

Monitoring nitrates in real time

BY LYNN BETTS

IOWA farmers and anyone else interested in nitrate levels in selected Iowa streams can now check online 24/7 for real-time updates and historic nitrate levels. The measurements come from a new system of sensors placed in the water at 55 stations across the state.

The state-of-the-art sensors are deployed by the University of Iowa (41 sensors) and the U.S. Geological Survey (14 sensors). Many are taken out of the water during winter because they would freeze, but all 55 should be functioning each spring, said research engineer Chris Jones.

First monitors used in 2012

Jones works in the Hydrosience and Engineering Division of the university's Iowa Institute of Hydraulic Research (IIHR). He told farmers at the 2016 Iowa Soybean Association Research Conference held last winter in Des Moines that the first monitors were deployed beginning in 2012 specifically to measure progress on Iowa's Nutrient Reduction Strategy.

"You can't make good policy without good data," Jones said. "The only scientific way to know if the strategy is working is to quantify the amount of nitrate leaving Iowa through its streams."

Jones said IIHR strategically located its 41 stations to measure the nitrate loads being carried out of Iowa by its rivers. "Some are in small streams, and some are at the bottom of larger watersheds," he said. "All the larger watersheds will be cov-

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Chris Jones,
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University of Iowa

ered by the end of this year."

Jones said nitrate levels and other information are collected and sent from each of the sensors every 15 minutes, around the clock. That information is published in real time at the Iowa Water Quality Information System (IWQIS) website.

"Our tool lets people look at both the concentration [parts per million] and total loads [tons of nitrates] discharged from a particular point over a period of time," Jones said. "That load can be quickly compared to the watershed size so we know the yield of nitrate in water per acre as well."

Jones said chlorophyll, dissolved oxygen, turbidity, pH and water temperature are also collected. The website dis-

plays current and annual water quality conditions, along with daily and cumulative rainfall and snowmelt. The IIHR harvests all the USGS data, so the IWQIS website includes the USGS data as well.

The IWQIS stations are powered by solar cells and use cellphone transmission to send data every 15 minutes. That data is both more complete and up to date than the traditional "grab sample" ambient monitoring programs, where a person goes to a stream site biweekly or once a month to physically draw samples of water that are taken back to a lab for testing.

Iowa leads the nation

"No one in the country is doing water quality monitoring like this," Jones said. "Florida has some sensors deployed, and there are a few in California, Illinois, Indiana and maybe Kansas. But Iowa was the first," he said, "and we have by far the largest assembly of these real-time sensors."

Jones is traveling to China to install one of the sensors on the Huai River, and also hopes to get a sensor installed in the Netherlands. "Those areas are like Iowa; we'd like to get water quality data from there and compare it to Iowa's," Jones said. "We'd really like to get a little more worldwide view on this."

Jones foresees real-time monitoring will also extend to smaller watersheds in Iowa, but added that the sensors are expensive and monitoring smaller streams involves private landowners who would need to voluntarily agree to the monitoring.

The idea to use sensors for real-time water quality monitoring came from a system developed to monitor and forecast flooding in Iowa. "After extensive flooding in Iowa in 2008, the state of Iowa established the new Iowa Flood Center," Jones said.

"IFC researchers designed a cost-efficient network with 200 stream stage sensors that measure stream height and transmit data automatically and frequently to the on-line Iowa Flood Information System that you can view in real time," he said. "That gave us the idea to use a similar system for water quality."

Each sensor costs about \$16,000, Jones said, and they're being funded largely by the Iowa Nutrient Research Center at Iowa State University to assist the state of Iowa with the Nutrient Reduction Strategy.

Funding has also come from the U.S. Department of Housing and Urban Development, and the U.S. Geological Survey and the Iowa Department of Natural Resources are among partnering agencies.

"Our primary intention — especially this coming year — will be to quantify the load of nitrate leaving the state of Iowa," Jones said. "We want to trend that over time to see if the practices we're implementing for the Iowa Nutrient Reduction Strategy are indeed working and reducing loss from farm fields."

You can find nitrate levels in water measured by the 55 sensors at the Iowa Water Quality Information System website at iwqis.iowawis.org.

Betts writes from Johnston.



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