

Hurricane Irene polluted Catskills watershed

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Samples taken from a stream in Esopus Creek in the Catskills during Hurricane Irene show the amount of sediment and organic matter collected during at 3.5-hour intervals. Credit: Bryan Yoon

(Phys.org)—The water quality of lakes and coastal systems will be altered if hurricanes intensify in a warming world, according to a Yale study in *Geophysical Research Letters*.

Bryan Yoon, the study's co-author and a doctoral student at the Yale School of Forestry & Environmental Studies, found that last summer during Hurricane Irene—the worst storm in the New York area in 200 years—record amounts of dissolved organic matter darkened Catskill waters and affected the Ashokan Reservoir that supplies New York City with drinking [water](#).

"This is the biggest rain event ever sampled for the region," said Yoon, who conducted the study with Pete Raymond, professor of ecosystem ecology at Yale.

As a primary source of drinking water for New York City, the Catskill Mountains is designated as forest preserve, and roughly 62 percent of the watershed studied is protected by New York State. Over a two-day period in late August 2011, Irene dropped over 11 inches of rain—17 percent of the average annual rainfall—on Esopus Creek that feeds the Ashokan.

Yoon found that the volume of water discharged by the creek increased 330-fold, and the creek exported an unprecedented amount of dissolved organic matter to the Ashokan, equivalent to 43 percent of its average annual export. Yoon likened the increase in dissolved organic matter to a person being fed 40 percent of his annual food in a few days.

Although not discussed as often as other [water quality](#) topics such as turbidity, dissolved organic matter plays a critical role in the aquatic environment and for the provision of clean drinking water. In moderate quantities, dissolved organic matter also provides food and nutrients for microbial communities.

In excessive amounts, however, dissolved organic matter could lead to numerous environmental problems, Yoon's study found. Dissolved organic matter binds with metal pollutants and transports them; interferes with ultraviolet processes that reduce pathogens in water; affects aquatic metabolism; and leads to the formation of carcinogenic disinfection byproducts, such as trihalomethanes during chlorination.

"All of those problems become more serious as larger quantities of dissolved organic matter are transported to lakes and coastal systems," he said. "[Hurricane](#) Irene was a prime example that there is no limit to the amount of dissolved organic matter that can be exported by extreme rain events. Surprisingly, concentrations of dissolved organic matter didn't get diluted."

Raymond said that frequent hurricanes will flush more [organic matter](#) out of the ground and into lakes, reservoirs and coastal waters, potentially altering their biogeochemical cycles.

More information: The study, "Dissolved Organic Matter Export from a Forested Watershed during Hurricane Irene," was funded by the Hixon Center for Urban Ecology at F&ES and can be viewed at www.agu.org/journals/gl/gl1218/2012GL052785/

Provided by Yale University

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