Clean Water Works

A TECHNICAL JOURNAL of the THE NORTHEAST OHIO REGIONAL SEWER DISTRICT

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Water Quality & Industrial Surveillance

Monitoring and protecting our clean-water resources

INSIDE: Emergency Response / Aquatic Bugs / Industrial Pretreatment

FROM THE SUPERINTENDENT OF ENVIRONMENTAL SERVICES



Dear Reader,

This year's **CleanWaterWorks** focuses on the environmental services provided by our Water Quality and Industrial Surveillance (WQIS) department. Our team works to ensure that discharges to the sewer system are free from hazardous pollutants that may threaten our treatment plants, infrastructure, and the environment.

Our Industrial Pretreatment program has been delegated by Ohio EPA with the authority to enforce the regulations of the Clean Water Act, ensuring that wastewater from industrial sources will not have a harmful effect on our infrastructure and operations.

We evaluate water quality in the local streams and on Lake Erie to ensure that our wastewater treatment processes do not have a negative impact on the environment. We may also identify pollution from other sources, which we investigate and work to eliminate. Investigations during 2013-14 led to the elimination of over 500,000 gallons per day of illicit discharge to the environment.

WQIS staff also serve as emergency responders, on call 24 hours a day and available to respond to many different emergencies, including residential odor complaints, industrial fires with polluted runoff, and hazardous spills. Our trained investigators work closely with local HazMat teams and fire departments to respond to emergencies and protect our sewer system and the environment.

We are dedicated to protecting our operations, Lake Erie, and our waterways. That commitment to environmental protection makes the Northeast Ohio Regional Sewer District an industry leader, and an organization that is essential to the quality of life in our communities. We hope you enjoy this issue's overview and continue to join us in our efforts to keep our Great Lake great.

Scott Broski

A 21-year employee with the Northeast Ohio Regional Sewer District, Scott Broski has served as Superintendent of Environmental Services since December 2014.



The MISSION of the Northeast Ohio Regional Sewer District is to provide progressive sewage and stormwater management through innovation, fiscal responsibility, and community partnerships.

Our VISION is to be the environmental leader in enhancing quality of life in the region and protecting its water resources.

This annual magazine gives subjectmatter experts the opportunity to explain in greater detail our work and that of our partner agencies.

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Water Quality & Industrial Surveillance

onitoring water quality is key to the Sewer District's clean-water mission. Our Environmental Assessment staff sample at numerous sites year round, to determine if local waters meet Ohio standards. **COVER STORY PAGE 4**

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More than sewers

by Mark Matteson and John Rhoades

Monitoring water quality is key to our mission

ater quality is explained in the Clean Water Act as the standard of purity that is necessary for the protection of fish, shellfish, and wildlife populations in the aquatic environment, and for recreational uses in and on the water.

Since 1986, the Northeast Ohio Regional Sewer District has had a program to monitor the water quality of surface waters in its service area, which includes Cleveland and 61 member communities in Cuyahoga, Lake, Summit, and Geauga counties.

The Sewer District performs water quality sampling to provide information regarding the condition of local streams, rivers, and Lake Erie. This sampling can provide meaningful data, including information on bacteria, pollutants, and nutrients (such as phosphorus).

This data is used to 1) establish and monitor water-quality criteria for different water bodies, 2) assess the impact of spills, illicit discharges, and environmental disruptions (and make recommendations for their remediation), 3) identify changes and trends in water quality and existing or emerging problems, especially those attributable to Sewer District facilities and programs, 4) coordinate monitoring activities with fellow agencies and entities interested in protecting water quality, and 5) provide a scientifically sound, current information basis for environmental planning and future pollution-abatement projects.

Members of Environmental Assessment, a division of the District's Water Quality & Industrial Surveillance (WQIS) department, are responsible for conducting this sampling at numerous sites, including small streams like Mill Creek and Doan Brook, large rivers like the Cuyahoga and Chagrin, and Lake Erie. Staff collect thousands of water samples on an annual basis. Although sampling takes place year round, most takes place during the Ohio EPA-designated "recreation season," from May 1 through October 31.

In 2006, the Ohio EPA launched its Credible Data Program, based on a need for high-caliber ("credible") data, collected by competent people, that can be used



with confidence to make important decisions regarding Ohio's water resources.

Qualified Data Collector status exists at three levels, with Level 3 having the highest standards and requirements for training, experience, skills, testing for certification, and field and laboratory methodology. Our Environmental Assessment staff have been certified by Ohio EPA as Level 3 Qualified Data Collectors in Fish Community Biology, Benthic Macroinvertebrate Biology, and Chemical Water Quality and Stream Habitat Assessments.

Environmental Assessment applies the State of Ohio's water-quality standards to determine if surface waters meet the designated use set by Ohio EPA. For example, the Cuyahoga River mainstem is designated as a "Warmwater Habitat." Results are compared to historic data to show temporal as well as spatial trends.

The health of fish and macroinvertebrate communities is evaluated through the use of several Ohio EPA indices, described on page 7. An examination of the specific characteristics of biological communities is used in conjunction with water quality data to identify impacts to the biological communities.

WQIS staff also are members of two regional hazardous-material teams. Spills or illicit discharges to water bodies within our service area will often require water-quality sampling, and our staff is appropriately prepared to deal with these situations. (See page 26.)



