

ENVIRONMENT

Hodgson finds a way to fool Mother Nature

Researcher shows how to improve health of a lake

By Paul Srubas » Green Bay Press-Gazette

Successfully proving that a bit of ecological future can be scientifically predicted and getting that proof published in a prestigious scientific journal are not the worst ways to end a 41-year career.

"It's a nice way to go out the door," said James Hodgson, who wrapped up his 41-year teaching career at St. Norbert College in December and is putting the finishing touches on his part of a 27-year research project.

Hodgson, newly retired professor of biology and environmental science, has been working with a team of researchers from around the country for the last several decades.

Over the years, the group has contributed greatly to the world's knowledge about the effects of changes in the food chain in ecosystems like small inland lakes. Thanks in part to the group's research, it's become common knowledge among environmentalists that ecosystems like lakes can be manipulated and improved by

ABOUT THE FIND

See the results of Hodgson's research in Science magazine's Internet publication, Science Express, at www.sciencemag.org/content/early/recent. The article will be available in hard copy in coming weeks.

» See Nature, A-2

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James Hodgson,
retired biology professor

making changes in key parts of the food chain.

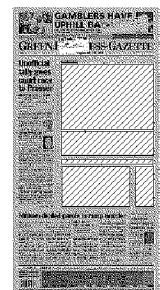
Hodgson gives this example: A lake choking out from overproduction of algae can be made clearer and healthier through the introduction of predator fish such as largemouth bass. The bass would feed on and reduce the population of the minnows and small fish that feed on zooplankton, which would increase the population of that zooplankton, which feed on and cut back on algae production. The change in the chain causes what scientists call a "regime shift" in which the entire ecosystem shifts from one stable state to an-

other.

"We know it's going to occur," Hodgson said. "We demonstrated it eloquently a number of times."

Hodgson and other scientists have long theorized that regime shifts happen at a single defining moment, like a teeter-totter tilting abruptly when weight is shifted to one side.

However, that abrupt tipping-point idea remained a theory until recently, when Hodgson's crew set out to prove it. It's the results of that research that will appear in the newest issue of Science magazine, a prestigious scientific journal



that Hodgson says routinely rejects about 98 percent of the research submitted to it.

Using two privately owned, gated lakes in Michigan's upper peninsula, Hodgson's crew worked for three years to prove not only that regime shifts have a tipping point but also that the exact moment of tipping is predictable.

The researchers used one lake as a control site and the other as the test site, where they introduced largemouth bass to induce a regime shift in the food chain.

The shift could have been accomplished in as little as a year, but the researchers induced it as slowly as possible so they could measure for signals of variance in everything from temperature to chlorophyll levels to pumpkinseed sunfish population to bass weight.

"We had to do it slowly, because we didn't know what we were looking for," Hodgson said. "We measured chlorophyll every five minutes for three years — when the ice was off the lake — and pumpkinseed distribution every day. It was a very intense data set."

It wasn't all work and no play.

"If you want to find out what bass eat, you've got to catch them, and the most efficient method was angling," Hodgson said. "We'd fish for science all day, then go fishing for fun."

Fishing for science under these conditions was so easy "a bozo could do it," Hodgson said, because the scientists knew exactly how many fish were in the lake, what they weighed and what they ate, and they had caught all of the same bass numerous times before. In one outing five people caught 87 bass in the space of two hours.

"It was catch, measure and release," Hodgson said. "We'd get the weight, measurement, the stomach contents would be pumped, the fish would be tagged. ... Some of these fish had been around 15 years, and every fish was identified, so we could trend their diets and growth."

It's the kind of work that yields more than just arcane scientific findings; some of it would be a gold mine to any tournament bass fisherman. Hodgson can tell you, for example, how long the trauma and resulting weight-loss lasts in bass that have been captured and released.

The discovery of the predictability of the tipping point for regime shifts is also more than just an arcane scientific finding.

