



Metropolitan Water Reclamation District of Greater Chicago

# Press Release

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## Argonne, MWRD complete first phase of Chicago River study

*Early data shows healthy, diverse microbial community*

Scientists with the Metropolitan Water Reclamation District of Greater Chicago (MWRD) and the U.S. Department of Energy's (DOE's) Argonne National Laboratory are halfway through a groundbreaking seven-year study that is showing early indications of healthy and diverse microbial communities in the Chicago Area Waterway System (CAWS).

Argonne and the MWRD released a mid-term report Tuesday that highlights baseline data and begins to explore how the MWRD's new developments in water quality innovation are making a difference in the quality of the CAWS. The CAWS Microbiome Study examines the complex microbial communities in the CAWS using advanced analytical and computational tools to explore what micro-organisms are in the CAWS, where they came from and what are they doing.

The early results indicate that Chicago area waterways have healthy and diverse microbial communities. Like many other river systems, the communities vary in their makeup based on location and a variety of other factors but are generally stable.

By sequencing the genes of bacteria from the rivers, researchers made some interesting finds. For example, genes from the *E. coli* present in the samples were found to be predominantly non-virulent.

"We are excited to be partnering with Argonne National Laboratory on this pivotal study that will examine the microbial content of our waterways and as a result, tell us more about the quality of this improving water," said MWRD President Mariyana Spyropoulos. "Given the progress we have made in the Tunnel and Reservoir Plan (TARP) and new disinfection facilities that came into service over the past year, we have the chance to examine how our work has made a difference in the water."

Since 2013, Argonne scientists have been analyzing samples taken monthly from 16 different sites in the CAWS during the recreational season, between March and November, and running them through a DNA sequencer to identify and count the microbes in the river.

"Repeating the sampling multiple times is critical because we need to understand if and how the river's inhabitants change

with time and space," said Argonne environmental scientist Cristina Negri. "We want to find out how the microbial communities may change with the season, after rainfall, during temperature swings, after large discharges, after sewer overflows, or even as a result of boats churning up the sediments as they pass and redistribute the microbes."

The MWRD-sponsored work measures and records changes in microbial communities in the CAWS as the MWRD undertakes new efforts to improve the water system. The MWRD began disinfecting secondary treated water at the O'Brien and Calumet Water Reclamation Plants earlier this year. The Thornton Composite Reservoir went online in 2015, and the first phase of the McCook Reservoir — parts of the Tunnel and Reservoir Plan — is almost completed.

"The river has become substantially cleaner over the past several decades, thanks to many interventions, but we still don't have a very thorough understanding of what lives there," said Jack Gilbert, an Argonne environmental microbiologist. "Our study looks at all bacteria and viruses, pathogenic or not, by sequencing the genomes of the whole community and using our computational might to sort through who is there and what they are doing. This is important because all these species interact with one another in the water—perhaps there's another microbe or condition that triggers blooms of bad bacteria."

The full study will be completed in 2019 and will record the improvements that occur as the MWRD takes steps to manage its outflow. As it approached the midpoint of the project, Argonne submitted a Phase I draft report which will undergo peer review prior to release. The report provides a baseline assessment of microbial communities before disinfection was implemented.

Microbial communities are key players in maintaining the health of the CAWS. Traditional laboratory culture methods, such as fecal bacteria counts, have been extensively used to characterize the CAWS microbial quality for regulatory purposes. Because these methods cannot determine the sources of any contaminants, genetic analysis performed by Argonne can improve the understanding of the composition and sources of the microbial population.

*(continued)*

## Argonne, MWRD complete first phase of study *(continued)*

In the long term, this work will provide another layer of information to enable good stewardship and management of this important water resource, as well as to gain insight into how to improve water quality for primary contact recreation uses.

Negri and her colleagues are creating a hydrological model of the river that incorporates the microbial data, laying out how water flows from different sources and how rain events, water flow and environmental conditions affect bacterial diversity and count.

“This work will provide a more genomic science-based understanding of the microbial health of the Chicago area waterways and should help us understand the sources of microbes that we currently recognize during fecal indicator bacteria monitoring,” said Geeta K. Rijal, MWRD Supervising Environmental Microbiologist.

A link to a video describing the study can be found at: <https://www.dropbox.com/s/222h9xpdvn48gih/RiversFINAL2.mp4?dl=0>.

### **About Argonne National Laboratory**

Argonne National Laboratory seeks solutions to pressing national problems in science and technology. The nation’s first national laboratory, Argonne conducts leading-edge basic and applied scientific research in virtually every scientific discipline. Argonne researchers work closely with researchers from hundreds of companies, universities, and federal, state and municipal agencies to help them solve their specific problems, advance America’s scientific leadership and prepare the nation for a better future.

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### **Recovering Resources, Transforming Water**

*Established in 1889, the MWRD ([www.mwr.org](http://www.mwr.org)) is an award-winning, special purpose government agency responsible for wastewater treatment and stormwater management in Cook County, Illinois.*