lab Judges!



Photo by Oona Lönnstedt via PBS NewsHour

Larval European perch that has ingested microplastic particles (light-colored spheres on bottom side).

and PVC,” Lönnstedt said. “If we can target the chemical that is most harmful, at least this could hopefully be phased out of production.”

Nsikan Akpan is the digital science producer for PBS NewsHour. Prior to joining NewsHour, his work appeared in NPR, Science Magazine, Science News, Scientific American, Newsweek and elsewhere. He holds a doctorate in Pathobiology (Columbia University) and is an alum of the science communication program at the University of California, Santa Cruz. Follow on Twitter @MoNscience.

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Citizen Science

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The American Littoral Society was founded by scientists and naturalists who believed in the value of citizen science. Today, we continue that tradition – engaging members of the public in field research to increase the data collected and to connect our volunteers more closely to the natural world. Here are some ways you, your kids and grandkids, your students and your friends can get involved in science that will help the coastal environment:

American Littoral Society Fish Tagging Program

Our 1,000 volunteer anglers tag nearly 25,000 fish per year for the Society. We share this data with scientists at National Marine Fisheries Service at Woods Hole, Massachusetts, where it is used by scientists throughout the United States. Our data are also being used by Dr. Dwayne Fox, at Delaware State University, for a study of sand tiger sharks. We're also working with Rutgers University to integrate our data into an online geographic information system so taggers and the public will be able to learn more about fish and their behavior. To learn more about this program and how you can tag for us, visit our website's fish tagging pages or contact Jeff Dement (jeff@littoralsociety.org).



Photo: Doug Lloyd, asatlakstudios.com

A fisherman tags a striped bass in Maine waters.

Spill Spotters Network

This spring, the Society launched a new program in New Jersey to create a citizen response and reporting network in case of an oil spill or other severe pollution event. An important part of this program is to involve residents in taking baseline censuses of pre-selected coastal areas that would be vulnerable to such pollution. We are training teachers, scout leaders, our members, and others to help lead this effort. To learn how you can get involved visit our website's Spill Spotters pages or contact stevie@littoralsociety.org.



Reimphoto/istockphoto.com

Young citizen scientists

Stevie Thorsen (stevie@littoralsociety.org)

Jelly Watch

Marine biologists from Monterey Bay Aquarium Research Institute need help from citizen scientists to gather data about sightings of jellyfish, red tides, squid, and other unusual marine



jrnabacha/istockphoto.com

A seagull feasts on a jellyfish.

life. When you are at the beach or in the ocean, you can contribute to a long-term dataset by reporting about the animals you saw or the conditions of the beach. You can also help by reporting when the beach is clean or when there are no jellyfish in the water. You can help even more by submitting a picture of what you saw. Visit <http://jellywatch.org/>.

Whale FM

Help marine researchers understand what whales are saying. Listen to recordings of orcas and pilot whales on your computer and help match them to like recordings. This project is sponsored by *Scientific American*, *Zooniverse*, and marine scientists from around the world. This is great for ocean lovers who don't live near the ocean. Visit <http://whale.fm/>



Eric Middelkoop/istockphoto.com

A pod of orca whales swims through.

Action Alerts

Sign the petition to protect Barnegat Bay!

Our online petition requests that the Christie Administration declare Barnegat Bay "impaired" for nutrients under the Clean Water Act, an important first step towards developing a pollution reduction budget to help bring the Bay back to health. There are many contributing factors in the Bay's ecological decline, but one of the key reasons is polluted stormwater runoff created by over-development of lands that drain into our streams, rivers and ultimately the Bay itself.

Help restore the West Pond in Jamaica Bay Wildlife Refuge

Please join the Birder's Coalition for Gateway in our petition to restore freshwater to the West Pond in Jamaica Bay Wildlife Refuge, part of the National Park Service's Gateway National Recreation Area in Queens County, NY. On October 12, 2012, Hurricane Sandy breached the 45-acre freshwater West Pond in Jamaica Bay Wildlife Refuge – a home, breeding ground and migratory stop-over location to an estimated 330 species of birds and a diverse array of wildlife. Saltwater now flows into the West Pond and has damaged this vital ecosystem, one of the only significant sources of freshwater in the coastal environment of New York City and part of the Atlantic Flyway.

Visit littoralsociety.org for more information

About the American Littoral Society

The mission of the American Littoral Society is to promote the study and conservation of marine life and habitat, protect the coast from harm, and empower others to do the same. Since 1961 the Society has empowered people to care for the coast through advocacy, conservation, and education, not only providing a voice for the coast, but also giving concerned citizens the knowledge and tools they need to raise their voices as well (littoralsociety.org).

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Operator Quiz Test No. 112 – Digesters

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!