The Environmental and Maintenance Services Center (EMSC) is home to Water Quality & Industrial Surveillance (WQIS) and Analytical Services, among other Sewer District departments. WQIS monitors and samples discharges into the wastewater system and enforces the U.S. EPA's pretreatment program regulations for more than 1,000 industrial users. Analytical Services analyzes over 600,000 samples of water, wastewater, industrial waste, and surface water each year, in one of Ohio's largest laboratories.

Our data also can be used to determine whether or not compliance with pollutant regulations is being met. Sampling data is not only vital in determining where pollution problems exist, but it also shows where progress has been made. All of this is very important for the District's three wastewater treatment facilities.

The data collected by the Sewer District is avail-

able for anyone who is interested. It is important that timely, high-quality data is collected and made available to those who need it. **CWW**

Mark Matteson is a WQIS Investigator and John Rhoades is WQIS Manager at the Sewer District.

Measures of water quality

The health of fish and macroinvertebrate communities is evaluated through the use of Ohio EPA's Index of Biotic Integrity, Modified Index of Well-Being, and Invertebrate Community Index. The characteristics of these communities is used in conjunction with water-quality data and Qualitative Habitat Evaluation Index results, to identify impacts to the biological communities.

Electrofishing surveys are used to evaluate the health of the fish community. (See page 8.) The Index of Biotic Integrity (IBI) looks at fish numbers, diversity, feeding strategies, environmental tolerances, and disease symptoms. The Modified Index of Well-Being (MIwb) looks at the number of individual fish and their weights.

The Cuyahoga's IBI and MIwb scores have been improving since the District began conducting electrofishing surveys in 1990. In 2014, all but two of the Cuyahoga sites upstream of the navigation channel had MIwb and IBI scores attaining the Warm Water Habitat use designated by Ohio EPA.

The presence of pollution-sensitive fish are an indication of improved water quality. Since 1990, the number of native fish species and the proportion of pollution-sensitive fish have increased as the Cuyahoga's water quality has improved.

The Cuyahoga's macroinvertebrates (insect larvae, worms, snails, etc. living in or on the bottom of the river) are sampled using Hester-Dendy samplers, which consist of stacks of small plates held together with a bolt. (See page 14.) The samplers are attached to a concrete block and placed in the water for six weeks. Then the samplers are removed and the macroinvertebrates that have colonized the plates are indentified and counted.

The results of macroinvertebrate sampling are evaluated using the Invertebrate Community Index (ICI), which compares the sampled locations with relatively unimpacted reference sites.





Mlwb scores at River Mile ("RM") 7, 10, 11, and 14 on the Cuyahoga River

The Ohio EPA's minimum Warm Water Habitat ICI score is 34. All of the Cuyahoga sites exceeded this score. (Two locations scored 38 and the remaining locations scored 40.)

The Qualitative Habitat Evaluation Index (QHEI) measures the physical attributes of a stream—such as gradient, bank condition, and substrate (stream bottom) type—which can help explain why fish species are present or absent.

FINDINGS

The overall health of the fish and macroinvertebrate communities in the Cuyahoga River has improved substantially over the past several decades. In 1969, when debris in the Cuyahoga last burned, many people would have thought results like these were impossible.

Several Sewer District projects have helped reduce the amount of pollution in the Cuyahoga River:

- A pretreatment program for industry that has reduced the amount of metals flowing to our Southerly Wastewater Treatment Center
- Upgrades to Southerly, including new treatment processes for the removal of ammonia and residual chlorine
- Increased collection of stormwater (Mill Creek Tunnel) for treatment at Southerly, resulting in fewer sewage overflows
- The decommissioning of smaller wastewater treatment plants, whose flows are now conveyed to Southerly via the District's Cuyahoga Valley Interceptor
- The capture and treatment of previously untreated dryweather sewage overflows that were identified by the District's Environmental Assessment program or other efforts

Gone fishin' by Seth Hothem

Fish communities tell a lot about water quality

ssessing the fish community in a stream is one way that the Sewer District determines water quality and tracks changes over time. The types and abundances of fish in a stream indicate if the water there is clean or not.

There are many reasons why fish are useful indicators of water quality. For instance, a fish spends all of its life in water, and if there is anything wrong with the water, the fish will be exposed to it and may be negatively impacted. Fish are also near the top of the food web in aquatic ecosystems. Because of this, their health is dependent on the health of lower organism groups, such as algae, plants, and macroinvertebrates. If anything is wrong with those groups, the fish will not survive.

Fish sampling at each site is usually conducted one to three times each summer using a method called electrofishing. In electrofishing, an electrical current is put into the water. The current stuns the fish, and the electroshocking team pulls them from the water with nets. During fish surveys, all of the habitat areas within a section of stream are electrofished. The size of the stream section assessed (150, 200, or 500 meters in length) depends on the site's drainage area.

There are three types of electrofishing methods that the District currently uses. For larger streams, a boat (either 14' or 17' in length) is used. A generator produces an electrical current that enters the water through anodes hanging from the front of the boat. (The boat itself acts as the cathode, completing the circuit.) One or two people standing near the front of the boat net the stunned fish that come to the surface.

