Crowdsourcing a 7-day forecast for rivers and stream

Texted data from citizen scientists will help create weekly forecasts of fishing, flood and other stream conditions

BUFFALO, N.Y. — A cell phone and a few seconds of time.

That's all residents of northern Michigan need to take part in a new project designed to improve management and conservation of a vital natural resource: fresh water.

The idea behind the endeavor is simple but impactful. Fishermen, boaters and other outdoor enthusiasts text data on river levels and temperature to scientists. Then, the project team feeds this and other information into a computer model that generates a 7-day forecast of water conditions.

The pilot location is the Boyne River in Michigan, where researchers have set up five citizen science stations featuring stream height and temperature gauges, along with three additional state-of-the-art gauges that collect similar data at other locations.

"People who are outside a lot — fishermen, hikers, bird watchers — have access to all this local knowledge, and we want to tap into that," says researcher Chris Lowry, PhD, associate professor of geology at the University at Buffalo. "If we're successful at the Boyne River, we could expand the system to other locations and other watersheds."

"A forecast is useful for a lot of reasons," Lowry adds. "If we can predict when the water will be high, we can anticipate floods, or tell factories when they can draw water from a river with the least harm. We can forecast the best fishing conditions, and also advise fishermen on when to stay away. When streams are warm, for example, we don't want to even do catch and release, because coldwater fish like trout are already being taxed and are less likely to survive."

Lowry is leading the project, along with Darren Ficklin, PhD, assistant professor of geography at Indiana University. Damon Hall, PhD, assistant professor in the Center for Sustainability at Saint Louis University, and Jason Knouft, PhD, associate professor of biology at Saint Louis University, are also partners.

The power of citizen science

The scientists received funding from the National Science Foundation this summer to start the project, and they anticipate having a forecast up and running in about a year.

The forecast will predict stream flow, water temperature and which sections of the waterway will be good and poor habitats for fish on different days. Initially, the predictions will look three and seven days out, but the system should be capable eventually of generating information for every day of the week.

The forecast will be based on data — including texts from citizen scientists — that show how water levels and temperature responded to past weather conditions (like rainfall).

"By using crowdsourcing, we'll be able to create a model that is constantly improving itself, with new data coming in all the time," Ficklin says. "That's what's transformative about this project."

A new way to monitor fresh water

Crowdsourcing could help fill gaps in knowledge at a time when traditional methods of monitoring fresh water are on the decline, Lowry says.

He explains that in recent years, tight budgets have forced the U.S. Geological Survey to stop recording water levels at many streams the agency has watched for decades. And most monitoring focuses on large rivers of importance to urban communities.

To compensate, Lowry and colleagues have been using crowdsourcing to collect data on smaller streams since 2011. That effort, called CrowdHydrology, is active in 11 states.

The Boyne River has been part of CrowdHydrology since 2015, and locals — including the [Friends of the Boyne River](#) — have been highly active in texting data from the beginning. That's one reason scientists chose the Boyne River as the pilot site for the new modeling project.

"Knowing what our river is doing is a great step forward if we ever need to defend it," says area resident Ed Strzelinksi, a former board member and longtime current member of Friends of the Boyne River. "If bottling plants decide to start drawing more water and it impacts our Boyne River, how would we know about it if we didn't have any baseline data? What if fracking, which takes huge quantities of water, comes here?

"If we notice that something is changing, we now could actually have some data and objectively go to the folks who are in power and say, 'Something is going on here, and here is the data to show what's happening.'"

Of the plans to develop a stream forecasting model based on data from the Boyne, Strzelinksi says, "I think it's excellent. If lessons we learn within our watershed could be expanded to sustain water resources and ecosystem management elsewhere, this is good."