- An anaerobic digester with a normal operating temperature of 95°F would be considered:
 - Psychrophilic
 - Mesophilic
 - Thermophilic
 - Atmospheric
- How many pounds of total solids are loaded into a digester given the following:
Sludge Feed = 5,000 gals
Digester Volume = 10,000 ft³
Total Solids = 5.8 percent
Volatile solids = 62 percent
 - 2,419 lbs.
 - 2,585 lbs.
 - 1,500 lbs.
 - 242 lbs.
- Anaerobic digesters should have a volatile acid to alkalinity ratio of:
 - 1:10
 - 1:2
 - 10:1
 - 2:1
- Two main gases produced by the breakdown of volatile matter in a digester are:
 - Oxygen and Methane
 - Methane and Carbon Dioxide
 - Hydrogen Sulfide and Carbon Monoxide
 - Carbon Dioxide and Oxygen
- If an aerobic digester that is 15' wide, 10' deep, and 100' long is fed 5,000 gallons of sludge per day, what is the detention time?:
 - 22.4 days
 - 3 days
 - 0.04 days
 - 2.24 days
- What course of action should a wastewater operator take if an anaerobic digester is "sour":
 - Increase the amount of sludge pumped to the digester
 - Add an acidic substance to decrease the alkalinity
 - Add a basic substance to increase the alkalinity
 - Remove the hatches to introduce oxygen to the digester
- The breakdown of wastes by microorganisms in the presence of dissolved oxygen is called:
 - Anaerobic Digestion
 - Endogenous Respiration
 - Aerobic Digestion
 - Stasis
- This type of bacteria grows and thrives in a temperature range above 113°F:
 - Mesophilic
 - Thermophilic
 - Psychrophilic
 - Supernatant
- A scale composed of soluble forms of ammonia, phosphate and magnesium formed from the digestion process commonly found in digested sludge lines and valves is known as:
 - Enzymes
 - Alkalinity
 - Saprophytes
 - Struvite
- What is the volatile matter reduction percentage of a digester that has an input sludge of 70 percent volatile matter and an output sludge of 55 percent volatile matter?
 - 4.7 percent
 - 21 percent
 - 15 percent
 - 48 percent

Answers 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, or visit www.nywea.org/OpCert.



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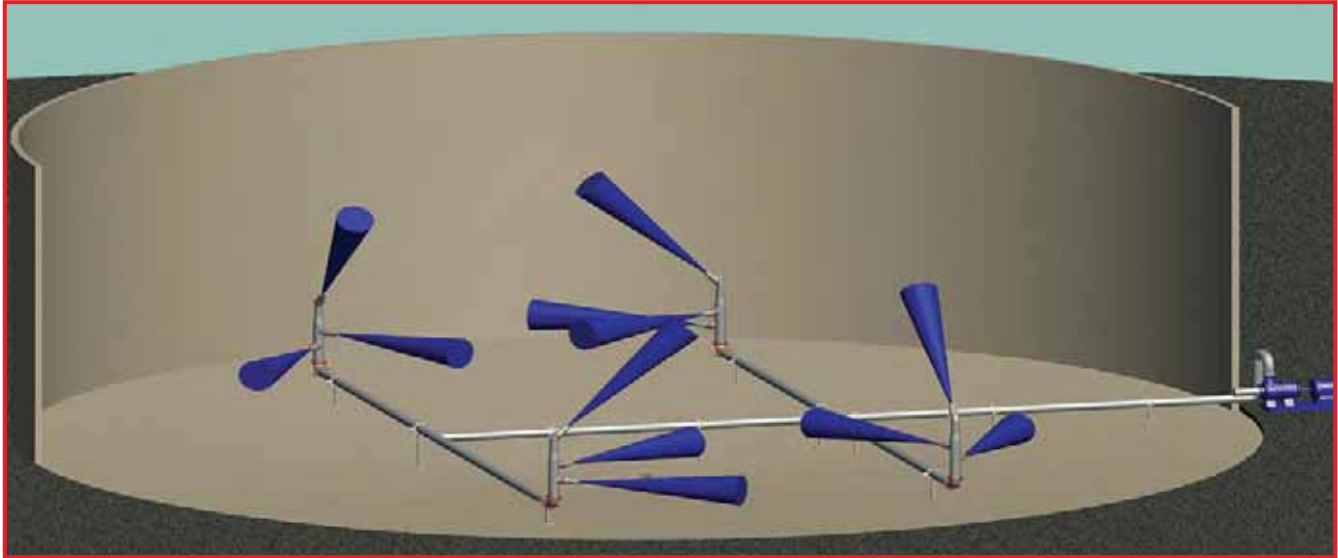
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Answers from page 61: 1 B, 2 A, 3 A, 4 B, 5 A, 6 C, 7 C, 8 B, 9 D, 10 D

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