For smaller streams, surveys are completed using either longline or backpack electrofishing. In longline electrofishing, the generator that produces the current is left on shore. For backpack electrofishing, a battery is carried by a person. In both instances, a cable attached to a wand-type device with a net puts the cur-



Fish like the silver redhorse have returned to previously uninhabitable waters thanks to improvements in water quality.



WQIS staff do a fish survey on a wetland restoration project, using a 14' electrofishing boat.



A generator delivers an electrical current to anodes suspended from the front of the boat.



rent into the water. Another person walks along and helps to net the fish.

After the surveys are completed, the fish are sorted into buckets by individual species. They are counted and examined for the presence of any abnormalities such as eroded fins, lesions, and tumors. If the stream has a drainage area greater than 20 square miles, the fish are also weighed. They are then released back into the water.

The results are analyzed using two indices developed by the Ohio EPA. The Index of Biotic Integrity (IBI) is based on 12 different measures of the fish community, including number of fish, diversity, feeding strategies, environmental tolerances, and disease symptoms.

The second fish index is the Modified Index of Well-being (MIwb). This index is based on the number of fish, their biomass, and the diversity of the fish community. Together, these two indices tell if the fish community is meeting goals set by Ohio EPA. **CWW**

Seth Hothem is Supervisor of Environmental Assessment at the Northeast Ohio Regional Sewer District.

New fish species in the Cuyahoga

Since the early 1990s, the Northeast Ohio Regional Sewer District has monitored aquatic communities in the Cuyahoga to determine the overall health of the river. During the summer, the fish communities are sampled.

Starting in 2006, the District began observing different types of fish in the river. Between 2006 and 2014, 17 fish that had never been collected before by the District in the Cuyahoga were found.

New species of fish collected since 2006 include the silver redhorse, rainbow darter, johnny darter, mimic shiner, and stonecat madtom, all of which are sensitive to pollution.

Additionally, the bigmouth shiner, which has been collected from the Cuyahoga, is considered by the Ohio Department of Natural Resources to be "threatened" and has only been found in a few Ohio streams.

The fish collected in recent years demonstrate that the water quality in the Cuyahoga River is improving and its capacity to support a more diverse aquatic community is increasing. However, there is still more work to do within the watershed to improve water quality conditions.



Silver redhorse



Rainbow darter



Johnny darter



Mimic shiner



Stonecat madtom



Bigmouth shiner

NEW FISH COLLECTED BY THE SEWER DISTRICT (2006-2014)

LAMPREYS Sea Lamprey

TROUT Lake Trout

SUCKERS Silver Redhorse* Spotted Sucker

*Pollution-sensitive species

MINNOWS Bigmouth Shiner* Silverjaw Minnow Mimic Shiner* Brook Silverside*

CATFISH Flathead Catfish Stonecat Madtom*

SUNFISH Orangespotted Sunfish DARTERS Jonny Darter*

Rainbow Darter*

PERCH Walleye

OTHERS Western Mosquitofish Round Goby

PHOTOS COURTESY OHIO DEPARTMENT OF NATURAL RESOURCES AND NEORSD EXCEPT:"JOHNNY DARTER" BY BRIAN ZIMMERMAN AND "MIMIC SHINER" BY ULAND THOMAS



An interview with Mike Durkalec of Cleveland Metroparks



What is your role at Cleveland Metroparks?

We're responsible for upholding the conservation end of our mission, and that includes aquatic habitats. I oversee the recreation fisheries program and a good portion of aquatic monitoring.

Metroparks and the Sewer District have a common task: water-quality monitoring.

Because our jurisdiction areas overlap, we work together to determine where there are gaps in our data and who will fill those gaps. The Sewer District is certified by EPA to do the larger mainstem streams. Cleveland Metroparks monitors a lot of the smaller headwater and primary streams, since we have so many of them in our parks.

There is a history of collaboration between Metroparks and the District.

Even when I started with Metroparks in 2005, there was this recognition that the two organizations had similar missions, as far as data collection. It certainly has strengthened over the years. In 2011, we submitted a Joint Study Plan to Ohio EPA to survey streams in the Rocky River Watershed.

In Spring 2012, Northern Ohio saw the largest fish kill caused by illegal dumping in its history. It was traced back to a small manufacturing facility in Strongsville that had dumped cyanide waste into the river. There was a multi-agency investigation, with Metroparks doing a lot of the coordinating and initial assessment of damages and the Sewer District playing a pivotal role with water-quality testing. Using a dye test, the District confirmed that the suspected storm sewers were indeed the source of the waste detected at the fish kill. There were felony convictions and the business owner ended up paying Cleveland Metroparks \$300,000 in damages.

The District is monitoring the stream and wetland restoration at Wildwood Park on Euclid Creek. And of course the new Watershed Stewardship Center at West Creek in Parma is another collaborative, educational effort between the District and Metroparks.

The District also hosts an annual meeting with Ohio EPA, Ohio Department of Natural Resources, Cuyahoga Valley National Park, Cleveland Metroparks—just about any agency that has a stake in water-quality monitoring. It's the only cohesive regional effort that I'm aware of, to coordinate who is sampling what, and when, so we don't duplicate efforts. It's an excellent initiative.

