Robots may protect drinking water from terror attacks

OTISCO LAKE, New York (AP) -- A network of underwater robots beaming up a near real-time environmental profile of lakes, rivers and reservoirs could soon be on the prowl helping safeguard the nation's drinking water from sabotage.

The robots would replace researchers who painstakingly collect water samples in bottles and take them back to the laboratory for analysis, an expensive, time-consuming and sometimes dangerous practice.

By summer 2005, Syracuse University researchers will have installed a dozen robotic sensors to form the largest underwater monitoring system of its kind in the country and one of the most extensive in the world, said principal investigator Charles Driscoll, a professor of environmental systems engineering at Syracuse.

The project will cover more than 25 miles of the Seneca River and five connected lakes, including three municipal drinking water sources for more than 500,000 people in central New York: Otisco, Skaneateles and Owasco lakes.

"Not too far off, though, this technology will be able to serve as an early warning system, a network of robotic sentinels, to protect our waterways from terrorist attacks," said Steven Effler, executive director of the Upstate Freshwater Institute, a partner in the project.

The institute also oversees a network of six robots in the Schoharie Reservoir and Schoharie and Esopus creeks, which provide drinking water for New York City.

Real-time monitoring

Similar underwater environmental monitoring programs are under way in Minnesota, Washington, Nevada and North Carolina, said Bruce Munson, an associate professor at the University of Minnesota in Duluth, where the technology was pioneered.

"This is promising technology," said Ben Grumbles, who heads the U.S. Environmental Protection Agency's water office. "The key to protecting our water resources is real-time monitoring. These robots present an exciting opportunity to accomplish that."

The water-detection system is one of several projects under way by researchers and companies to hone sensitive detection equipment for use in homeland security. For example, researchers at Pennsylvania State University are working on an inexpensive, disposable sensor for ricin, the highly poisonous protein found in castor beans and thought to be a potential terrorism agent.

The underwater robots are known as a RUSS system -- Remote Underwater Sampling Stations -- developed in the late 1990s as part of a National Science Foundation educational project to give college and high school students an opportunity to monitor lakes and rivers over the Internet. The first systems were installed in 1998 in Ice Lake and Lake Independence in Minnesota.

Syracuse launched its first robotic monitor in 1999 in Onondaga Lake, a federal Superfund site that is considered the nation's most polluted waterway.

Tracking pollution as it occurs

Here's how RUSS works:

A mobile, underwater sensor package, tethered to a floating platform, contains an onboard computer, solar panels and telemetry equipment for position tracking. As the computer-controlled sensors move vertically through the water, they collect data as frequently as every 10 minutes on temperature, oxygen, turbidity, light and salt content.

This summer, Driscoll and his team will be testing a new generation of sensors to detect phosphorous, iron, nitrates, nitrites, ammonia and other substances.

The data are transmitted via cellular phone signals to the main computer at Syracuse and eventually posted on the Web.

The information enables scientists to better understand the environmental systems at work

and assess whether the water is suitable for consumption, aquatic life and recreation, Driscoll said.

One of the system's greatest benefits, he said, is its ability to track pollution as it occurs, letting scientists manage it and make informed, on-the-spot decisions.

"The New York project is extremely well designed and will give scientists a deep understanding of how the different components of a lake interact," Munson said.

Still, the technology is not quite ready as an early warning system. Currently, the robots are removed each winter. Effler said scientists are working on a monitoring system that will rest on the lake bed and can be used year-round.

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