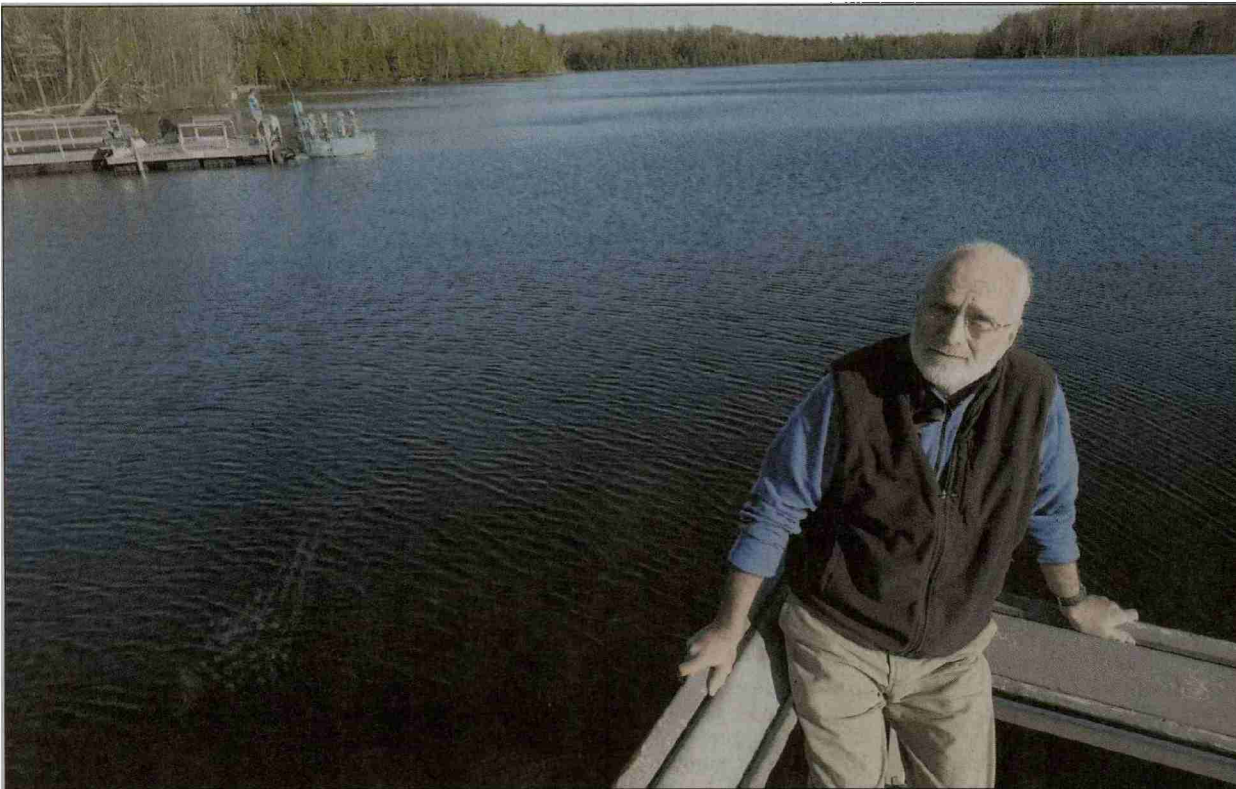
"The 'take home' here is that we should be able to predict potentially catastrophic ecological regime shifts tied to such things as overgrazing," Hodgson said.

If scientists can predict the tipping point in a lake being brought into a healthy balance, they theoretically can predict the point where it flops to the unhealthy side, he said. And the same would be true of forests, grasslands, deserts and other ecosystems, healthy and unhealthy.

In a world of manmade ecological problems, the research should lead to ways not only of saving problem ecosystems but also of predicting tipping points in large-scale ecological systems so that public policies can be put in place to save those systems before they tip too far, Hodgson said.

"Good policy is based on good science," he said. "Hopefully, that's where this goes."

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St. Norbert College professor James Hodgson poses at Lily Lake as a backdrop for an article he published in the magazine *Science*. The article features a finding by his team of researchers on the predictability of the timing of ecological regime shifts in lakes in the Upper Peninsula of Michigan that are similar to Lily Lake. **Jim Matthews/Press-Gazette**