Our Natural Resource division has identified some big conservation issues, like stormwater, that have a real trickle-down effect on the quality of our downstream aquatic communities. The Sewer District tries to educate the public on these issues, and that's another important connection our agencies have, and it will only get stronger.



And, like the District, Metroparks electrofishes?

Yes, Metroparks does electrofishing for recreational fishery community surveys, to better manage those fisheries. We also do it for educational purposes with college biology classes at just about every local university, talking about what the fish populations mean in terms of water quality. Education is a big part of our mission.

What trends have you noticed with regard to water quality in our streams?

We have had a systematic regional improvement in water quality ever since the Clean Water Act. There have been low points, certainly, but there have been improvements in fish communities and interesting new species. We found a central bigmouth shiner in Baldwin Creek after a dam removal project. In Euclid Creek, we found a pink salmon, always a surprise in that stream.

Sea Lamprey are a non-native parasite originally from the Atlantic Ocean. They devastate sport fish like lake trout, and there has been a spike in their numbers. But as nasty and ugly as they are, they do need relatively clean water to spawn. Since streams are cleaning up, there are more opportunities for sea lampreys to spawn. It's not a feel-good story in that regard! Sometimes these things can be complicated. Two native species that have turned up in recent years in the Rocky River are the flathead catfish and spotted sucker, and they are becoming more common. It's always neat to see the biodiversity increasing naturally.

A young angler caught a Great Lakes muskie at Edgewater Park, right on Lake Erie. That's a species that appears to naturally be making a comeback as the habitat improves along the lakefront, and the water clears, especially the weedy areas near the shore where they spawn.

Recently, Rocky River and Lake Erie were named top places in the country to fish.

Yeah! *Field & Stream* has a "150 Top Places to Fish in the U.S.," and Rocky River and Lake Erie were two of only three Ohio locations mentioned! We're pretty proud of that. I think it reflects national notoriety in what we have to offer here in terms of recreational fishing. **CWW**

Mike Durkalec is an aquatic biologist in the Natural Resources division of the Cleveland Metroparks. Michael Uva is Senior Communications Specialist at the Sewer District.

Aquatic bugs

Macroinvertebrates tell a clean-water tale

B enthic macroinvertebrates are animals that lack a backbone, are large enough to be seen with the unaided eye, and live at least part of their life cycle in water. Simply put, they're aquatic bugs you can see.

The Northeast Ohio Regional Sewer District has been surveying benthic macroinvertebrate communities since the late 1980s. We study these organisms because they play important roles in the environment: they are a food source for organisms that live in and around the water, and they also use and re-distribute organic matter and nutrients in the water.

Ohio EPA use benthic macroinvertebrates to determine if a stream segment is meeting Clean Water Act goals, or if it needs improvement. The reason to focus on biology, and not simply water chemistry, is that when you take a water sample it only offers a snapshot of what is happening, while benthic macroinvertebrates live in the water year round. The District's goals are to collect baseline data, assess impacts and trends, determine if District permits are being met, and gauge the overall health of the watershed.

The Sewer District utilizes the same sampling methods that Ohio EPA has used since 1973. For most sites, we use a modified Hester-Dendy, or "HD," sampler, named after the scientists who first utilized them. *(See page 16.)* Five HDs are tied to a cinderblock and placed in the stream or river to allow benthic macroinvertebrates to colonize. After six weeks, the HDs are cut from the cinderblock and placed in plastic containers. Then, our trained biologists (or a contract lab) identify and count the bugs on the HDs.

Our investigators also use a dip net, similar to a fishing net, but with much smaller openings and of sturdier material, for use in and around rocks and woody debris. Dip nets are used to sample all of the different habitats at a site, since the HD is typically installed near the middle of the stream.

The HD provides a *quantitative* sample, the dip net, *qualitative*. Quantitative sampling tells us how many of each type of bug are in an area, giving us an indication of the community make-up, similar to a



census. Qualitative sampling only indicates if a type of bug is present or absent from a site. Putting both types of data together helps us determine the overall health of the water body and, in some cases, it can even point to a specific problem that should be addressed. If a site has an abundance of tolerant bugs—snails, for example—but very few intolerant species, like stoneflies, the site might need improvement.

There are special methods of assembling the sampling information to determine the health of the stream. The primary measure is called the Invertebrate Community Index (ICI), developed by Ohio EPA. The ICI uses several metrics to give the user a score that corresponds to one of several categories ranging from "Healthy" to "Needs Improvement." These categories are specific to the five eco-regions situated within Ohio. (Greater Cleveland is located in the Erie-Ontario Drift and Lake Plains eco-region.)

We can see trends based on the data we collect. For example, comparing samples from 2007 and 2014 from Mill Creek in Warrensville Heights, we notice a significant increase in ICI score, Ephemeroptera, Plecoptera, and Trichoptera (or "EPT," three insect orders used to test water quality), and total taxa. (A *taxon* is a category, like genus or species.) Over seven years of studying benthics at the site, Mill Creek has improved from "Needs Improvement" to "Healthy." **CWW**

Ron Maichle is a Senior Investigator at the Northeast Ohio Regional Sewer District.

COMMON BENTHIC MACROINVERTEBRATES



INTOLERANT

MODERATELY INTOLERANT













Neoperla sp. (Stonefly) is sensitive to temperature changes, low dissolved oxygen, and habitat destruction.

