



RESEARCH NEWS

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Taking a closer look at the health of Lake Winnipeg

By Frank Nolan, Research Promotion Officer

Lake Winnipeg is the tenth largest body of fresh water in the world, and Canada's second largest watershed. It is also the third largest hydroelectric reservoir on the planet, and home to the largest commercial freshwater fishery in western Canada.

Unfortunately, Lake Winnipeg is being increasingly threatened by a combination of excess nutrient loading, climate change and the invasion of foreign species. Given its importance to Manitoba's fishing, hydroelectric and tourism industries, most of us would assume that the health of the lake has been exhaustively researched and monitored. According to University of Manitoba zoologist Brenda Hann, however, that is simply not the case.

"One of the things that is somewhat shocking to most people is how little we know about Lake Winnipeg," Hann said. "It is probably one of the most poorly-studied large lakes in North America."

Hann works with the Lake Winnipeg Research Consortium (LWRC), a group founded in 1998 to investigate deterioration in the lake's water quality following the 1997 flood. Made up of university researchers, government agencies, and corporate and stakeholder groups, the LWRC uses the former Canadian Coast Guard vessel *Namao* to conduct research on the biological, chemical and physical processes that impact Lake Winnipeg.

Before the LWRC began its extensive research program, scientists had very little reliable data to work with.

"If you look at the background information we've got, Bajkov went out in his own private vessel in 1929 and collected samples," Hann said. "The

next really substantial study was done 40 years later, in 1969. After that, there were scattered little bits and pieces the Province did, but the next major biological study wasn't until 1999."

Beginning in 2002, the LWRC began conducting comprehensive research surveys of Lake Winnipeg in spring, summer and fall. Each expedition lasts up to a month, and researchers collect samples from 65 stations in the lake's south basin, north basin and narrows. The stations are located using GPS coordinates to ensure that samples are being collected from the same place each time.

"Within our group, we've got people who are studying fish, zooplankton, phytoplankton (algae), bacteria, and water chemistry," Hann said. "We're trying to cover all aspects that are important to understanding this ecosystem."

Even though the LWRC has only been collecting samples for a few years, it is clear to Hann and the other researchers that Lake Winnipeg is under serious stress.

"We've got significant eutrophication, or nutrient loading, which is a major stressor and a big, big problem," she said. "There is nitrogen and phosphorus coming into the lake via the Red River, the Winnipeg River and the Saskatchewan River, as well as many of the smaller rivers from the east and west. Some of that is agricultural run-off, but a significant amount is coming in from sewage and waste water treatment plants that empty into the system."

Climate change, leading to higher mean annual water temperature and changes in the duration of open water

on the lake, is also a major concern. Lake Winnipeg is relatively shallow, with a mean depth of only 12 metres. As the climate warms, the amount of heat that enters the water increases. This can, Hann said, increase the likelihood of periods of thermal stratification in the lake.

"You can have an upper layer that is very warm and a cooler layer at the bottom," she said. "Until very recently, we never thought this happened in Lake Winnipeg because the lake is so shallow and seemingly well-mixed, but in 2003, which was a fairly warm year, we have strong evidence that the lake was stratified for as much as six weeks in mid-summer." Associated with this stratification were very low concentrations of oxygen (hypoxia) in the bottom waters.

Hann's own research is focused on the organisms that live in the bottom sediments of Lake Winnipeg, including worms and insects. She said stratification and hypoxia can have a major impact on these animals, and this can affect the delicate balance of life in the lake.

"All of these organisms can be affected, particularly insects that spend a good portion of their development time at the bottom. As they emerge up through the water column, they are fed upon voraciously by all of the fish species, so they make up a really big part of the fish diet. If you start to stress that base of the food web, it can have major consequences for the entire food chain."

Nutrient loading and stratification also affect the competitive interactions among the different species of algae, causing algal blooms and further stressing the food chain.

"Let's say you tip the balance in favour of blue-green algae," Hann said. "There are a lot of things that won't eat

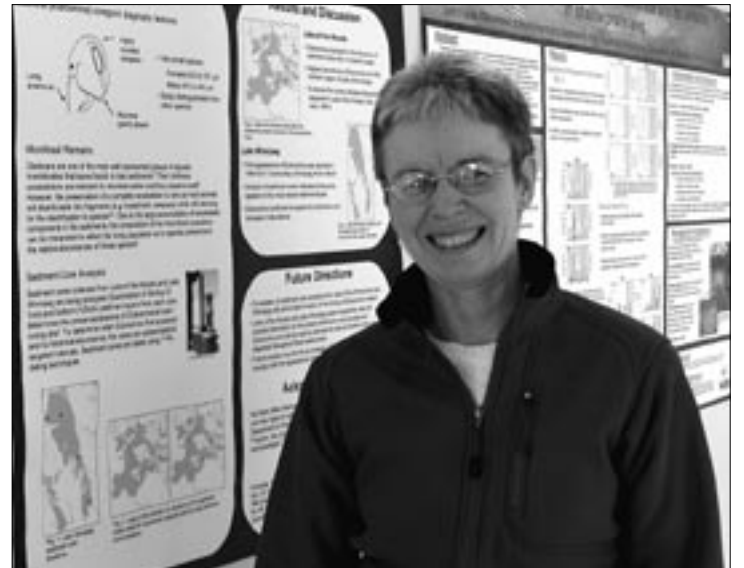


Photo by Frank Nolan

Brenda Hann, zoology, is studying the organisms that live at the bottom of Lake Winnipeg.

blue-greens, so a lot of that biomass in the upper layers ends up settling to the bottom and forming mats that stress the organisms there. Everything is connected, and if we think only about these two stressors, nutrient loading and climate change, they can interact and lead to serious consequences for the ultimate health of the lake."

Hann said that invasive species, including rainbow smelt (already in the lake), and rusty crayfish and several species of zooplankton (not yet here) also are expected to have an impact on the lake's ecosystem, compounding the larger problems caused by nutrient loading and climate change.

"We simply can't ignore this anymore. We all have a stake in the future health of this lake ..."

Brenda Hann
Department of Zoology

"The water quality of Lake Winnipeg is equal to, if not worse than the water quality of Lake Erie 30 years ago," she said. "Unlike Lake Erie, however, Lake Winnipeg seems to be under the radar, but should it be? We simply can't ignore this anymore. We all have a stake in the future health of this lake, and we all have a role to play. I think there has been an increasing groundswell of interest and concern, but the problem is what will it translate into?"

On March 22, Brenda Hann will give a public presentation about her Lake Winnipeg research as part of the *Get to Know Research at Your University* speaker series. The presentation begins at 7:00 pm in the Smartpark boardroom at 135 Innovation Drive. Admission is free, and everyone is invited to attend.



(Photo courtesy of Mike Stainton, Freshwater Institute, Department of Fisheries and Oceans.)

Hann collects a sample from Lake Winnipeg with Rollie Fortin, water quality specialist with Manitoba Water Stewardship.

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