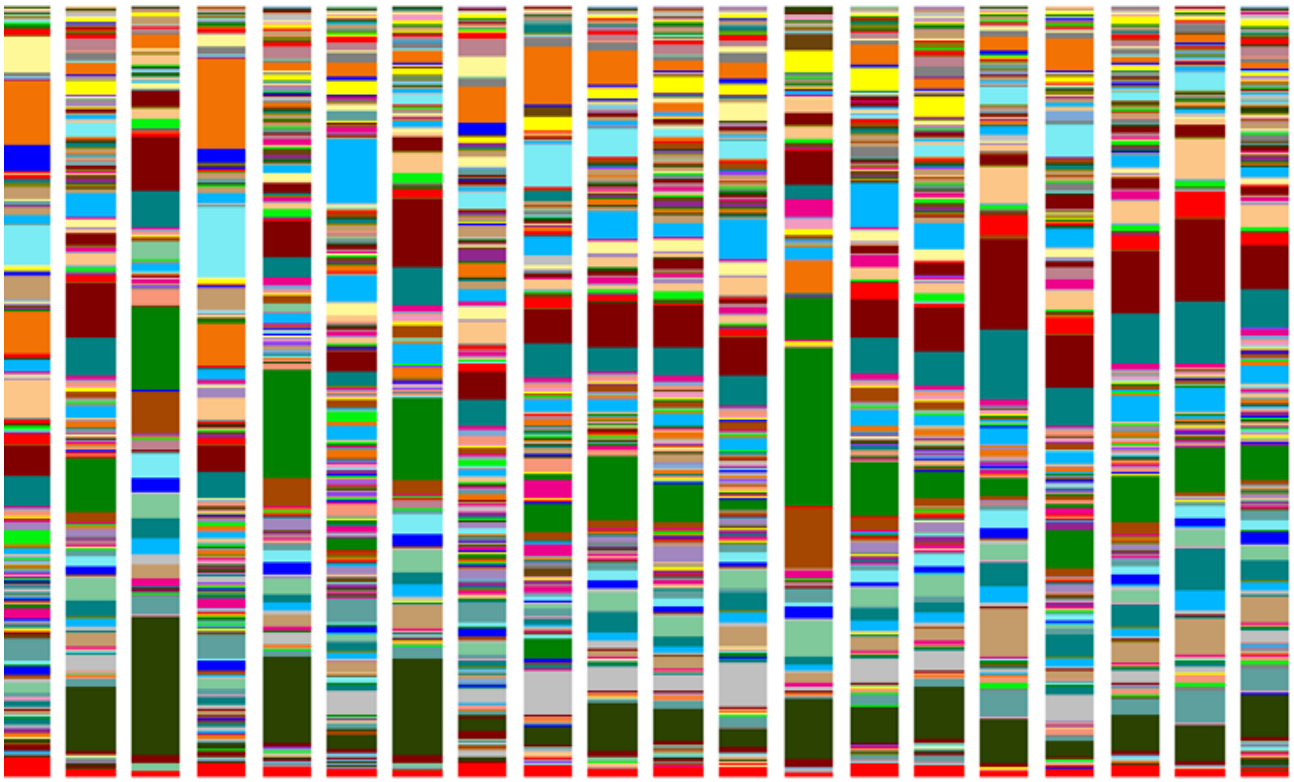
Metropolitan Water Reclamation District *of* Greater Chicago

Press Release

Allison Fore
Public and Intergovernmental Affairs Officer
312.751.6626
allison.fore@mwrd.org
100 East Erie Street, Chicago, Illinois 60611

For immediate release
February 25, 2019

Pioneering study by MWRD and Argonne takes closer look at improving microbial health and composition of area waterways



The many colors highlight the vast diversity of bacteria found in the Chicago River; each column is a different site, and each color represents a unique bacterial species. Scientists from the MWRD and Argonne are gaining a better understanding of the source of those microbes.

A groundbreaking study by scientists at the Metropolitan Water Reclamation District of Greater Chicago (MWRD) and Argonne National Laboratory (Argonne) is revealing a waterway system benefiting from developments in improving area water quality.

Argonne and the MWRD have released an interim report more than five years into a seven-year metagenomic study that uncovers a new understanding of the microbial make-up of the Chicago Area Waterway System (CAWS).

"The Phase II interim report gives us a fascinating scientific glimpse into the condition of our aquatic ecosystem," said Commissioner Debra Shore. "It helps us gauge the effectiveness of what we have been doing to improve water quality, and it gives us a roadmap for how we can continue to improve water quality in the future."