Hydropsyche bidens (Caddisfly) is tolerant of high silt and organic pollution.

Maccaffertium exiguum (Mayfly) is tolerant of turbidity and organic pollution.

Hydroptila sp. (Microcaddisfly) constructs a case out of silk and sand grains.

Tubellaria (Flatworm) is found at the majority of sites but is sensitive to low oxygen.

Dicrotendipes neomodestus (Midge) is sensitive to most toxic pollution, but tolerant to nutrient and organic pollution.

Physa (Snail) is tolerant of low dissolved oxygen, and found in large numbers in stressed systems.

"HYDROPSYCHE BIDENS" AND "HYDROPTILA SP." COURTESY OF THE STATE HYGIENIC LABORATORY AT THE UNIVERSITY OF IOWA,"TUBELLARIA" COURTESY OF UNIVERSITY OF OTTAWA/BIOLABS

FOLERAN1

Case Study: Improvements at Mill Creek

n 2014, the Northeast Ohio Regional Sewer District conducted water chemistry sampling, habitat assessments, electrofishing, and benthic macroinvertebrate sampling on Mill Creek, in Cleveland.

The purpose of the study is to determine impacts from combined sewer overflow (CSO) and other pollution sources on water quality and the biological community. Monitoring near the mouth of Mill Creek is required by the Sewer District's National Pollutant Discharge Elimination System (NPDES) CSO permit. An upstream site was also monitored to help identify any impacts.

Water chemistry samples were collected once a week for five weeks starting in June. In general, the Mill Creek sites met Ohio EPA water-quality standards for warmwater habitats. However, due to heavy rains in June 2014, some parameters did not meet the standards.

A Qualitative Habitat Evaluation Index (QHEI) score was also determined for each site. The QHEI, developed by Ohio EPA, is used to assess the aquatic habitat conditions at each sample location by providing an evaluation of the physical components of a stream, which can help explain why some fish species are present or absent there.

Ohio EPA has set a target QHEI score of 55 for headwater sites. Both of the Mill Creek sites exceeded this goal, and the site near the mouth of the creek had a score that is considered to be "Excellent." (Since 2007, all sites sampled on Mill Creek have met the target QHEI score of 55.)

Sampling for macroinvertebrates in Mill Creek started in 1995, and has been conducted annually since 1999. Macroinvertebrates are sampled using Hester-Dendy samplers, which consist of stacks of small plates held together with a bolt. These samplers are attached to a concrete block and placed in the water for six weeks. Then the samplers are removed, and the macroinvertebrates that have colonized the plates are identified and counted.

The results of this sampling are evaluated using Ohio EPA's Invertebrate Community Index (ICI). This scoring system compares the sampled location with relatively unimpacted reference sites. Since 2003, ICI scores for Mill Creek have consistently increased.

Mill Creek fish are sampled using longline electrofishing techniques. An electrical current stuns the fish, causing them to float to the surface where they can be collected with a net. The captured fish are counted, identified, weighed, and examined for the presence of any physical



abnormalities. The fish are then released back into the water.

Electrofishing results are evaluated using the Index of Biotic Integrity (IBI). The IBI also was developed by Ohio EPA



ICI scores at River Mile ("RM") 0.12, 0.70, 8.30, and 10.13 on Mill Creek



and is an indicator of the health of the fish community. It looks at fish numbers, diversity, feeding strategies, environmental tolerances, and disease symptoms. In 2014, all sampling at sites downstream of the

numbers of hog suckers and sand shiners have been collected, and pollution-sensitive rainbow darters and shorthead redhorses were collected in 2012 and 2013.Also

Mill Creek Falls indicate that the fish community is getting healthier.

Three pollutionsensitive fish species—the northern hog sucker, sand shiner, and greenside darter—were collected in 2009 near the mouth of the stream. Since then, greater collected in 2013 downstream of the falls was the common intolerant redside dace, found only in "Exceptional" warmwater habitats. All of these species are pollution sensitive and are generally found only in clean, unpolluted waters.

The two downstream sites were in full attainment of Ohio EPA's criteria in 2014. This indicates that CSO on Mill Creek is not significantly impacting the biological community at this site. They also show how the creek has improved in recent years. These improvements may be due in part to the Mill Creek Tunnel, built to capture wetweather discharges from CSO.

The improvement in the fish community may also be due to the influence of the Cuyahoga River, which Mill Creek flows into. In recent years, fish communities at Cuyahoga River sites immediately upstream and downstream of Mill Creek have also improved, fully meeting Ohio EPA's criteria.



IBI scores at River Mile ("RM") 0.12, 0.70, 8.30, and 10.13 on Mill Creek



Northern hog sucker



Sand shiner



Greenside darter

Finding the source by Donna Friedman

District teams hunt down illicit discharges

he Sewer District's Illicit Discharge Detection and Elimination (IDDE) program is aimed at creating cleaner waterways for the ecosystems that we live in.

An illicit discharge is waste that flows through stormwater pipes and out into the creeks, rivers, and other waterbodies, often right by people's homes. This waste can come from blocked sanitary sewers or from structures that are supposed to lead to the sanitary system, but were mistakenly connected to the stormwater system. Especially if storm and sanitary lines run parallel to each other, and if precautions are not taken, it can be easy to connect in to the wrong pipe.

