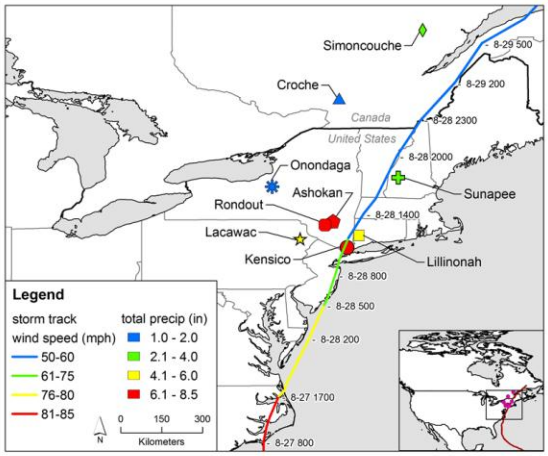
Lake Lillinonah buoy provides insight into the impact of Tropical Storm Irene

As temperatures around the globe continue to rise, one consequence is an increase in extreme weather, such as hurricanes and tropical storms. Irene, Lee, and Sandy have made us much more aware of this global phenomenon. Along with the havoc and suffering brought to people, strong storms have lasting impacts on the ecosystems we depend on for services, such as food and clean water.

Increasingly, lake associations are playing an important role in understanding the effects of extreme weather. In 2012, Lake Lillinonah was part of a study that looked at how environmental conditions were transformed in lakes along Irene's path[1]. Data from the Friends of the Lake research buoy and the Lake Lillinonah Volunteer Water Quality Monitoring Program helped scientists identify lakes at risk of suffering post-storm water quality declines.

Research buoy on Lillinonah.
Photo credit: Laura McSweeney

In the summer, lakes are thermally stratified, with warm water rising and cool water sinking. The rain, wind, and runoff from storms can result in thermal mixing, disrupting the cycling of crucial nutrients. Runoff water also washes soil, leaves, and other terrestrial matter into lakes—creating murky waters and an infusion of nitrogen, phosphorus, and carbon that can take months-to-years to process.



The map shows the track of Irene. Each lake is shown with a different symbol. The colors represent different storm intensity with red as the highest wind speed and rainfall.

When Irene touched down in August of 2011, the study found that lakes with large watersheds located far from the storm's path suffered more mixing and terrestrial inputs than lakes with small watersheds located close to the storm's path. This is because the amount of water delivered to each lake was related to storm intensity (e.g., rainfall amount) and the size of the lake's watershed.

In addition, the study showed that, post-Irene, the terrestrial matter washed in from the land was an important fuel source for biological processes, such as plant growth. In the case of Lake Lillinonah, it's suspected that the large amount of phosphorus delivered during the storm could contribute to future algal blooms, which could impair recreation in the lake even further.

Because the frequency of intense rainfall events is increasing, the study concludes that lake stewards will need to consider more frequent inputs of terrestrial material when making management decisions. The study also highlights that automated sensors, such as those in Lake Lillinonah, are one of the best methods of capturing the environmental changes that occur before and after major storms.

Ashokan Reservoir after Irene showing the brown inputs of terrestrial matter.
Photo credit: Perri Paul and Tom Mills, NYC DEP

Understanding how lakes respond to extreme weather requires long-term water quality monitoring, something citizens can support by volunteering with a local lake association and educating their elected officials on the importance of funding monitoring efforts. For more information, contact Jen Klug at jklug@fairfield.edu.

[1]Klug, J.L., D.C. Richardson, H.A. Ewing, B.R.Hargreaves, N. R. Samal, D. Vachon, D.C. Pierson, A. E. Lindsey, D. O'Donnell, S.W. Effler and K.C. Weathers. 2012. Ecosystem effects of a tropical cyclone on a network of lakes in northeastern North America. *Environmental Science and Technology: 46* (21), pp 11693–11701. DOI: 10.1021/es302063v