After releasing an initial report in late 2016 that documented baseline data for the waterways, scientists went back and took a closer look to determine what effects the MWRD's advancements, like the Tunnel and Reservoir Plan (TARP) and applications of disinfection technologies at water reclamation plants (WRPs), might have on the water in the CAWS. They discovered after studying nearly 2,100 water samples taken from the CAWS that these MWRD water quality improvements were also improving the quality of the water in the CAWS and the health of microbial communities in the waterways. *(continued)*

Pioneering study by MWRD and Argonne *(cont.)*

Since 2013, Argonne scientists have been analyzing MWRD samples taken monthly from 16 different sites in the CAWS during the recreational season between March and November, and running them through DNA sequencing techniques to identify and learn more about the composition and origins of the microbes in the river. They have examined the water at different locations, following rain events, at discharge outfalls next to WRPs and at outfalls of combined sewer overflows. Through the novel study, researchers have gained a better grasp on the bacterial diversity in the waterways.

Such a comprehensive assessment of a major city's waterway system, especially when the MWRD is attempting to improve the wastewater quality being distributed to the river, is unparalleled," said Professor Jack Gilbert, group leader for Microbial Ecology at Argonne National Laboratory. "It provides us with clarity on how the river recovers when we reduce the input of human waste."

The study determined that the CAWS has more than 20,000 species of microbes in the water and sediment. The microbes are environmental bacteria that are present in used water from homes and industries and in stormwater. The diverse microbial community found in the CAWS was determined to be healthy with a stable community of microorganisms, typically found in fresh water streams. The genetic analysis of these microbes has provided insight into the sources of the bacteria, ranging from fish and sediment to treated water and sewage.

"Significant reduction in sewage indicators and increase in fresh water indicators can be attributed to both disinfection as well as phased TARP completion," the report stated.

The second phase of the study, however, also suggested that water quality in the CAWS is also impacted by conditions that are outside the control of growing advancements in water treatment technologies, such as wildlife, stormwater runoff and existing sediment which also influence the microbial communities of the CAWS.

Different disinfection technologies were implemented in time for the 2016 recreational season to add another layer of treatment at the two water reclamation plant locations, where the MWRD discharges water after it has been treated and cleaned. Disinfection occurs after wastewater passes through a series of treatment processes, including screening, settling and aeration to encourage bacteria and other organisms to clean the water. The purpose of disinfection technologies is to neutralize harmful bacteria. The study showed that fecal coliform indicator bacteria levels decreased downstream of the MWRD's O'Brien WRP in the North Shore Channel in Skokie and in the Little Calumet River downstream of the Calumet WRP on Chicago's far South Side. This is according to water samples that compared pre and post-disinfection.

But these decreases in fecal coliform bacteria levels were not seen in river waters upstream of the WRPs and tributaries during and after rain storm events, illustrating both the power and the limit of disinfection. The early signs of improvement in the Calumet River system, following the addition of the 7.9-billion gallon Thornton Composite Reservoir in late 2015, suggest that TARP, with its ability to contain the first wave of untreated sewage during rain events, may in fact have a more wide-ranging impact on water quality because disinfection does not affect water coming upstream from the WRPs and tributaries. Thornton, for example, has nearly eliminated combined sewer overflows by capturing stormwater and excess sewage before it could overwhelm local sewer systems and spill out into local waterways. Stage I of the McCook Reservoir, which came into service in late 2017, captured more than 27 billion gallons of water and combined with adjoining tunnels the whole McCook system captured 46.1 billion gallons in only its first year. If not for TARP, that water could easily have polluted and overwhelmed local waterways.

"Thanks to Argonne's partnership in this unique DNA study, we now know about the fascinating collection of living bacteria communities in the final effluent, river water, sediment and tributaries," said Dr. Geeta Rijal, who is the MWRD project leader.

Given this increasing microbial data, Argonne is creating additional models to understand the relationship between sewage indicator microbes and environmental conditions, like water flow and water chemistry. The full study will continue through 2019 with additional data from 2018 and 2019 to be assessed. A peer review of the study is being conducted by Water Research Foundation organized national experts. Dr. Karla Heidelberg, director of the Environmental Studies Program at the University of Southern California and a national environmental genomics and metagenomics expert, commended the MWRD's pioneer study. The research, she said, was "well thought out and potentially very exciting in modernizing how MWRD thinks about managing water quality and the health of the waterway system affected by the metropolitan Chicago region."

To learn more about the MWRD and the Argonne study, visit www.mwrd.org/irj/portal/anonymous?NavigationTarget=navurl://57a1634f5128f3f7e1b01f4712f681a5&LightDTNKnobID=-901277970.