Communities having Municipal Separate Storm Sewer System (MS4) permits are required by the EPA to develop and implement a plan to deal with these discharges. Detecting, tracing, and eliminating illicit discharge takes time and resources, and given its cleanwater mission, the Sewer District sees it as one of its duties to assist communities in the enormous task of addressing these problems.

The first step that our investigators take when

tracing an illicit discharge is to review information that the Cuyahoga County Board of Health (CCBH) provides on area sewer outfalls, which are designed to allow discharge into waterways during rain events, rather than backing up and flooding streets. Each summer, CCBH samples hundreds of outfalls from many of the communities also served by the District.

On dry-weather days, storm sewer outfalls should have very little, if any, flow. Waste usually can't be detected just by physical observation, so District teams collect water samples to be analyzed for *E. coli*, a bacteria that lives in the intestines of people and animals, and a strong indicator of sanitary sewage infiltration.

District investigators may need to re-sample an outfall up to five times to verify that it does indeed have high *E. coli*, because not all outfalls flow consistently, and it could be only an intermittent problem.

The investigators will verify other outfall data in their database. Which side of the river is it on? What kind of pipe is it? Is there anything peculiar about the flow? The data we collect is an integral part of the process, for the current investigation and those to come.

Investigators Donna Friedman and Seth Hothem collect water samples to track the source of sanitary waste discharging into Big Creek.





Investigators analyze each street's input by sampling at the manhole closest to the intersections.

Stacie Hark receives water samples at the District's Analytical Services lab in Cuyahoga Heights.

Based on the data from these analyses, investigators will note the samples that had high *E. coli* counts and head out into the field to start an investigation.

The team will identify the "reach" of the investigation area, figuring out what streets may be tied into the storm sewer line that leads to the outfall. By doing this, they will know where to start sampling and tracing the flow.

Investigators then will bracket the problem areas by "smart sampling." For example, if an outfall lies at the end of a main street, and there are many stormsewer lines from smaller streets flowing into that main street, it makes sense to sample at the manhole closest to each intersection, to evaluate each street's input to the main line.

Investigators try to bracket the problem as narrowly as possible, sometimes down to a few houses or a single building, so a community has less trouble when it comes to identifying and resolving the issue. The crews will pop manholes along the length of a street to observe dry-weather flow that may indicate a house or building that should be connected to the sanitary system is instead discharging into the storm sewer.

Samples are delivered to the Analytical Services laboratory at the District's Environmental & Main-

tenance Services Center for *E. coli* analysis, and the results come back in 24 hours.

Once the problem area has been traced and a report filed, it is time to talk to the community. One of the District's watershed team leaders will talk to a community representative about possible solutions and timelines, and what the District can do to help remediate the problem.

Following this process, either the city or the District will identify exactly which house or building is wrongly connected. This is usually accomplished with a dye test, although in some cases the District will run a robot camera along the length of the sewer pipe to see exactly where a connecting pipe is dripping in.

Over the past two years, over 500,000 gallons per day of raw sewage discharges to the environment have been eliminated thanks to the Distict's Water Quality & Industrial Surveillance department, its watershed managers, and the communities involved. **CWW**

Donna Friedman is an Investigator in the Water Quality & Industrial Surveillance department at the Northeast Ohio Regional Sewer District.



Results from the lab's E. coli analysis come back in 24 hours.



A storm sewer outfall that opens to let out flow when it rains. Our IDDE team investigated sanitary waste present here and discovered a broken lateral line leaking from nearby apartments into the sewer. Investigators worked with the community to get the pipe fixed and the discharge eliminated.

There's an app for that!

he Sewer District's Geographic Information System (GIS) group, in conjunction with WQIS investigators, put together two software applications to facilitate the process of tracing illicit discharges.

The Illicit Discharge Environmental Assessment Logger (IDEAL) helps organize the work flow on a workspace that everyone can see. Investigators and watershed leaders can post action items on specific outfall investigations.

The Tracking Illicit Discharge to the Environment (TIDE) app provides a spatial interface for investigators to plot samples, dye tests, investigation areas, and more on an iPad.A live feed allows supervisors and others working on the case to see exactly what is happening. —Donna Friedman



IDEAL application



TIDE application

Metal men

by Michael Uva

Investigators keep watch over industrial wastewater

ince 1984, the Sewer District has had an EPAapproved Industrial Pretreatment Program. The Clean Water Act gives the District the authority to regulate industrial wastewater discharges to its collection system: the sewers.

District crews inspect hundreds of local companies each year, in order to comply with EPA mandates for monitoring and sampling. Some companies are subject to annual inspections because they fall into predefined categories, based on the type of manufacturing processes in their facilities. Some of these processes create wastewater that is potentially more toxic than others. Other companies are inspected because of the sheer volume of water used.

"These companies need greater oversight," said Senior Investigator Wolfram von Kiparski. "The District monitors industrial wastewater discharges to ensure that the discharges do not harm the collection system, interfere with biological processes at our treatment plants, or pass through into the environment."

Many companies are required to have a pretreatment system to treat their wastewater before it enters the sewer system. These systems remove pollutants from wastewater in order to meet discharge limits.

