A noxious weed threatens the Connecticut River. Students created a device to join effort to eradicate it

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The multimillion dollar threat to the lower Connecticut River from the invasive aquatic weed hydrilla has attracted attention from around the

country, as scientists work on ways to contain it.

Now, a group of engineering students from Northeastern University in Boston are developing a remote method of tracking its spread, a task that has so far consumed two years of work by the new and thinly staffed state Office of Aquatic Invasive Species.

The Hydrilla Hunter, as it has been christened by the students, is a small, remote-controlled, robotic vessel with a sophisticated underwater camera that can distinguish hydrilla from other aquatic vegetation, plot the weed's location, and relay coordinates to the state's scientific team.

"I'm happy that we are just raising awareness of it," said Riya Sen, a senior mechanical engineering student who was part of the 12-member student team that conceived the project and is now completing it.

Related strains of hydrilla have been a problem elsewhere, particularly in the south. But the Connecticut strain appeared locally less than two decades ago and has since exploded along the river's banks and its creeks, coves, and tributaries from just south of Springfield to Essex, near the river's mouth.

Scientists believe hydrilla reached Connecticut as a decorative aquarium plant and was introduced to the river by families disposing of pet fish.

Over the course of the summer, it creates impenetrable, acre-sized mats of weed. Anglers can't drop hooks through it; it fouls, and stalls boat motors and kayakers can't penetrate it. In some areas, such as around the Mattabassett River in Middletown, it can slow river flow and create huge mosquito breeding grounds. Tax collectors worry about its effect on waterfront property values and marina owners are spending money to clear channels for customers.

The Connecticut Agricultural Experiment Station, of which the invasive species office is a part, is limited in its anti-hydrilla efforts by staff and funding. Using its two boats and laptop computers with global positioning software, the state scientists this year finished what turned into a two-year effort to map the extent and density of hydrilla.

Based on the state's map, the U.S. Army Corp of Engineers last summer began measuring river flow and current with dye as a preliminary step to a plan next summer to test whether hydrilla rich areas can be controlled with herbicide.

Which is where the Northeastern students believe they can help.

The river now looks as if it is hydrilla-free because the mats of plants break off from the bottom, break off into pieces and drift south to Long Island Sound every fall. Since Connecticut River hydrilla is believed to propagate when fragments sink and form new plants, the weed is expected to return in even greater force next summer.

That means there is a need for continuous mapping. And that is how the Northeastern students say devices like Hydrilla Hunter can be used.

"We are working on finding hydrilla in early stages, not when it is fully grown, not when it can clog up our motors, but when it is a little sprout," said Dan Simpson, a mechanical engineering student and team member. "And that way, when it sweeps an area, it can notify people so they can work on ways to remove it."

The project is a requirement the students had to meet to graduate with engineering degrees. It brought together teams of mechanical, electrical, and computer engineering students. Electrical and computer engineering student Lisa Byrne developed the concept with mechanical engineer Jessica Healey last summer.

The heart of the device is a hyperspectral camera, which is able to distinguish between different wavelengths of light unique to specific plants. That means the camera can pick out hydrilla from all the other aquatic vegetation by the wavelengths of light it reflects.

"Every plant has its own spectral signature," Byrne said. "That is the amount of reflectance it has at different wavelengths of light. There are certain wavelengths where it is easier to distinguish plants from one another because of the amount of chlorophyll in the plant."

The camera is hung below the craft—which the students were required by federal regulation to equip with running lights—and angled slightly forward to operate in natural light. It is propelled by an array of electric propellers. In response to remote controls, the craft can move forward, sideways, in reverse and it is capable of a zero turn radius.

Through its geopositioning software, it can be programmed to survey a specific area and send coordinates to scientists when it spots hydrilla.

Healey said the device is semi-autonomous, meaning it requires close human oversight.

"There are a few fail safes if things go wrong," Healey said.

"But it is meant to be worked in tandem so it still needs some human help out there. The main goal is to reduce manual work load. Fewer people out there on a boat," Healey said. "You could send it off to one place to do something while you go somewhere else to do something different. It currently has a 90-minute run time so it could be sent out and recollected."

The students said Hydrilla Hunter remains very much a work in development that needs further testing and refinement. Certain

components may have to be replaced with others. They hope to take it to Connecticut for tests this winter.

Northeastern electrical and computer engineering professor Charles DiMarzio said the concept is sound and, with minor modifications, governments may be able to use it or devices like it to find a variety of nuisance vegetation.

"I think they could pretty much take this technology," DiMarzio said. "First of all they would have to do some experiments, try it out and refine it to reduce the cost and improve the performance, the length of time it can be out there. And I think they would really need to think about making it more useful for other species in other states to spread the investment around.

"But I think it is very feasible that this could be made something that could be used pretty easily at a relatively low cost," he said.

Greg Bugbee, who is directing Connecticut;s anti-hydrilla effort, said he had been consulted by the Northeastern students and is awaiting more evidence of Hydrilla Hunter's performance.

"It's a start," he said.