"It's a parallel chemical process to our manufacturing process," explained Randy Solganik of Cleveland's City Plating, an electroplating company. Inspecting a company's pretreatment system is necessary to ensure that it is in good condition and capable of properly treating industrial wastewater prior to it being discharged into the sewer system.

The District takes wastewater samples using a Teledyne Isco 3700 automatic sampler, "the tool of the trade," according to von Kiparski. The sampler has 24 bottles, and is usually programmed to take a sample every 15 minutes for a 24-hour monitoring period. The sampler's rotating arm can be programmed to start anytime, drawing wastewater into sample bottles via a plastic tube and peristaltic pump, rotating 15 degrees at a time to fill each bottle.

"We can monitor sewage and industrial effluent anyplace we choose, without having to be present," said von Kiparski. "The samplers extend our reach, as we can be in several places at once." Each of the District's two enforcement crews visit between three to four businesses each week.



Investigators William Stanford and Wolfram von Kiparski test the pH in wastewater from a food manufacturing facility in Cleveland.



Throughout a 24-hour period, the rotating arm moves 15 degrees at a time to deliver samples into each of the 24 bottles.



Adding pink dye helps the team determine the path of wastewater flow between manholes.

Samplers can also be installed in the sewers downstream of industrial facilities, for covert monitoring. "We need to confirm that industrial wastewater is being properly treated at all times, not just when a company knows we are there," said von Kiparski.

The sampler is locked and left unattended at the facility. After 24 hours, a District team will return, and a quick visual inspection of the sample bottles will allow them to note anything unusual. "We inspect each sample for any outward sign that something may be amiss," said von Kiparski. "We can bring our concerns to an industrial user immediately, and even estimate when a malfunction occurred. It helps them to address the situation immediately."

After completing a pH test (using both paper pH

strips and a calibrated meter), the crew delivers the samples to the District's Analytical Services staff, who will take custody and run further analyses for other regulated pollutants, such as heavy metals. The District uses the laboratory data to determine compliance or non-compliance with pollutant discharge limits, and may even use the data to apply a surcharge to the industrial user's sewer rate.

When a company is found to be violating limits, a notice is issued and the District works with the business in its effort to return to compliance. In extreme cases, enforcement action may be necessary: fines may be levied or sewer service revoked. The District may also refer cases to the U.S. EPA Criminal Investigation Division for potential criminal prosecution. **CWW**

Dental detox

by Jillian Knittle

Amalgam program keeps mercury out of the sewers

ercury is a naturally-occurring element found everywhere in the environment, and it has a special status in many environmental regulations due to its ability to build up in the environment and increase in toxicity as it multiplies in concentration up the food chain.

A stringent mercury limit of 1.3 nanograms/liter was set by the Ohio EPA, per the Great Lakes Initiative for discharges into the Lake Erie basin. Mercuryremoval technologies are prohibitively expensive, averaging more than \$10 million per pound removed, so Ohio EPA allows wastewater treatment plants to discharge at levels somewhat higher than 1.3 ng/l.

In order to maintain this variance, the Sewer District is required to implement a Pollutant Minimization Program to locate, identify, and (where cost-effective) reduce levels of mercury.

The District's Mercury Group monitors 14 area hospitals that have been identified as significant sources of mercury. Hospitals are required to conduct quarterly mercury sampling and submit annual reports detailing the results, as well as their progress towards reducing their mercury load to the sewer system.

Dental facilities have been identified as one of the

largest controllable sources of mercury. All 460 dental facilities in the District's service area are required to have an *amalgam separator*, a device designed to remove mercury used in fillings from the facility's waste stream. The amalgam particles settle out and accumulate in the separator, and are recycled.

"A silver filling is called an amalgam restoration," explained Dr. Richard Gromofsky, who has a practice in Richfield. "It's a series of different components mostly silver, tin, nickel, and copper—mixed and placed into the tooth. Mercury acts as the binder. As you condense it into the cavity, the mercury evaporates. . . . The more it evaporates the harder the filling gets. There's always some mercury left, even if you're cutting out a silver filling 20 years later."

The Mercury Group conducts triennial inspections of all dental facilities. These visits include an interview confirming how the facility handles dental amalgam waste and an inspection of the amalgam separator. A dental facility may be issued a Notice of Violation if they do not abide by the terms of their Administrative Order or fail to maintain their amalgam separator according to the manufacturer's recommendations.



Sewer District Investigator Jillian Knittle pays a visit to Dr. Richard Gromofsky to verify that his facility has an amalgam separator.

The separator keeps mercury particles from entering the sewer system.

Bimonthly influent and effluent sampling is conducted at the District's wastewater treatment plants, using the EPA-approved Method 1669 (known as "clean sampling"). Samples are analyzed by our Analytical Services staff, using EPA Method 1631, effective at measuring low-level mercury concentrations. The results must meet the limits set forth in our National Pollutant Discharge Elimination System permits.

Further upstream, the District's interceptor sewers are sampled and tracked to locate individual sources of mercury. Existing data regarding industrial, commercial, and domestic users is evaluated. Monitoring plans focus on the most potentially significant contributors.

Our water quality investigators are on call 24 hours a day to respond to mercury-related spills and accidents. In 2004, the District purchased a Lumex[®] mercury vapor analyzer to assist in detecting dangerous mercury vapors in an area and ensuring that atmospheric levels are not greater than a safe exposure limit. WQIS work with local emergency responders, consulting firms, and the EPA to minimize mercury entering its collection system. In the past decade, our team has responded to over 20 emergencies involving mercury spills or accidents. *(See page 26.)*

The Sewer District offers a program allowing residents to exchange mercury thermometers for digital ones at no cost. Since 1998, WQIS has collected and recycled nearly 10,000 mercury thermometers.

The District also accepts mercury-containing items at its Environmental & Maintenance Services Center in Cuyahoga Heights. The items are picked up by an authorized mercury recycler for proper disposal. Since the inception of the program, WQIS has collected and recycled over 700 pounds of mercury. **CWW**

Jillian Knittle is a Senior Investigator in the District's Water Quality & Industrial Surveillance department.

Emergency response by Wolfram von Kiparski

WQIS on call 24/7 for spills and other accidents

or over 30 years, the Water Quality & Industrial Surveillance department has responded to emergency calls from all over the Sewer District's service area. WQIS responds to emergencies 24 hours a day, 365 days a year.

If there is a potential threat to the sewer system or the environment, WQIS will dispatch a crew of investigators prepared to handle a wide variety of situations. Callers will report unexplained odors, chemical or fuel spills, or events that they perceive as needing immediate attention. WQIS is often dispatched to assist area fire departments or Ohio EPA if an emergency is in any way sewer related.

Over half of the emergency calls that WQIS receives are odor complaints. These range from common sewage odors (associated with any sewage collection system) to chemical spills or natural gas leaks.

If a resident calls WQIS to complain about a gaslike odor, a crew is dispatched to the address. Enroute, the team will discuss what the caller meant by "gas." Was it natural gas, gasoline, sewer gas, or something else? The dangers posed by flammable gasoline vapors or natural gas filling a basement are quite different from those of ordinary sewer gas, and WQIS has the training, experience, and equipment needed to recognize threats and respond appropriately.

Our investigators are trained to (at least) the NFPA/OSHA HazMat First-Responder Operations level. In addition, since 2013 the District has served on the Southwest Emergency and Chagrin/Southeast Response Teams. These teams mostly include municipal fire departments; the District's membership is a formal acknowledgement of the long-time relationship between fire departments and WQIS.

The District's WQIS staff can be called out to any HazMat incident (a spill or a chemical release, for example) and seamlessly enter an established incident command structure. Resources are pooled and efforts are not duplicated, which leads to an effective and efficient community response to emergencies. **CWW**

Wolfram von Kiparski is a Senior Investigator in the Sewer District's Water Quality & Industrial Surveillance department.



WQIS Investigators and the Southwest Emergency Response Team respond to a large hydrochloric acid spill in Cuyahoga Heights in November 2013.



WQIS investigates a spill of over 2,000 gallons of highly caustic liquid in September 2012, although the response could not prevent a massive fish kill on West Creek.



A District investigator brings absorbent material to contain a fuel spill on Lorain Road in Cleveland.



Senior Investigator Wolfram von Kiparski prepares to collect a sample of an unknown caustic material at the entrance of a CSO storage tunnel.



Best practices by Linda Mayer

Watershed Center promotes stormwater stewardship

he Watershed Stewardship Center at West Creek is designed to help us consider ways we can improve our urban watersheds and stormwater management.

The Center is the result of a Sewer District partnership with Cleveland Metroparks and the West Creek Conservancy. The District invested \$3 million in capital improvements to the site, and participated in the design process for the Center, which opened in June 2013. In addition, we have a 20-year commitment to provide about \$250,000 annually for programmatic support, including District staff, site improvements and maintenance, and professional trainings and workshops.

The Stewardship Center's exhibits explain what a watershed is, how watersheds have changed over time, and the impacts of pollution and erosion on the ecology of our water system, particularly streams. One exhibit shows which fish species inhabit a healthy part of West Creek, and which ones live in a part of the stream that has been impacted by pollution. The exhibit then addresses the question: What do we need to get our *biota* (animal and plant life) back?

The Center offers everything from basic water-

quality exhibits to onsite field studies. We view the Center as being a technical place, appropriate for fifthgraders on up. WQIS staff provide fish-monitoring data, and the Center's Outdoor Experience team demonstrates macro-invertebrate collecting and waterquality testing for student groups that come through.

Most importantly, the Center demonstrates how homeowners and businesses can more effectively manage water onsite so that it doesn't negatively impact the streams. When rain falls on your property, how can you keep it there? We explain to visitors how rain flows from the Center's green roof to a cistern, and then to a working wetland. There also is a large bioretention cell that conveys storm runoff from the parking lot to a series of bioswale step pools, and into another wetland.

By maintaining all of that stormwater, we reduce our impact on the natural environment, currently facing issues of pollution, erosion, and flooding.

The Center's restored wetlands are starting to teem with life. It's a great indication that they are improving and that nature is coming back. **CWW**

Linda Mayer is the Sewer District's Environmental Education Specialist.

WATERSHED STEWARDSHIP CENTER AT WEST CREEK

2277 W. Ridgewood Drive Parma, OH 44134 440.887.1968

HOURS OF OPERATION: Tuesday - Saturday 10 a.m. - 4:30 p.m. Sunday Noon - 4:30 p.m.





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